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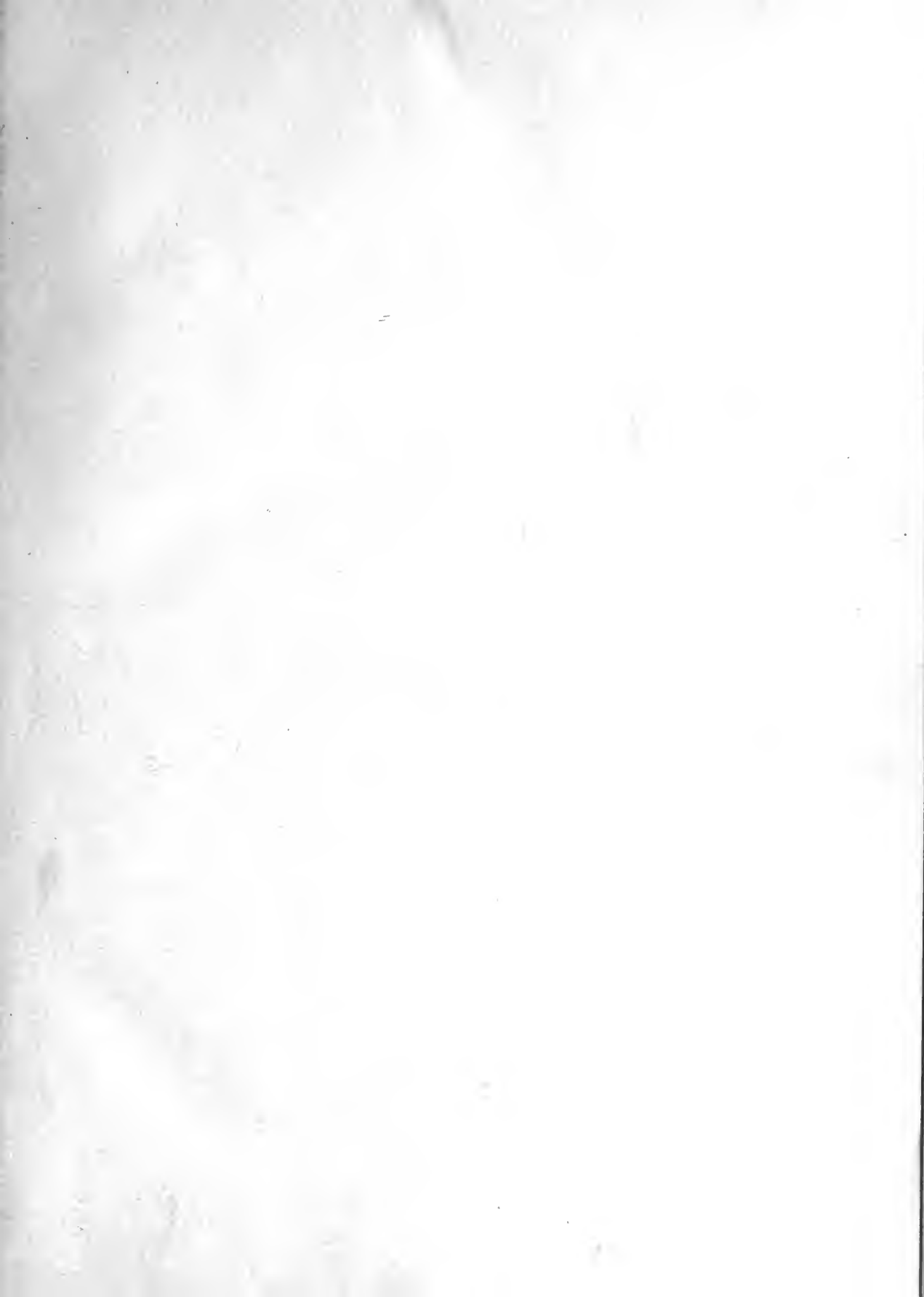
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THE
POPULAR EDUCATOR:

A COMPLETE ENCYCLOPÆDIA

OF

Elementary, Advanced, and Technical Education.

NEW AND REVISED EDITION.

VOLUME I.



CASSELL, PETTER, AND GALPIN,

LUDGATE HILL, LONDON, E.C.;

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THE POPULAR EDUCATOR.

INTRODUCTION.

At no period in the history of our country was it less necessary to offer an apology for introducing a national work on Education than at the present time. So keen is the competitive spirit of the age, that the advantage of knowledge in the struggle for advancement is apparent to all. The mighty power of steam applied to railways and vessels has developed national and international communication to a degree not dreamt of at the commencement of the century. Telegraphy presents to our view the daily contemporaneous history of the world; and the Press, relieved from those shackles which impeded its action and fettered its influence, has become a powerful medium for the communication of thought between the leading minds of the age. In the political condition of our own country a change has been wrought, the consequences of which the boldest prophet avows his inability to predict, but which all parties agree will be fraught with good or evil, according to the degree in which the new recipients of power may be possessed of the knowledge to use that power aright. The necessity of Education, therefore, which was fiercely combated when this work first saw the light, is now universally admitted, and the mode and the system alone remain to be discussed. This truth was fully recognised by no one more than the late Earl of Derby, the illustrious chief of the Conservative party, and he was pleased to accept the dedication of this work to himself. Gratifying as is this complimentary recognition of the services which the original edition of the POPULAR EDUCATOR has rendered in the promotion of National Education, we feel that the basis of our present claim upon the co-operation of all the friends of that great movement consists in this—that *our system has been tested, its efficiency has been proved*, whilst a sale of 750,000 copies has testified, on the part of those for whom it was designed, their appreciation of the work and their estimate of its value.

But some twenty years have elapsed since the POPULAR EDUCATOR first issued from the press, and during that period considerable advances have been made in many of the departments of knowledge. To perfect the work in accordance with all the discoveries up to the present day, we have found it necessary to introduce many new subjects, and to re-model many of our old lessons, and we shall spare no expense in making these changes as complete as possible. To amuse, to instruct, to elevate, will be our constant endeavour. To render the workman more perfect in his vocation, the soldier and sailor better fitted for the higher positions of his profession, the naturalist more conversant with the beauties of Nature, the politician further acquainted with the im-

portant events in the history of his country, and to place at the command of the student for the Civil Service or University Examinations all the branches of education necessary for his advancement, no effort will be wanting. Our ambition is to place in every English Home an Educational Encyclopædia, invaluable as a manual of study and a work of reference, which, whilst simple, progressive, and interesting in its style, shall be powerful for the improvement and the advancement of its students.

In the three great departments of knowledge which this Work will embrace—History, Science, and Languages—the end of such instruction, viz., its practical application to the affairs of life, will be kept steadily in view. Science will be taught not merely as abstract truth or an interesting intellectual exercise, but as embodying in all its branches those principles, a knowledge of which will explain the various phenomena of the world, and enable us to avail ourselves more intelligently, and therefore more successfully, of all the varied material with which Nature has supplied us.

Instruction in Languages—whether living or dead—will be so conveyed as to enable the student not only to understand a given set of books in any particular tongue, but to make him master of the language itself by gradual and easy, but yet real and tangible stages.

The Historic Sketches, by means of which we shall teach History, will, we hope, render that study no longer a mere record of battles, an obituary of kings, a mighty chaos of incident; but will illustrate how each nation has discharged its functions in the world's history—how each epoch has played its part in the drama of a nation's life.

A reference to our list of contents will show that under various heads will be included every branch of study which can possibly be useful in the varied walks of life.

The great aim and object of this Work is to enable the people to educate themselves. We have only to ask them to realise the magnitude and grandeur of the work in which they will be engaged if they determine to do so. Obstacles will be overcome by united resolution. Every difficulty surmounted will be additional strength for further victories. A good education is the best legacy we can leave to our children. It is the best investment we can make for ourselves. The educated man in every walk of life carries with him his own capital—a capital unaffected by monetary crisis—an investment whose interest is not regulated by the success of speculation—a legacy which none can dispute, and of which none can deprive.

LESSONS IN FRENCH.—I.

IN commencing these Lessons in French, instead of beginning with a long chapter exclusively devoted to the pronunciation of words, and the variations which are caused in the sounds of vowels and consonants by changes in their relative position, we have thought it best to enter at once into the construction of the language, and endeavour, without unnecessary delay, in as plain a manner as possible, to make our readers familiar with its various idioms and peculiarities. The Section on French pronunciation will be divided into several portions, one of which will be given at the commencement of each lesson in French, until the subject is exhausted.

SECTION I.—FRENCH PRONUNCIATION.

I. THE FRENCH ALPHABET.

1. A tolerable pronunciation of any spoken language may be acquired by imitating the sounds of that language, as uttered by a living teacher. But the reading and writing of any language cannot thus be learnt. The pupil must bring into requisition something else besides his imitative powers, if he would thoroughly comprehend any language. The alphabet of the language to be learnt must be exhibited and examined, and then mastered.

2. An alphabet is a collection of different characters called letters, each of which represents its own peculiar sound. These letters differ from each other in name, form, size, and sound. Used as vehicles of thought, they must not only be familiar to the eye, but their use, both singly and combined, must be understood.

3. Two objects are to be before the student whilst perusing these preliminary lessons on French pronunciation, namely:—

First.—The acquisition of the correct pronunciation of the various sounds of the letters of the French alphabet.

Second.—To learn how to combine and use these sounds, in order to read the French language easily, intelligibly, and profitably.

4. The first object will be accomplished by the aid of analogous English sounds; that is, every sound represented by a letter or combination of letters of the French alphabet, will be unfolded, analysed, and defined, as far as possible, by means of analogous sounds of a letter or combination of letters of the English alphabet.

5. The second object will be accomplished by learning a few brief and simple rules, illustrated and enforced by appropriate examples.

6. Diligent attention, patient labour, and a determination to succeed, will enable the learner to overcome every obstacle, and thus make him master of a language, not only exceedingly difficult for foreigners to acquire, but beautiful in itself, and co-existent with the triumphs of civilisation.

7. The student's attention is next directed to the French alphabet. While the English alphabet contains twenty-six letters, in the French alphabet there are only twenty-five. It has no letter which corresponds to the English *w*, though it is occasionally found in French books. It is used only in foreign words, and then pronounced like the English *v*.

8. The French alphabet is divided into vowels and consonants.

9. THE VOWELS.—The vowels are six in number, namely:—

a e i o u y.

10. THE CONSONANTS.—The remaining letters of the alphabet, nineteen in number, are called consonants, namely:—

b c d f g h j k l n
p q r s t v x z.

11. THE COMPOUND VOWELS.—There are seven compound vowels, namely:—

ai au eau ei eu oi ou.

They are thus called because, being united together, each vowel loses its own simple sound, and helps to form another new sound. They form but one syllable, and are consequently pronounced by one emission of the voice.

12. THE DIPHTHONGS.—There are six diphthongs, namely:—

ia ie io ua ue ni.

They are thus called because, though pronounced as one syllable, the sound of both vowels is distinctly heard.

The following ten combinations of three successive vowels are also called diphthongs, namely:—

iai aiu ieu oia one oui uai nei
uie ueu.

These diphthongs are thus divided into syllables:—

i-ai i-au i-ai ou-a ou-e ou-i r-ai
u-ai u-ai u-ai.

They must, however, be pronounced quickly, and as one syllable. Sometimes, also, we find four successive vowels in the same word, namely:—

ouai in the word jou-ai,
oueu „ „ jou-eur,
ouée „ „ bou-ée.

The first example—ouai, is composed of two compound vowels, viz.: ou and ai.

The second example—oueu, is also composed of two compound vowels, viz.: ou and eu.

In the last example—ouée, the final *e* is silent, and the three vowels are thus divided, viz.: ou and é.

13. THE VOWEL Y.—The vowel *y* is frequently found combined with other vowels, but in such combinations it is never used as a diphthong. Its use in combination is peculiar, and will be fully explained hereafter.

14. THE NASAL VOWEL SOUNDS.—There are certain sounds called nasal vowel sounds, produced by the combination of the vowels with the consonants *m* and *n*, namely:—

am em im om um ym
an en in on un yn.

These sounds will be explained hereafter.

15. THE NASAL DIPHTHONGAL SOUNDS.—There are also certain sounds called nasal diphthongal sounds, produced by the combination of nasal vowel sounds with a vowel, not nasal, before them, namely:—

ian ien ion uan uin ouan ouin.

These sounds will also be explained hereafter.

16. THE LIQUIDS.—The following combinations of the consonants are called liquids, namely:—

ll gu.

The sounds of these liquids are very common in the French language, and will be explained hereafter.

SECTION II.—THE ARTICLE.

1. In French the article [§ 13 (2)]* has, in the singular, a distinct form for each gender, as:—

Le fils, the son. La fille, the daughter, the girl.
Le frère, the brother. La sœur, the sister.

2. Before a word commencing with a vowel or an *h* mute, the final *e* or *a* of the article *le* or *la* is cut off, and replaced by an apostrophe, leaving the article apparently the same for both genders [§ 13 (7)], as:—

L'aïeul [(l') aïeul], the grandfather.
L'aïeule [(l') aïeule], the grandmother.
L'hôte [(l')ôte], the landlord.
L'hôtesse [(l')ôtesse], the landlady.

3. There are in French only two genders, the masculine and the feminine [§ 4]. Every noun, whether denoting an animate or inanimate object, belongs to one of these two genders.

MASC. L'homme, the man. FEM. La femme, the woman.
Le livre, the book. La table, the table.
L'arbre, the tree. La plume, the pen.
Le lion, the lion. La lionne, the lioness.

4. AVOIR, TO HAVE, IN THE PRESENT OF THE INDICATIVE.

<i>Affirmatively.</i>			
SING. J'ai,	I have.	PLUR. Nous avons,	We have.
Tu as [§ 33 (1) (2)]	Thou hast.	Vous avez,	You have.
Il a,	He has.	Ils ont, m.,	They have.
Elle a,	She has.	Elles ont, f.,	They have.

* References thus [§ 13 (2)] refer to Sections in Part II. of these Lessons, but by references in Roman numerals, thus, [Sect. I. 30] the learner is directed to Sections in Part I., the portion of our "Lessons in French" which we are now commencing.

Interrogatively.			
SING. A-t-il ?	Have I ?	PLUR. Avous-nous ?	Have we ?
As-tu ?	Hasst thou ?	Avez-vous ?	Have you ?
A-t-il ?	Has he ?	Out-ils ? m.	Have they ?
A-t-elle ?	Has she ?	Out-elles ? f.	Have they ?

5. The *e* of the pronoun *je* is elided, when that pronoun comes before a vowel or an *h* mute, and replaced by an apostrophe, as *J'ai* [*J*(*o*)*i*], I have, as above [§ 146].

6. In interrogative sentences, when the third person singular of a verb ends with a vowel, and is immediately followed by a pronoun, the letter *t*, called *euphonic* [Sect. I. 30], must be placed between the verb and the pronoun, and joined by two hyphens, as:—

A-t-il ?	Has he ?	A-t-elle ?	Has she ?
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RÉSUMÉ OF EXAMPLES.

Le père a la viande, vous avez le café, et j'ai l'eau.	The father has the meat, you have the coffee, and I have the water.
L'homme a le pain, l'enfant a le sel, et nous avons le poivre.	The man has the bread, the child has the salt, and we have the pepper.

VOCABULARY.

Avoine, <i>f.</i> , oats.	Madame, <i>Madam.</i>	Qui, <i>who.</i>
Blé, <i>m.</i> , wheat.	Mademoiselle, <i>Miss.</i>	Sel, <i>m.</i> , salt.
Boucher, <i>m.</i> , butcher.	Meunier, <i>m.</i> , miller.	Seulement, <i>only.</i>
Boulangier, <i>m.</i> , baker.	Monsieur, <i>Mr., Sir.</i>	Table, <i>f.</i> , table.
Cheval, <i>m.</i> , horse.	Non, <i>no.</i>	Thé, <i>m.</i> , tea.
Et, <i>and.</i>	Oui, <i>yes.</i>	Viande, <i>f.</i> , meat.
Farine, <i>f.</i> , flour.	Pain, <i>m.</i> , bread.	Vin, <i>m.</i> , wine.
Frère, <i>m.</i> , brother.	Plume, <i>f.</i> , pen.	Vinaigre, <i>m.</i> , vinegar.
Livre, <i>m.</i> , book.		

Obs.—Note and remember that the noun *livre*, book, is masculine, but the nouns *livre*, a pound (in weight), and *livre*, a piece of money equivalent to a franc, are feminine.

EXERCISE I.

To be translated into English.

1. Qui a le pain ? 2. Le boulangier a le pain. 3. A-t-il la farine ? 4. Oui, Monsieur, il a la farine. 5. Avons-nous la viande ? 6. Oui, Monsieur, vous avez la viande et le pain. 7. Le meunier a la farine. 8. Le boulangier a la farine et le blé. 9. Avons-nous le livre et la plume ? 10. Oui, Mademoiselle, vous avez le livre et la plume. 11. Le boucher a la viande. 12. Le meunier a la viande et j'ai le café. 13. Avez-vous l'eau et le sel ? 14. Oui, Monsieur, nous avons l'eau, le sel, et l'avoine. 15. Avons-nous le thé ? 16. Non, Monsieur, la fille a le thé, le vinaigre, et le sel. 17. Ai-je le vin ? 18. Non, Madame, vous avez seulement le vinaigre et la viande. 19. Avez-vous la table ? 20. Oui, Madame, j'ai la table.

EXERCISE 2.

To be translated into French.

1. Have you the wheat ? 2. Yes, Sir, I have the wheat. 3. Who has the meat ? 4. The butcher has the meat and the salt. 5. Has he the oats ? 6. No, Madam, the horse has the oats. 7. Have we the wheat ? 8. You have the wheat and the flour. 9. Who has the salt ? 10. I have the salt and the meat. 11. Have we the vinegar, the tea, and the coffee ? 12. No, Sir, the brother has the vinegar. 13. Who has the horse ? 14. The baker has the horse. 15. Have we the book and the pen ? 16. No, Miss, the girl has the pen, and the miller has the book. 17. Have you the table, Sir ? 18. No, Sir, I have only the book. 19. Who has the table ? 20. We have the table, the pen, and the book.

SECTION III.—THE ARTICLE (Continued).

1. The article *le*, with the preposition *de* preceding, must be contracted into *du*, when it comes before a word in the masculine singular, commencing with a consonant or an *h* aspirated [§ 13 (8) (9)], as:—

Du frère, of the brother.	Du château, of the castle.
Du héros, of the hero.	Du chemin, of the way.

2. Before feminine words, and before masculine words commencing with a vowel or an *h* mute, the article is not blended with the preposition, as:—

De la dame, <i>f.</i> , of the lady.	De l'amie, <i>f.</i> , of the female friend.
De l'argent, <i>m.</i> , of the money.	De l'honneur, <i>m.</i> , of the honour.

3. In French, the name of the possessor follows the name of the object possessed [§ 76 (10)], as:—

La maison du médecin,	The physician's house.
L'arbre du jardin,	The tree of the garden.
La lettre de la sœur,	The sister's letter.

4. The name of the material of which an object is composed always follows the name of the object; the two words being connected by the preposition *de* [§ 76 (11)], as:—

L'habit de drap,	The cloth coat.
La robe de soie,	The silk dress.
La montre d'or,	The gold watch.

RÉSUMÉ OF EXAMPLES.

Le tailleur a l'habit de drap du médecin.	The tailor has the physician's cloth coat.
Vous avez la lettre de la sœur du boulangier.	You have the baker's sister's letter (the letter of the sister of the baker).
A-t-il le livre de la dame ?	Has he the lady's book ?

VOCABULARY.

Argent, <i>m.</i> , silver, money.	Conteau, <i>m.</i> , knife.	Porte-crayon, <i>m.</i> , pencil-case.
Bas, <i>m.</i> , stocking.	Cuir, <i>m.</i> , leather.	Robe, <i>f.</i> , dress.
Bois, <i>m.</i> , wood.	Dame, <i>f.</i> , lady.	Satin, <i>m.</i> , satin.
Chapeau, <i>m.</i> , hat.	Drap, <i>m.</i> , cloth.	Sœur, <i>f.</i> , sister.
Charpentier, <i>m.</i> , carpenter.	Foin, <i>m.</i> , hay.	Soie, <i>f.</i> , silk.
Cordonnier, <i>m.</i> , shoemaker.	Habit, <i>m.</i> , coat.	Soulier, <i>m.</i> , shoe.
Coton, <i>m.</i> , cotton.	Laine, <i>f.</i> , wool.	Table, <i>f.</i> , table.
	Médecin, <i>m.</i> , physician.	Tailleur, <i>m.</i> , tailor.
	Montre, <i>f.</i> , watch.	
	Or, <i>m.</i> , gold.	

EXERCISE 3.

To be translated into English.

1. Avez-vous la montre d'or ? 2. Oui, Madame, j'ai la montre d'or et le chapeau de soie. 3. Monsieur, avez-vous le livre du tailleur ? 4. Non, Monsieur, j'ai le livre du médecin. 5. Ont-ils le pain du boulangier ? 6. Ils ont le pain du boulangier et la farine du meunier. 7. Avez-vous le porte-crayon d'argent ? 8. Oui, Monsieur, nous avons le porte-crayon d'argent. 9. Avons-nous l'avoine du cheval ? 10. Vous avez l'avoine et le foin du cheval. 11. Qui a l'habit de drap du charpentier ? 12. Le cordonnier a le chapeau de soie du tailleur. 13. Le tailleur a le soulier de cuir du cordonnier. 14. Avez-vous la table de bois ? 15. Oui, Monsieur, j'ai la table de bois du charpentier. 16. Ont-ils le couteau d'argent ? 17. Ils ont le couteau d'argent. 18. Le frère du médecin a la montre d'argent. 19. La sœur du cordonnier a la robe de soie. 20. A-t-elle le soulier de cuir ? 21. Non, Madame, elle a le soulier de satin. 22. Avons-nous le bas de laine ? 23. Non, Monsieur, vous avez le bas de soie du tailleur. 24. Qui a le bas de coton ? 25. Le médecin a le bas de coton. 26. La dame a le soulier de satin de la sœur du boulangier.

EXERCISE 4.

To be translated into French.

1. Have you the tailor's book ? 2. No, Sir, I have the physician's watch. 3. Who has the gold watch ? 4. The lady has the gold watch and the silver pencil-case. 5. Have you the tailor's shoe ? 6. I have the tailor's cloth shoe. 7. Have we the wooden table ? 8. Yes, Sir, you have the wooden table. 9. Have they the silver knife ? 10. They have the silver knife. 11. The lady has the silver knife and the gold pencil-case. 12. Has she the satin dress ? 13. The physician's sister has the satin dress. 14. Who has the wood ? 15. The carpenter's brother has the wood. 16. Have you the woollen stockings ? 17. No, Sir, I have the cotton stockings. 18. Who has the baker's bread ? 19. We have the baker's bread and the miller's flour. 20. Have we the horse's hay ? 21. You have the horse's oats. 22. Have we the tailor's silk hat ? 23. Yes, Sir, you have the tailor's silk hat and the shoemaker's leather shoe. 24. Have you the cloth shoe of the physician's sister ? 25. No, Madam, I have the lady's silk dress.

LESSONS IN GEOGRAPHY.—I.

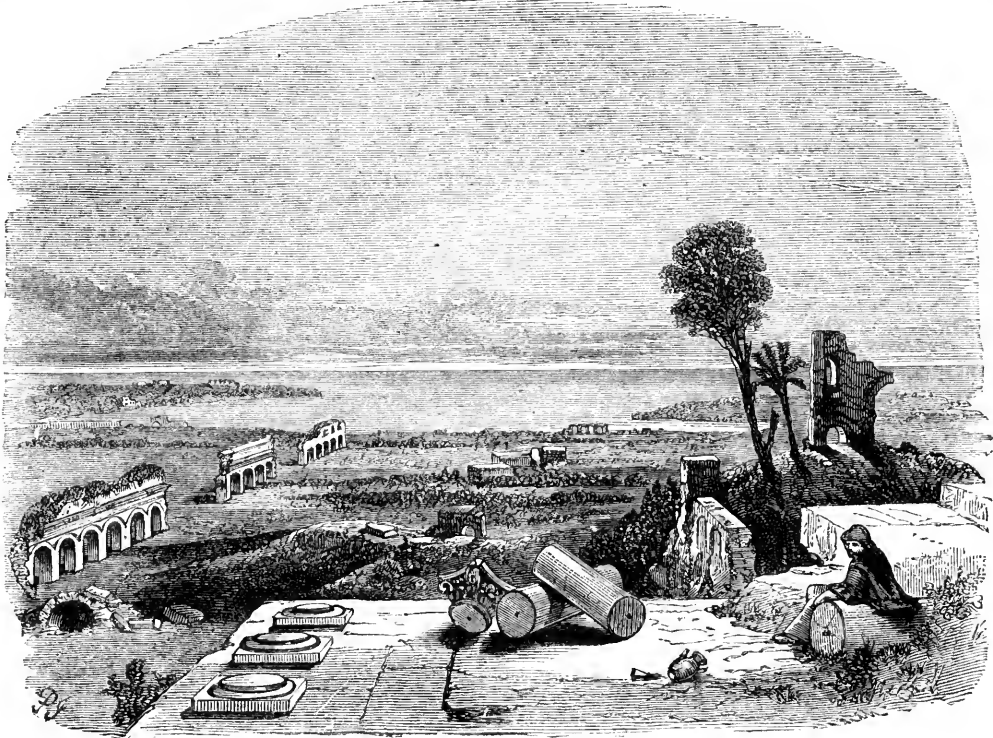
EARLY NOTIONS; THE GEOGRAPHY OF THE SCRIPTURES. The term Geography is derived from two Greek words, *γη*, the earth, and *γραφη*, a description (pronounced *ghee* and *grai-phi*), and simply means a description of the earth's surface; it is therefore rightly applied to that science which treats of the natural outline and extent, the political division and constitution, the civil and social condition, and the industrial wealth and population of the various countries, kingdoms, and states which have appeared, or which now exist on the face of the globe. Geography includes also the description of the form of the earth, its

motions, its place in the solar system, the great circles supposed to be drawn on its surface, and its position in the heavens by which it is surrounded on all sides; the diversified nature of its surface, as seen in its mountains, valleys, plains, rivers, seas, and oceans, and in the constitution and phenomena of the atmosphere by which it is enveloped, as in a swaddling band; and the different races of animals, including man, and the various kinds of vegetable and mineral productions which are distributed over its surface.

It will be sufficient for our purpose, in this first lesson, to state generally that the form or shape of the earth is that of a globe or ball, and that the height of the highest mountains on its surface is so small in comparison with the size of the earth, and interfere so little with its rotundity, or roundness, that this height has about the same proportion to the diameter of the earth, which the thickness of common writing-paper has to the diameter of a twelve-inch terrestrial globe. The ancients had

possessing all those antiquated notions in science, particularly in geography and astronomy, which the uninstructed tribes of Asia, Australasia, and Polynesia possess at the present day.

"The Hebrews," says an eminent writer, "obviously never attempted to form any scientific theory respecting the structure of the earth. The natural impression which represents it as a flat surface, with the heaven as a firmament or curtain spread over it, is found to be universally prevalent. Beneath was conceived to be a deep pit, the abode of darkness and the shadow of death. In one place we find the grand image of the earth being *hung upon nothing*; but elsewhere the *pillars* of the earth are repeatedly mentioned; and sometimes the *pillars* of heaven. In short, it is evident that every writer caught the idea impressed on his senses and imagination by the view of these grand objects, without endeavouring to arrange them into any regular system." We have quoted this passage as a specimen of the loose style of writing and thinking regarding



RUINS OF TYRE.

no such knowledge of the earth as we now possess; and though some of the most intellectual of the philosophers of Greece, such as the famous Pythagoras, are supposed to have reached the notion of its globular form, it was buried under a cloud of errors and extravagances.

To the most extended view which the human eye can take of any part of the surface of the earth, even from the highest eminence found on that surface, it appears to be one vast and illimitable plain, diversified by hill and dale, land and water, mountain and valley. The heavens appear to be a luminous dome above the head of the observer, bespangled with stars at night, and they seem to rest on the surface of the earth at an immense and immeasurable distance. He feels as if he would be afraid to travel so far, either on land or sea, as to reach the limit which he supposes must ultimately be found to this surface, lest he fall over into an interminable abyss; and he supposes that the phenomena of the heavens are confined to the upper and visible concave which he beholds, while his imagination dooms all beneath his feet to death and everlasting oblivion. Such were the limited notions which prevailed at an early period in the history of the world; and it is one great proof of the antiquity and authenticity of the sacred Scriptures, that they describe men as they really were in ancient times, and as

the science of the sacred Scriptures. The style of these writings, in the places above referred to, is highly poetical; and who, we would ask, expects to find didactic theories in a poem? The poet seizes the phenomena of nature as they appear to the eye, and enlarges, magnifies, or arranges them at pleasure; he is not tied to rules, nor confined to the language of the schools. To do so, would destroy his poetry, and reduce his imagination to an automaton. The book of Job, in which these grand expressions are found, is the oldest book in the world. It was written long before the time of Moses; and though found in the Hebrew language, it was evidently not written by a Hebrew. It is curious, however, that the writer of this book should have lighted upon such a striking fact, as that the *earth hangs upon nothing*! Had this been found in a Chinese or a Hindoo book, possessing such claims to antiquity as the Hebrew book, it would have been lauded to the skies as a proof of superior knowledge, and would have been held as an infallible proof that the Chinese or the Hindoos, ages ago, were actually acquainted with the facts of modern science.

The same writer looks to Phœnicia for the origin of geographical knowledge; and there can be no doubt that, being some of the earliest merchants and traders both by sea and land, the Phœnicians must have been among the first nations of the world

who acquired some knowledge of its surface, and of the countries it then contained. It is admitted that the tenth chapter of Genesis contains a view of the known divisions of the earth at an early period, and that it agrees in some striking particulars with the records of profane history! It is also acknowledged that Ezekiel visited Tyre, as Herodotus did Babylon, with the eye of an intelligent observer; and it is considered probable that he held intercourse with the best-informed men in that great school of commerce and navigation. The geographical boundaries to which he alludes are considered as placed at the farthest limits of their knowledge—viz., Tarshish, Ophir, the Isles, Sheba and Dedan, the River, Gog and Magog, and the North.

Tarshish is deemed, with very great probability, to have been the name used in Scripture for *Africa*. It appears to have belonged originally to a great African city, called *Carthage* in later times, and well known from its rivalry to Rome; it was afterwards extended to the whole continent of which that city might be considered the metropolis; but especially to that division of it, now known by the name of Northern Africa, exclusive of Egypt and the countries adjacent to the Arabian Gulf. This division was called by the Romans *Africa Propria*, that is, *Africa Proper*, and included *Carthage*; and Jerome calls a voyage to *Tarshish* an "African voyage." This also solves a difficulty which has been found in the Scriptural accounts of two different voyages to *Tarshish*; the one up the Mediterranean Sea, from the Strait of Gibraltar, bringing iron, silver, lead, and tin, the produce of Spain and Britain (Ezek. xvii. 12); and the other, up the Red Sea, or Arabian Gulf, from the Strait of Bab-el-mandeb, bringing gold and silver, ivory, and apes, and peacocks, the produce of Central Africa (1 Kings x. 22).

Ophir, as being connected with *Tarshish* and *Sheba* in the voyages of Solomon's ships for gold and other produce, is rightly considered as a part of *Africa*, which indeed appears highly probable from the similarity of the name. The eastern coast is the quarter to which all the indications seem evidently to point. In the voyage to *Tarshish* by the Red Sea, the name of *Ophir* is also mentioned, and in one case the latter is substituted for the former (2 Chron. ix. 10). But we have seen that *Tarshish* is a name for one part of *Africa*; now, *Ophir* is a name for another part of the same continent. As gold is the produce of *Ophir*, we must look to that part where it is to be found. This, for the sake of consistency in the history of the voyage, can only be *Sofala*, where abundance of gold is said to exist, and whence it could easily be brought in ships through the Red Sea to *Sheba* in *Arabia*; from the Strait of Bab-el-mandeb it could either be carried overland through this country to Jerusalem, or it could be transported up the gulf to the place now called *Suez*, whence it could readily be brought into the palace of Solomon the king.

The *Isles*, the isles of the Gentiles, the isles of the sea, the isles of Chittim and of Elishah, all point out the islands which abound in the Mediterranean, which is called "the sea" and "the great sea" in Scripture. These are acknowledged to be Sicily and the other islands belonging to Italy and Spain; the islands of Greece, a country almost wholly insular and peninsular; and the islands of Cyprus and Crete (*Candia*), with various other smaller islands scattered through the Archipelago, and lying on the west of *Asia Minor*.

Arabia Felix, or *Arabia the Happy*, is considered to be the country anciently called *Sheba* or *Sabaa*. Its trade was in gold and incense; and it was carried on by caravans which came from the coast, where they had been imported from *Ophir*. The "companies of *Sheba*" are mentioned in *Job*—a fact which shows the antiquity of its commerce; and the "multitude of its camels" are spoken of in *Isaiah*—another fact which shows its value and long continuance. The commerce of *Dedan* rivalled that of *Sheba*. It came up the Persian Gulf from the Strait of *Ormuz*. The imports were ivory and ebony, and "precious clothes" for chariots. These were the commodities of *India*, and they were carried across the desert of *Arabia*, or *Arabia Deserta*, into *Petra*, the capital of *Arabia Petraea*, or *Arabia the Stony*, which consisted chiefly of the ancient country of *Idumea*, or *Edom*. The inhabitants of *Dedan* were only the merchants who brought the produce of *India* to the capital of *Edom*, as a depôt for the supply of the countries lying to the north and the west of it, and "the travelling companies of *Dedanim*" might consist of native *Hindoo* or *Asiatic* traders, whose home was on the deep.

The *River* meant the great river, the river *Euphrates*. On its banks stood the mighty capitals of *Assyria* and *Babylon*, and there flourished the most renowned empires of antiquity. Here also was supposed to have been the seat of *Paradise*, or the garden of *Eden*. Thus saith the poet:—

"Seek not for *Paradise*, with curious eye,
In Asiatic climes, where *Tigris'* wave,
Mixed with *Euphrates* in tumultuous joy,
Doth the broad plains of *Babylonia* lave.
'Tis gone with all its charms, and, like a dream,
Like *Babylon* itself, is swept away;
Bestow one tear upon the mournful theme,
But let it not thy gentle heart dismay.
For know, wherever love and virtue guide,
They lead us to a state of heavenly peace;
Where bliss, unknown to guilt and shame, preside,
And pleasures unalloyed each hour increase."

Along the countries situated between the *Euphrates* and the *Tigris*, and on both sides of these rivers, *Ezekiel* mentions a number of cities, as *Haran*, *Camneh*, *Eden*, *Asshur*, etc., from which great caravans proceeded to *Tyro* with cloths and other valuable commodities. These appear to have been brought overland across the countries of *Asia*, and probably by interior caravans from *Hindestan* and the borders of *China*, the native country of silk.

The *North*, and *Gog* and *Magog*, described by *Ezekiel*, have been considered as denoting the *Seythian* hordes of warriors who invaded the south, and carried away "silver and gold and a great spoil." But the passages in which the *North* is mentioned are, with more reason, supposed to refer to the high table-lands in the interior and the north of *Asia Minor*, *Phrygia*, *Galatia*, *Cappadocia*, and *Paphlagonia*. The imports from these regions were "vessels of brass and persons of men." These countries are famous for their produce in copper, iron, and steel to this day; and their trade in slaves for the supply of harems is equally notorious. Horses and mules are also mentioned as brought from the same quarter; and this trade also has been found a branch of the traffic carried on in the upland tracts of *Paphlagonia*. Thus, we have given a succinct view of the ancient geography recognised in the Scriptures.

LESSONS IN ENGLISH.—I.

INTRODUCTION.

In commencing a series of lessons in English, it appears desirable to let the readers of the *POPULAR EDUCATOR* know what they may expect. Briefly, then, we intend to exhibit the facts of the language and the productions of the language. The facts of the language, if systematically presented, will involve its laws; and on the other hand, the productions of the language, historically treated, will comprise its literature. In this way, the facts and the productions proposed for our consideration will obviously lead the careful student to a knowledge of the language. Nor without a study of both the facts and the productions can any such knowledge be acquired. A knowledge of any language implies a familiarity with its literature, and a familiarity with the facts or laws of its construction. It is not possible to have one without the other, any more than it is to know the principles of Grecian art without having studied its masterpieces. Apart from the literature of a language, we cannot know its grammar; apart from the grammar of a language, we cannot know its literature. The literature of a language is the organic life, whose laws grammar has to learn and expound. The grammar of a language is merely a systematic exposition of the laws observed in the composition of its literature. Hence it is that an acquaintance with the literature of a language should precede the study of its grammar. Indeed, the productions of a language are earlier than its grammar. Men pronounced sentences, delivered speeches, composed and sang poems, long before they had any idea of the rules of which grammar is made up. The thought was first; then came the utterance, and out of many utterances at last grew the science of grammar. Grammar has no other function than to deduce and set forth the laws of a language, which have been already observed by some great writer or great writers. The criticism which in Greece gave birth to grammar was long posterior to Homer.

The knowledge of the grammar of a language, then, does not involve a knowledge of the language itself. Still less are the

two identical. Grammar is only one branch of the tree. Important as grammar is, it is scarcely the most important of the branches which combine to form the knowledge of a language. Grammar is only a means to an end. It is a pathway to the temple. The temple itself is the treasure of great thoughts which constitutes the literature, and which we have termed the productions of a language. It is for this treasure that a language is worth the labour of study; and in regard to literary treasures, no language will repay attention more fully than the English.

From what has been said, it is also clear that the grammar of a language is to be learnt in its literature. Grammar is no arbitrary thing. Its rules are not inventions. Its forms are not optional. They are both merely general statements of facts—facts ascertained by the careful perusal of what we term classical authors; that is, authors of high and universal repute. The office of grammar is to make a systematic report of the usages observed in writing by the great minds of a nation. Hence grammar is a science of imitation. The grammarian, like the sculptor, takes a model, and having studied its parts and qualities, endeavours to reproduce the whole. Authority, in consequence, is the great principle recognised in grammar. The authority of such men as Macaulay, Mackintosh, Addison, Dryden, Shakespeare, is, in grammar, paramount and supreme. What they do we must follow, and we must follow it because it is their practice. Their words, their forms of speech, their constructions must be ours. They are our masters, we their scholars. They give laws, we obey the laws they give. Scarcely less than implicit and unqualified ought the obedience to be; for grammar merely declares what is customary, and what is customary in a language is known by what is customary among its best writers.

Let it be observed that it is the *English language* that we are about to study. Consequently it is the qualities and the laws of *that* language that it will be our business to ascertain. If we were studying Sanscrit or Hebrew, then the qualities and the laws of the Sanscrit and the Hebrew would be the object of our search. Disregarding them, we are equally to disregard the qualities and the laws of the Latin. The best of Latin grammars would be a very bad English grammar, and a usage in Latin is no authority for the introduction into English of a similar usage.

The principles now set forth determine the mode of our proceeding. We have no intention to copy forms and rules from the writings of former grammarians, or to arbitrarily devise forms and rules. We shall rather take the language as it is, and inquire into its qualities and laws. Beginning with the simplest enunciations of thought, we shall lead the student to analyse them, and from such analysis to deduce for himself the fundamental facts and principles of the English tongue. This process must be gone through three times: first, in regard to the forms of the language or its grammar; secondly, in regard to the productions of the language or its literature; and thirdly, as an appendage to the last, in regard to the origin and progress of the language or its history. If the reader attentively accompany us over this extended field, he will possess a full as well as accurate acquaintance with the English language.

Language is the expression of thought by means of articulate sounds, as painting is the expression of thought by means of form and colour. The relations which subsist between our thoughts, when carefully analysed and set forth systematically, give rise to logic. The laws and conditions under which the expression of our thoughts takes place form the basis of grammar. The logician has to do with states of the intellect, the grammarian is concerned with verbal utterances.

A cursory attention to the subject will suffice to prove that there are laws of speech. There is, indeed, no province of the universe of things but is subject to law. Each object has its own mode of existence, which, in conjunction with the sphere of circumstances which surround it, gives rise to the laws and conditions by which it is controlled. Accordingly, language takes its laws from the organs by which sound is made articulate, from the culture of the intelligent beings by whom these organs are employed, from the purposes for which speech is designed, and from even the medium and other outward influences in union with which these purposes are pursued.

Were there no such laws the science of grammar could not exist. The sciences are in each case a systematic statement of generalised facts—in other words, of definite laws; and grammar

rests on phenomena clearly ascertained, invariable in themselves, capable of being distinctly stated, and equally capable of being wrought into a system of general truths.

If the conditions under which thought became speech had been in all cases the same, there would only have been one language on the face of the earth. Descending as mankind did from a common progenitor, the various tribes would have spoken a common tongue. But at Babel the builders were "scattered abroad," and became subjected to outward influences of the most diversified character, and engaged in the most varied kinds of life. Men's pursuits were different almost from the first. Climate and soil change with every change of locality. And both original endowments and the degree of culture superinduced by external influences, or what may be termed indirect education, would be as diverse as the tribes, not to say the individuals of which the species consisted. All these diversified influences would speedily beget varieties in speech which time would increase and harden into different languages.

From this diversity there arise two kinds of grammar—the universal and the particular. Universal grammar is formed by studying language in general, by passing in review the several languages which exist (or most of them), and selecting and classifying those facts which are common to all. Particular grammar is the result of the study of any one given language. By a careful consideration of the usages of the best English writers we discover what constitutes English grammar. If, after we have ascertained the laws of a number of separate languages, we then compare our discoveries one with another, and mark and systematise what we find common to them all, we compose a treatise on general grammar. Particular grammar resembles the anatomy of the human frame, and limits its teachings to one set of objects. Universal grammar is like comparative anatomy, which treats of the general laws of animal life, as deduced from a minute study of the animal kingdom in general.

It is with particular grammar that we are here concerned;—of the grammar of our nation—namely, the English—we have to treat.

Grammar and logic, or the laws of expression and the laws of thought, are, we have seen, closely connected together in the nature of things. Not easily, then, can they be sundered in manuals of instruction. If separate, they are related sciences; as being related to each other, they may afford mutual light and aid. Requiring separate treatment, they each give and receive illustration. Grammar assists the logician to put his thoughts into a lucid form; and logic assists the grammarian to make his utterances correspond to the exact analogy of his thoughts. No one can be a perfect grammarian who is entirely without logic; and no logician who neglects grammar can successfully convey his ideas to others.

But in a manual which proposes to handle the subject of grammar, and of English grammar, reference to logic must be tacit and latent; it may be felt, it must not be displayed. Yet, in at least one or two terms will our obligation to logic be more positive and outward, for we shall borrow from that science such words as *subject*, *attribute*, *predicate*, and the like; and this because these terms, when once their import is understood, afford facilities for explanation far greater than the ordinary terms employed in English grammars. In these cases, however, and in other things in which we shall depart from what is usual, we shall also supply the customary views and the ordinary terms.

As the English language, like other languages, was spoken before its laws were formed into a systematic treatise called a grammar, so the real facts of the language, in their primary and their model form, exist and are to be looked for in the every-day speech of well-educated persons. Hence the speech of educated persons is of authority in grammar no less than the language of the best authors. Nay, we seem likely to find a language in its greater purity when we take it from the lips of educated persons generally than when we derive it from the somewhat artificial shapes which it assumes in the learned or the popular volume. If so, "household words" are good for grammar as well as for practical wisdom. And so it is in the nursery we may look for the English tongue in a form the most simple and yet the most idiomatic. Of all teachers of English grammar the best is a well-educated English mother. Hence it is evident that a nursery, in a cultivated English home, is the best school of English grammar. As a matter of fact, it is in such schools

that, among the upper classes of this country, the young learn to speak correct English from their earliest days. Were all English children trained in such schools, the language would be everywhere well and grammatically spoken. Consequently, could we place our student in cultivated nurseries, they would soon speak and write their mother tongue with correctness and propriety. We are unable to accomplish this. We cannot place the young of the working classes in cultivated nurseries, but we may attempt to do the next best thing; and that is to bring forth and set before them, in a living and organic form, the spoken language of such nurseries. And this shall we undertake, the rather because, as the mother is the child's natural educator, or, to speak more correctly, as the mother is an educator of God's own appointment, so every system of education will be good and effectual in proportion as it is in form, substance, and spirit, motherly.

We must add that we write for the English student. We write also for the uneducated and for the young. Having these facts before our mind, we shall study plainness and simplicity. Yet do we hope to be able to write in such a manner that scholars may not disdain to cast an eye on these pages. However that may be, we shall make it our first object and our last so to express our thoughts as to be fully understood, if not also readily followed, by the now large and meritorious class who are endeavouring to educate themselves. To labour for these is a very great pleasure. We ask for their confidence, and will endeavour to reward their attention.

LESSONS IN DRAWING.—I.

INTRODUCTION.

BEFORE we enter upon the subject of drawing, and how to draw, it will be of great service to some of our readers who may make up their minds to practise from our instructions, to give some little advice respecting the materials necessary for their use. First, the paper: the best and cheapest kind is that called "drawing cartridge," the imperial size is the most convenient, which when cut up into quarto, or four portions, will afford sufficient room for the subjects we intend to place before our pupils. Drawing books made of this paper, as well as the paper itself, with pencils, drawing boards, and other drawing materials, can be obtained from the publishers. The next and most important of all the materials are the pencils: for *free-hand* drawing—that is, drawing without the use of instruments—we recommend HB, B, and BB. The B pencil is first used for marking in the general proportions and character of the subject; this pencil must be used *lightly*, then the errors may be very easily effaced without disturbing the surface of the paper; and what is equally important is, that after the whole subject is arranged the drawing may be reduced in tone—that is, made lighter to receive the finished outline—to be done with the HB, which makes a cleaner and more definite line than the B. The B may also be used for shading, especially the broad or flat tones of shade: the BB is the finishing pencil for the extreme depth of tone in the darkest parts. For plan and geometrical drawing, an HH pencil is the most suitable. Be careful that the pencil is cut evenly with a sharp knife, not hacked or jagged as in Fig. 1. Fig. 2 represents the most suitable form of point. You must have a deal drawing board, half-inch or three-quarters thick, according to size, upon which the paper is to be laid and pinned down with flat-headed drawing pins. For highly-finished and important drawings it would be better to fix the paper in the following manner:—Wet both sides with a sponge, being particular that the paper is *not rubbed, wetted only*; turn the edges up all round about three-quarters of an inch broad, and paste the under-side; wait a minute or two until the paper has sufficiently expanded (which is caused by the wetting), then, having placed it evenly on the board, turn the pasted edges down and press them close to the board, under a cloth or piece of waste paper; once more wet the paper *gently* all over *except the pasted edges*, and lay the board down *flat*, somewhere, to dry; the pasted edges must dry first, or the paper will fly up, because as it dries it will contract. If the pupil is able to fix his paper successfully, he will see for himself the advantage of having a firm and smooth surface to work upon. The most convenient size of board is twenty-three inches by sixteen inches—this will take half of an imperial sheet of paper, very useful for plan drawing and working plans; these, with a piece of india-rubber, will be quite sufficient to start with. Thus,

having provided ourselves with implements, we will proceed to open our subject.

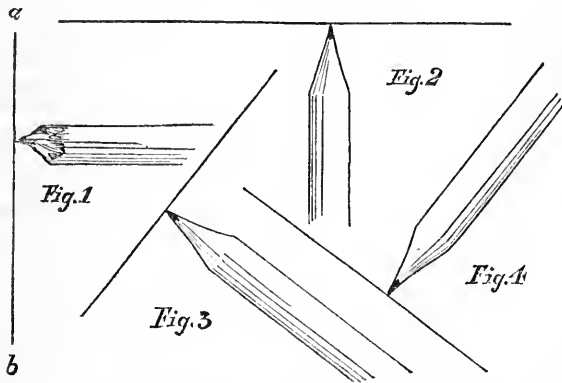
Many believe that the art of drawing can only be acquired by a favoured few—viz., by those who are supposed to possess a power which is but sparingly bestowed amongst mankind in general. This power or gift is by them called genius, and they would almost deem it an act of presumption to undertake the practice of the art unless they were previously assured that they possessed this gift, or power, or genius, or whatever else it may be termed. There are many who, after making a few attempts towards acquiring the power of drawing, give it up, and excuse themselves from further efforts by saying, "Oh, I have no genius for this; I must be born with the talent, or I cannot succeed." Such a mistake is very common; there will be scarcely a reader of this who could not furnish one or more cases in proof of the statement. That genius is not absolutely necessary, we know from undeniable evidence; there are and have been thousands of men who have proved themselves to be able draughtsmen, without adding to the list of our Raphaels and Turners; and there are very few indeed, considering the number who exercise the art, and whose success in drawing we must acknowledge to be very great, who can rank as first-rate artists. Knowing, then, this to be the case, we relinquish all attempts to create genius, and confine ourselves, by simple, practical instructions, to open a way by which any one who has the courage to persevere may acquire the power of drawing from natural or artificial objects, and enable him to represent his ideas in a way of which no other art is capable. For purely mechanical drawing—that is, the exact representation of the forms of objects, be they animals, trees, machinery, or anything else—no extraordinary genius beyond an earnest desire is required. Only let the pupil commence and proceed with a determination that nothing shall daunt him, to follow out certain leading principles, which having mastered, he will then discover that the application of these principles will render the art not so difficult as he at first imagined. Nevertheless, it is one thing to be able to draw a simple object, or a combination of these objects, and it is quite another thing to expect that having acquired this power it must, without fail, result in producing a talent for the higher qualifications of the artist. No; a great deal may be done towards gaining a full mastery of the principles of drawing applicable to a faithful transcript of any object whatever, before arriving at the stage which introduces us to that exalted position where genius is necessary for the full development of the poetic, or more elevated results of the artistic mind. In order, therefore, to enable a student to overcome the difficulties of drawing, he undoubtedly must be fully prepared and determined to attack every impediment he may meet in his progress; and for any one who is earnest in his work there is this encouraging thought, that if he meets with a succession of difficulties, and manages by perseverance to surmount them all one after the other, he must be making sure progress, whereas if none present themselves he may be assured he is standing still.

Our purpose in these lessons on drawing is first to enlarge upon the leading principles, and, taking these for the groundwork, we intend to apply them to all subjects, whether they be still-life (or objects), figure, or landscape drawing.

It is important to mention that, to draw a line successfully, much depends upon the position of the body, the hand, and the arm. The pupil must sit as uprightly as he can, having the copy and the paper he is drawing upon in a direct line before him; he must be able to see both his copy and his own drawing without having to raise or lower his head; he has no need to stoop over his work—it is bad for his health, and bad for his picture. We do not sit in the same position to draw as we do to write. The pencil is not subject to the same rules as a pen; it must be so held that if dropped from the hand whilst in the act of drawing the line, it would fall on the paper at a right angle with the line. For instance, to represent a perpendicular line (see *a to b*, Fig. 1), the pencil must be held as shown in the engraving; if a horizontal position is represented, as in Fig. 2; if an inclined line, as in Figs. 3 and 4. By attending to this rule we have such a command of the pencil that without moving the wrist we can reach either end of the line, or that portion of the line we wish to draw, without any danger of its being directed out of its proper course.

The pupil, very probably, will have noticed that there are but two kinds of lines to draw by which all objects whatsoever are represented—viz., straight lines and curved lines. It is the

disposition of these lines—in some cases all straight, in some all curved, and in others straight and curved united—that makes up the representation of the object before us. Their lengths, their positions, their curvatures or bendings, and the manner in which

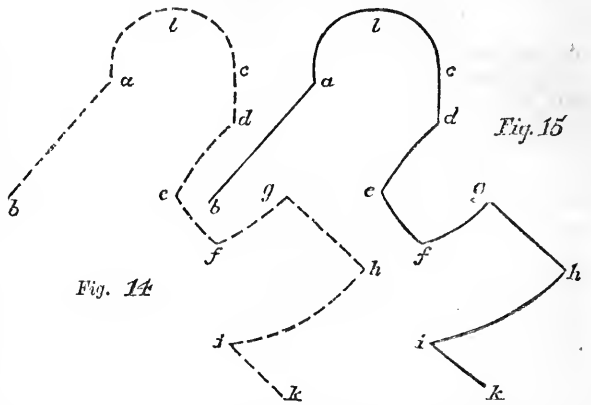
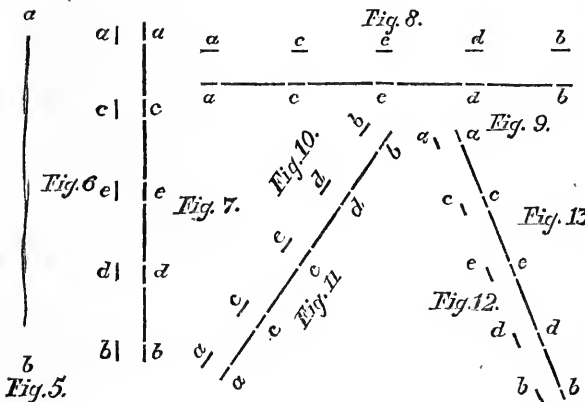


they are connected with each other, combine to represent the various forms which nature and art so abundantly furnish. The question then narrows itself to the consideration—how are we to treat these lines?

We will begin by a caution, and direct the attention of the student to the pernicious and unsatisfactory way which many pursue when drawing a line. They begin, we will say, at the top (Fig. 5), *a*, and make a series of continuous scratches until they have reached the supposed end at *b*. Now here, at the outset of our instructions, let us endeavour to impress upon the student that such a mode of procedure is fatal to anything like success in drawing. They who follow this practice depend upon the advantage of being able to rub out their failures, and try again and again, with very creditable perseverance, until they arrive at something like the line they wish for; but when the subject is a complex one—that is, one made up of innumerable lines and curves—and this scratching and rubbing-out process is repeated, it cannot be surprising if we should see the unfortunate beginner, labouring under despair and excitement, throw the whole aside in disgust, being fully persuaded in his own mind that he will never be able to make any progress whatever. They who follow this plan generally say drawing is exceedingly difficult, and that it requires genius or natural talent to enable any one to succeed. We therefore earnestly desire to impress upon all who hope to draw well not to allow themselves to fall into a method which we must again call most pernicious and unsatisfactory. To draw a single line requires the same care and judgment as a combination of any number of lines; each

wish particularly to impress this idea upon the mind of the student.

To draw a line at random, without a previous arrangement, trusting more to good luck than to skill for its being correct, and leaving out all consideration or inquiry as to its fitness until it is drawn, is the most discouraging practice that can be followed. Let the student make up his mind, before he attempts to draw the line, where it is to begin, and where it is to end. Take a single line for an example (Fig. 6). Let it be supposed it is to begin at *a* and end at *b*; make a point where it is to begin and another where it is to end, and follow this practice *invariably*, whatever the subject may be, and whatever may be the number of lines that compose it. If the line be too long to draw at once without leaving off, mark any number of points in the direction between the two points *a* and *b*, and mark those points first which are nearest the extremes (the order of the letters in Fig. 6 will explain this), ending with those near the centre. When these points are properly placed so as to be in a straight direction, join *a* to *c* by one continued and carefully drawn line—that is, without leaving off (observing what has been already said about the position of the pencil); then draw a line from *c* to *e*, from *e* to *d*, and from *d* to *b*, as in Fig. 7. By this process of *marking the distances* where there is a combination of lines, we overcome one, if not the greatest, difficulty in free-hand drawing. There are other helps for *placing* lines correctly, all of which will be noticed in their due course. This method of drawing a line must be practised *over and over again*



until it is accomplished. Then in the same way draw lines in a horizontal position, as in Figs. 8 and 9; then again inclined lines, as in Figs. 10 and 11, 12 and 13.

As we have said that all objects are to be represented by straight and curved lines, we will present a simple combination of these lines as an illustration of our system, when the utility of placing points to mark the positions and distances will be evident, for by this process we obtain that which one word will express, the *arrangement* of the drawing. It is this *arrangement of the places where the lines are to be drawn* that we would earnestly impress upon the learner the necessity of repeatedly practising, for upon this will depend the power of producing a correct and satisfactory drawing.

Figs. 14 and 15 may appear to be only a piece of scribble, yet they contain all that is necessary for the purpose of illustrating our meaning. First, then, observe the position of *a* with regard to *b* (Fig. 14), and their distance from each other, and place points to correspond, as *a* and *b* in Fig. 15; and also the positions of the other characteristic points respectively—*l* with regard to *a* being in a direct line with *a* and *b*, *c* with regard to *l* and *a*; also *d* perpendicular with *c*, and so on; *e* and *g* on the same level, *e* being perpendicularly under *l*, *i* under *f*, and *k* somewhat below the position of *i* under *g*. When all these characteristic points and distances are determined, then, as in the drawing of a simple line (as before explained), join these points by lines straight and curved as in the example, Fig. 14, producing the result as in Fig. 15. Respecting the importance of this fundamental principle, we cannot too earnestly impress it upon the mind of the pupil, and recommend him to practise it frequently.

line must be drawn cleanly, and with a knowledge beforehand of its proper position. The same principle that regulates one regulates the whole; it is only a repetition of that principle according to the number of lines in the drawing. We



THE SIGNING OF THE "GREAT CHARTER" AT RUNNYMEDE.

HISTORIC SKETCHES.—I.

MAGNA CHARTA.

It was high time something should be done when the prelates and barons of England made King John sign the Great Charter. The land had had no rest, the people no security, since the day when Duke William overthrew King Harold at Hastings, in October, 1066. If we take a glance at the history of the hundred and fifty years immediately succeeding the Conquest, we shall find it a record of many kinds of violence, an account of one perpetual striving which should be the greater, and it shows incidentally how much less than the whole world a man was willing to accept in exchange for his soul. Brother had striven with brother, sons with their fathers, for the throne. Kings had striven with prelates, barons with priests, for the mastery; baron had waged war on neighbouring baron on account of some private quarrel; even the religious houses were divided against themselves; and "the people"—that is to say, all those who were not of the so-called noble class—had been fearfully ill-used. In spite of the spirit of armed religion, as embodied in the institution of chivalry—in spite of the efforts of great and good men to procure some recognition of the law which bids us do unto others as we would have them do unto us, the grossest tyranny prevailed. The weakest went to the wall, and of the rulers it might well be said—

"The good old rule
Sufficeth them—the simple plan—
That they should take who have the power,
And they should keep who can."

Under such circumstances, it is not very wonderful if we find that the position of all classes beneath the highest, and notably the class which furnished labourers, was perfectly intolerable. The king oppressed the barons, the barons fought among themselves and oppressed their weaker brethren, the lesser barons oppressed the small freeholders, and the small freeholders placed themselves with the thralldom in which they kept the

labourers who depended on them for a living. Sometimes things were better, sometimes worse; but at all times, as far as the workmen were concerned, bad was best. "Christ and his saints slept," said the poor people in the reign of Stephen, 1135-1154. In no other way could they account for their grievous condition. "You might as well have tilled the sea" as the land, says the Anglo-Saxon chronicler, for when the husbandman had spent his labour and his earnings so as to induce the earth to bring forth her increase, lawless men swooped down upon the crop, and as often as not slew the helpless owner of it, and drove his family into slavery. Every man who was strong enough built a castle, forcing the people to work at the stronghold which was to overawe them; and he paid them for neither time nor trouble. "They filled the land full of castles"—there were eleven hundred in England in Stephen's reign, when the population was under two millions—"they greatly oppressed the wretched people by making them work at these castles, and when the castles were finished they filled them with devils and evil men." So writes the chronicler.

At times the Church lifted her voice to warn, to exhort, and to threaten; and now and again, in the most solemn manner, put the most notorious evil-doers out of the communion of Christian men; but in spite of the superstitious fears, which were general, respecting the power of the priesthood, the Church was nearly powerless to stop the universal rapine, until she resorted to the bold expedient of putting Christianity under arms. This she did by founding, or rather by moulding on her own plan, the institution of chivalry. She enlisted under the banner of the Cross the choicest and most generous of the warlike spirits, and having sworn them by word and deed, in every way, "to break the heathen and uphold the Christ," she sent them forth against the wolves who were making such havoc in her sheepfold. Murderers, robbers, violators, scoundrels of all sorts, began now to count the cost of their actions, and then they hesitated about repeating them, for they found they had to lay their account with cracked skulls and slashed

bodies in this world as well as with a solemn promise of eternal damnation in the next.

Henry II. mended matters a bit when he came to the throne in 1154, and by persevering in a wise policy strove to reduce to something like order the chaos into which society had fallen; but during the crusade which was led by Richard I. in 1190, and especially during the king's captivity in Austria, selfishness and wickedness in high places at home found scope for exercise, and law became silent amid the din of arms. From the Lion-Hearted himself, peer and commoner were content to endure much; they saw in the fearless, generous, though Normanly cruel King, qualities which commanded their affections if not their judgments, and they bore with something like satisfaction the continuous and heavy demands which he made upon their blood and treasure. But the Lion being dead was succeeded by one who had played the traitor against him during his lifetime, who had all the ferocity and all the cruelty of his brother without one of his noble qualities, and who was already known to the people by the utter depravity of his life. Here is his portrait, drawn by one of our ablest historians: "He stands before us polluted with meanness, cruelty, perjury, and murder; uniting with an ambition, which rushed through every crime to the attainment of its object, a pusillanimity which often, at the sole appearance of opposition, sank into despondency. Arrogant in prosperity, abject in adversity, he neither conciliated affection in the one, nor excited esteem in the other." Nor was this all. The man was the servant of a licentiousness which recognised no bounds. There was scarcely one family, even among the nobles, that did not smart under a keen sense of that injury which no man pardons to another. The sin for which Lucretia suffered and which drove the kings from Rome, the sin from the taint of which Virginus saved his daughter by killing her;—that sin sat heavily on John's soul, and stirred to their lowest depths the hearts of all England against him.

From such an one the nation would endure nothing tamely, not even those acts which former kings had done, and which by prescription had almost obtained the semblance of law. The barons were utterly enraged, the clergy were fixedly hostile, and the people were suffering to that degree at which they sometimes turn and teach their wrongers "in some wild hour how much the wretched dare." The king was quite unable to ride on the whirlwind he had brought about him, and everything was ready, everybody was prepared, for a revolution. But one thing was wanting to make the revolution successful. There was abundance of muscle, enough and to spare of disposition to kick against the tyrant, but there was not any one to gather the headstrong passions into a focus whence they might act with effect upon the object of their wrath. The barons and those under them—the wrongs the barons suffered at the king's hands taught them sympathy with those who whilom suffered wrong at their own—represented brute force as the untamed elephant represents it; they lacked the skilful guide who might gather up their strength and lead it to the goal they wished to attain. They wanted *Geist*.*

Before we ascertain whence *Geist* came, and the manner in which it worked, let us see rather more particularly what it was the barons and the people suffered that was so intolerable.

When the Conqueror obtained possession of the island, A.D. 1066, he gave the land to be divided among his followers as a reward for their services. The only condition he imposed upon them—a very necessary one to a prince who was only in military possession of the country—was, that whenever summoned they should attend him with so many men-at-arms, archers, etc., according to the extent of their fees or holdings, for six weeks at their own expense. This was the only strictly feudal obligation; but custom added a number of other obligations, which, though smaller, were more galling. If a baron died, his heir had to pay a sum of money by way of "relief," as it was called, or a fee to induce the king to accept him in his father's stead; and if the heir were under age, the king had the wardship of him, an office which enabled the king to put into his own treasure the difference between the youth's income and the cost of his keep and education, for though the situation was really one of trust, practically it was made the means of profit

to the trustee. If the ward were a woman, the warder could marry her to whom he pleased. For the purpose of making the king's eldest son a knight, and for providing a dowry for his eldest daughter, custom required that all the king's tenants should subscribe; and when the king went on a journey through any part of the country, his purveyors were in the habit of taking for the royal use, cattle, provisions, horses, carts, and whatever else might be wanted. Though as a matter of prudence the feudal prince summoned the grand council of all his tenants if he wanted their advice, he was under no legal obligation to summon them; and they might not meet unless he did so. While it was not supposed that a feudal prince could want money, seeing he had large demesne lands specially reserved to him, there was not any law forbidding him either to ask for it or to take it from the tenants.

Now it is easy to see that all the above-named institutions were liable to great abuse; and as a matter of fact they were abused to an unbearable extent. Reliefs, wardship, purveyance, the expensive military attendance, or the money commutation for it—all were made the means of screwing money or money's worth out of the people, and the Church, which held a great proportion of the land in the kingdom, was subject to spoliation as well as the lay tenants. All were tarred with the same brush. The sacred trust of guarding the infant orphan was sold for a fixed sum, and the purchaser of the trust got all he could for his money out of the ward's estate; men bought the right to marry heiresses who were wards of the king, and the right was sold to the highest bidder, almost without reference to personal qualifications.

But this was not all. John gave that worst sign of an evil government—the sale of justice. Henry II. had sold decrees, but the nuisance culminated under John. On the roll of the Exchequer are numerous entries of gifts, sometimes of money, sometimes of goods, in consideration of the king's influence to get a verdict. The judges also took bribes, and that in cases where the Crown was concerned.

Lastly, there was the great grievance of the forest laws, those remote ancestors of our existing game laws. These laws, made by the cruel Conqueror, who, says a Norman monk, "loved the tall stags as if he had been their father," made it a felony, punishable with loss of limb for an unauthorised person to be found in a forest, and by the same law it was made a capital offence to kill a stag.

If all these things were done in the green tree, what could have been done in the dry? If the king so acted towards the barons, prelates, abbots, and other chief tenants, how did these in their turn behave towards those under them? Badly, it is to be feared, though they made the best recompense they could, under the dictation of *Geist*, by including them with themselves in the charter of liberties. With the wretched labourers, the *villains*—the poor slaves who "knew not in the evening what they were to do in the morning, but they were bound to do whatever they were commanded," who were liable to beating and imprisonment at the will of their lord, who were incapable of acquiring property, or of giving freedom to their children—we have not now anything to do. They, alas! benefited but slightly by Magna Charta; their time of emancipation had not yet come.

Let us turn now to look at what *Geist* did to remedy, as regarded freemen, the wrongs from which they suffered.

Stephen de Langton was an Englishman who had been promoted to the see of Canterbury by the Pope, in defiance and in spite of the king. Before he gave John absolution, and took off the ban under which England had lain for the six years prior to 1213, he made the penitent swear to abolish all unjust practices, to do right, and to govern according to law; but a short time afterwards, the barons having refused to follow the king in an expedition to France, John turned his hired troops loose on the barons' lands, and burned and pillaged right and left. Langton met him at Northampton, and again at Nottingham, and by threatening to excommunicate every one of his followers, compelled him to desist. But *Geist*, in the shape of the Primate, knew that other means must be taken to prevent a repetition of violence. At a meeting of the barons in St. Paul's Cathedral, London, Langton said he had discovered a charter of liberties which Henry I. had granted when he was desirous of winning the support of the English against his brother Robert. He read the charter to them, and suggested

* The meaning of the word *Geist* is hardly to be rendered by any single equivalent in our language. It embodies the meaning of Brain, Sense, Discretion, Intelligence, and Will.

to the men of war that they might so combine as to compel the king to enlarge and re-grant it. This was in August, 1213. In November of the following year the barons met again at Bury St. Edmunds, Langton having in the meantime prepared a draft of the demand that should be made upon the king. His were the brains, his the *Geist*, that marshalled the warriors, and pointed out to them the direction in which their strength should be employed. The draft was read by the archbishop from the steps of the high altar, and was received with rapturous applause; and Langton, striking while the iron was hot, reminded the barons of all their wrongs, and swore them to keep steadfast to the cause even unto death, until they had obtained their wish; "and at length it was agreed that after the nativity of our Lord, they should come to the king in a body, to desire a confirmation of the liberties before-mentioned; and that in the meantime they were to provide themselves with horses and arms in the like manner, that if the king should perchance break through that which he had specially sworn (which they well believed), and recoil by reason of his duplicity, they would instantly, by capturing his castles, compel him to give them satisfaction."

Fully armed and in great numbers, the barons waited on the king on the 6th of January, 1215, and presented their demands. John asked for time, and they gave him till Easter to think about it. He employed the interval in attempts to break up the combination against him: he offered special privileges to the churchmen, got the Pope to write in his behalf, and tried to detach the leaders from their comrades. But the nobles remained firm, and getting no reply to their demand by Easter, met in arms at Stamford, and sent thence to John for his final decision. "By God's teeth, I will not grant them liberties that will make me a slave!" he screamed to Langton, who read over the clauses of the charter to him; but the Primate read on, and when he had finished, John promised an answer speedily. None came, so the barons marched, and after getting possession of several large towns, entered London on the 24th of May, 1215. Rendered despairful, and being almost alone, John sent to say he would give what was asked. When and where should he meet the lords? "Let the day be the 9th of June—the place Runnymede," was the answer sent back. A postponement to the 15th was agreed to, and on that day John, attended by a small retinue, met "the whole nobility of England," and negotiations were opened forthwith.

No tricks, no lies, no subtrefuges could now avail. John was absolutely in the hands of his indignant and determined lords, and he must agree to what they demanded, or take the consequences. Why need the liberty of others make him a slave? Is it that tyrants feel stifled when their fellow-men breathe? Better every way that they should feel stifled than that the alternative should present itself. But what were the stifling restraints on the royal respiration? Let us see.

The *Great Charter* provided, first, "That the Church of England (not Rome, be it observed) shall be free, and have her whole rights, and her liberties inviolable." It then went on to fix exactly the nature and extent of the feudal obligations, not only of the barons towards the king, but of the smaller holders towards the barons; the liberties of cities and towns were confirmed; the redress of existing grievances, such as the employment of foreign troops against Englishmen, arbitrary imprisonment without trial, the exaction of ruinous fines and the spoliation of wards and heiresses, was then assured; and that power so sweet to despots, of arbitrary, irresponsible punishment, was expressly renounced. But the grand clauses which made the charter so truly great, and which are laws to this hour, are those which provided that no tax should be levied but by order of "the general council of our kingdom;" that the royal officers who acted illegally should be personally responsible; that the Court of Common Pleas should be in one fixed place, instead of following the king's person. The grandest clauses of all, however, are these—

"No freeman shall be taken, or imprisoned, or disseised, or outlawed, or banished, or any ways destroyed; nor will we pass upon him, nor will we condemn him, *unless by the lawful judgment of his peers, or by the law of the land. We will sell to no man, we will not deny to any man, either justice or right.*"

For four days the negotiations went on; the country between Staines and Windsor was white with the tents of the iron-clad men, who had come to demand a charter of liberties. Stephen

de Langton kept them up to their work, not permitting them to lag, but not suffering them to overbear. It was on the 15th of June, Friday, that the conference came to an end. In the royal tent sat John (Laekland as they called him), with some dozen attendants, whose hearts were not stout enough to oppose or to defend him; and round the table on which the Great Charter lay stood the mightiest of the peers, men whose names are worthily inscribed on Fame's eternal bead-roll. Langton argued for them. He spoke their minds, and patiently did he bear with all that was urged against him, for he knew the power which was ready to back up his case. Never did summer sun shine on a more splendid sight than the meadow by Runnymede presented on this day in June, 1215. The king, after vainly trying to evade, to caress, and to intimidate, was forced to give in; the unbending firmness of Langton knew of no surrender but the fullest. Not only did he insist upon and obtain the king's signature to the grant, but he compelled the royal assent—and there the shoe pinched dreadfully—to a clause empowering certain barons to assume sovereign power in the event of the king failing to keep his oath.

Thus was won for Englishmen the Great Charter of Liberties, which has been handed down with honest pride from generation to generation, and which stands out as the rock on which our air-like freedom was founded, amid the sea of violence and selfishness which beat and broke on it in vain.

SYNOPSIS OF THE LIFE OF KING JOHN.

John was the sixth and youngest son of Henry II.; the seventh King of England after the Conquest, and the third of the Plantagenet dynasty.

Born at Oxford . . . Dec. 24, 1166	England under Papa Interdict 1208-13
Began to reign . . . May 27, 1199	Granted Magna Charta June 15, 1215
Lost Normandy . . . 1204	Died at Newark . . . Oct. 18, 1216

SOVEREIGNS CONTEMPORARY WITH JOHN.

<i>Denmark, Kings of.</i>	<i>Germany, Emperors of.</i>	<i>Scotland, Kings of.</i>
Canute VI. . . 1182	Philip. . . 1198	William . . . 1165
Waldemar II. . 1207	Otho IV. . . 1208	Alexander II. . 1214
	<i>Norway, Kings of.</i>	
	Sverre . . . 1184	
<i>Eastern Empire.</i>	Haco IV. . . 1202	<i>Spain, Kings of.</i>
Alexius III. . . 1195	Haco V. . . 1217	Alphonso IX. . 1158
Isaac II. . . 1203		Henry I. . . 1214
Baldwin I. . . 1204	<i>Portugal, Kings of.</i>	
Henry I. . . 1206	Sancho I. . . 1185	<i>Sweden, Kings of.</i>
	Alfonso II. . . 1212	Swerker II. . . 1199
	<i>Rome, Popes of.</i>	Eric II. . . 1210
<i>France, King of.</i>	Innocent III. . 1198	John I. . . 1216
Philip Augustus 1180	Honorius III. . 1216	

LESSONS IN PENMANSHIP.—I.

POSITION OF THE BODY, THE HAND, AND THE PEN.

GOOD handwriting is essential to almost all persons who have to make their way in the world. Great stress is laid upon it in the examinations for all Government appointments; it is required in every merchant's counting-house, in every office, in almost every shop. The boy who can write well obtains a situation—however humble the situation may be—far more readily than the boy whose "pot-hooks and hangers" are almost as difficult to decipher as the cuneiform characters of ancient Nineveh. It is our purpose to devote a portion of our space to "Lessons in Penmanship." Our efforts, at the outset, will be directed towards the instruction of those who have never learned to write, and the improvement of those who write badly; and we shall follow these lessons by a series of papers exhibiting the different styles of handwriting required in Government offices, the merchant's counting-house, and the office of the solicitor, etc. etc., with instructions in German chirography and the ordinary kinds of ornamental writing, especially the black letter, or German text, so necessary to the solicitor's clerk in engrossing deeds and legal documents.

With these preliminary remarks, we hope our students will attend very carefully to our directions in endeavouring to acquire an elegant system of penmanship, as by this means, combined with constant practice, they will surely become good writers.

In the first place, you should sit right in front of the desk or

table at which you intend to write; then, placing your left arm on the table and your left hand on the edge of the book or paper to hold it firm, if necessary, by pressure with the fingers, take the pen in the right hand, and grasp it firmly, but not too much so, between the thumb and the two fingers next to the thumb, that is, the forefinger and the midfinger, as shown in the accompanying representation of the hand with a pen in it. In this position, remember carefully that before you can draw a stroke, the point of the pen must be placed at the distance of about five-eighths or three-quarters of an inch from the tip of the midfinger, with its face or open part downwards, and not leaning to one side or other; the pen must also be placed alongside of the nail of the midfinger, not on the nail itself, but on the fleshy part of the finger close by it. The upper part of the pen must likewise be raised above the knuckle of the fore-finger, as seen in the figure of the hand, so that a thin paper-folder might pass a little way between this part of the pen and the knuckle. It is of essential importance to observe this part of the directions as well as the preceding, because for want of attention to these apparently trifling minutiae, or small matters, many bad writers have arisen, and some of them even teachers, who ought to know better what they are engaged in. For it stands to reason, and any one may prove it to himself by a few trials, that if the pen be allowed to fall below the knuckle, there is an instant loss of power, and of all real command over the pen.

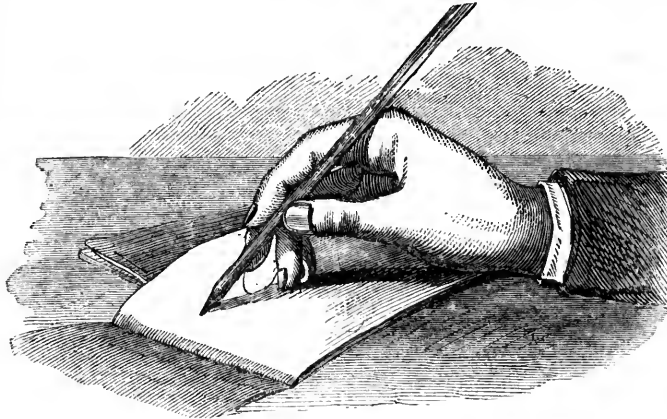
Another direction of equal importance with any of those we have now given, is the position of the thumb; this you bend outwards from the pen so as to cause the tip or fleshy part of the point of the thumb to rest upon the pen directly opposite the first joint of the forefinger, as shown in the figure of the hand. This completes the directions for the position of the three fingers which hold the pen. Now let us attend to the other two fingers. One of these, the little finger, must be held so as to touch the paper on which you intend to write, just on the tip of it, close by the *side* of the nail, while the hand itself is made to rest upon its heel, that is, close by the wrist, not pressing heavily, but as lightly as possible. In fact, the pressure on the tip of the finger should be light also, so that in writing the heel of the hand should assist the tip of the little finger, and the tip of the little finger assist the heel of the hand, by mutually bearing the weight of the hand, and acting alternately

kept upright, so that the top of the pen may point to the right ear when the hand is at the commencement of a line which you are about to write, and that as you move it along it must be kept parallel to this position throughout. It will assist you *very much* in obtaining and keeping this position of the hand to observe that the knuckle of the little finger and the knuckle or second joint of the thumb should both be kept always as near as possible at the same distance from the paper, say about an inch and a half, while in the act of writing. It will also be of

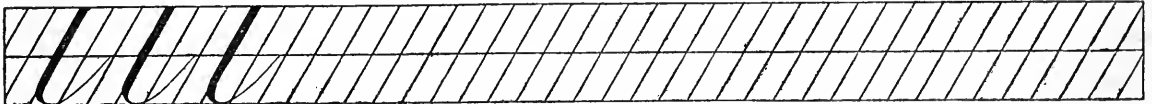
the greatest advantage if, at the commencement of a line in writing, you should have the elbow of the right hand pretty close to your right side, and as you move the hand along the line, in writing, to preserve the arm parallel to this position as well as the pen to its first position; in fact, if you do the one correctly you will necessarily do the other, unless you choose to *twist the wrist*, which would be equally painful, absurd, and unnecessary.

As to the position of the head and shoulders, stoop as little as possible; a gentle inclination of the head is all that is necessary in general, in

order that you may observe earnestly and accurately the motion of the hand and the formation of the letters. In near-sighted persons a greater inclination of the head is required than in ordinary cases; but in all cases whatsoever this rule is absolutely essential, to keep the chest entirely free of pressure on the table or desk at which you write; if once you acquire a habit of leaning on the table, or lolling upon it with your chest or stomach, you need never expect to be a good writer. We believe that many pupils have been seriously injured in their health by the practice or habit of leaning upon the chest while learning to write, and that such injury has followed them through life. What can be more absurd than to see a boy or girl sprawling on a table or desk with their arms akimbo, and their noses almost upon the paper imitating the motion of the pen? What more foolish or disagreeable than to see every stroke of the pen imitated by the mouth or the tongue, as if the writer was approaching a state of idiocy? Let every student of penmanship sit erect while writing, and let him only stoop his head with a gentle inclination, as we said before, sufficient to enable him to see clearly what he is doing, and to produce such a specimen of writing as will do credit to his care, attention, and ingenuity. With all these directions—and we have not spared them—you will require both time and



POSITION OF THE HAND WHEN HOLDING THE PEN.



COPY SLIP NO. I.—THE "POTHOOK."

as momentary fulcrums or resting-points, while the hand moves forward, making one stroke or letter after another. The other finger, next the little finger, usually called the ring finger, because ladies wear their rings upon it, is the most difficult to dispose of, but it must be done. Endeavour, then, to give it an elegant curvilinear form, something in the shape of part of a ring itself, so that it may lie passively between the midfinger and the little finger without interfering with their movements; it should be considerably within the little finger, and its first joint should rest very nearly upon the first joint of the little finger, in a crossing position. This completes the directions for the position of the little finger and the ring finger. Lastly, as to the position of the whole hand, you must carefully observe that while resting upon the heel of the hand and on the little finger, it must be

perseverance, and *constant practice*, either to learn the art of writing from the commencement, or to correct and improve the system you have already acquired. But perseverance, practice, and determination will do all that you require; and you will soon reap a rich reward for all your care, attention, and earnest application.

That those of our readers who are anxious to commence teaching themselves the art of writing may lose no time in making a beginning, we have given a copy slip, in which is shown the first stroke that demands the attention of the writer. It is a down stroke, commonly called a *pothook*, square at the top, and brought down with an equal or uniform pressure of the pen, until it begins to a hair line, which is turned at the bottom and carried upwards to the right.

LESSONS IN ARITHMETIC.—I.

THE term Arithmetic, which is derived from the Greek verb ἀριθμῶν (pronounced a-rith'-me-o), to count, is properly applied to the science of Numbers, and the art of performing calculations by them, and investigating their relations.

NOTATION AND NUMERATION.

1. Any single thing—as for instance, a pen, a sheep, a house—is called a unit; we say there is one such thing. If another single thing of the same kind be put with it, there are said to be two such things; if another, three; if another, four; if another, five; and so on.

Each of these collections of things of which we have spoken is a number of things; and the terms one, two, three, four, five, etc., by which we express how many single things or units are under consideration, are the names of numbers.

It will be seen that the idea of number is quite independent of the particular kind of units, a collection of which is counted. Thus, if there are four pigs, the number of pigs is the same as if there were four pens.

We shall treat first of abstract numbers.

2. The art of expressing numbers by symbols, or figures, is called Notation.

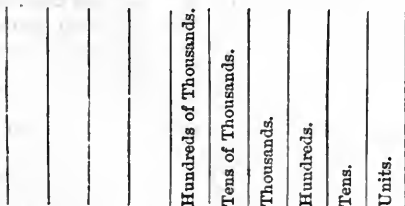
In the system of notation which we are about to explain, all numbers can be expressed by means of ten symbols (figures, or digits,* as they are called), representing respectively the first nine numbers, and nothing, i.e., the absence of number.

Table with 2 columns of numbers and their corresponding digit representations from 1 to 9 and 0.

N.B.—Ten times ten is called one hundred; ten times a hundred, a thousand.

3. Numbers are represented by giving to the figures employed what is called a local value—i.e., a value depending upon the positions in which they are placed.

Let a number of columns be drawn as below, that being called the first which is on the right, and reckoning the order of the columns from right to left.



If a figure—5, for instance—be placed in the first column, it denotes five units, or the number five; if it be placed in the second column, it denotes five tens; if in the third, five hundreds; if in the fourth, five thousands; if in the fifth, five times ten thousand; and so on, each column corresponding to a number ten times as great as the one immediately on its right.

* Digitá. So called from digitus, a "finger." This decimal notation clearly took its origin from these natural counting instruments.

Thus | 7 | 9 | 4 | 3 | would denote seven thousands, nine hundreds, four tens, and three ones; or, as it would be expressed, seven thousand, nine hundred, and forty-three.

Similarly, | 8 | 3 | 0 | 5 | 4 | 7 | would denote eight times a hundred thousand, three times ten thousand, no thousands, five hundreds, four tens, and seven ones; or, as it would be more briefly expressed, eight hundred and thirty thousand, five hundred and forty-seven.

We need not, however, draw the columns; it will be the same thing if we imagine them, and, instead of columns, talk of figures being in the first, second, third, fourth places, etc.

The symbol 0 put in any place, as already indicated in the previous example, denotes that the number corresponding to the particular column or place in which it stands is not to be taken at all: the 0 only fills up the place—thus, however, answering the important purpose of increasing the figure after which it stands tenfold.

Thus, 10 means that once ten and no units are taken—i.e., it denotes the number ten; 100 means that once a hundred but no tens and no units are taken—i.e., it denotes the number a hundred; 5001 means that five thousands, no hundreds, no tens, and one unit, are taken, or, as it would be more briefly expressed, five thousand and one.

4. Before proceeding further, we will give the names of the successive numbers:—

Table listing numbers from Ten to Ninety with their corresponding symbols and names.

Table listing larger numbers: Hundred (ten times ten), Thousand (ten hundreds), Million (a thousand thousands), Billion* (a million millions), Trillion (a million billions).

The numbers between twenty and thirty are expressed thus: twenty-one, twenty-two, twenty-three, etc., up to twenty-nine, to which succeeds thirty; and similarly between any other two of the names above given, from twenty up to a hundred: thus, 95 is called ninety-five.

After one hundred, numbers are denoted in words, by mentioning the separate numbers of units, tens, hundreds, thousands, etc., of which they are made up. For example, 134 is one hundred and thirty-four; 5,342 is five thousand three hundred and forty-two; 92,547 is ninety-two thousand five hundred and forty-seven; 84,319,652 is eighty-four millions, three hundred and nineteen thousand, six hundred and fifty-two.

5. It is useful, in reading off into words a number expressed in figures, to divide the figures into periods of three, commencing on the right, as the following example will indicate:—

Table showing a number (561,234,826,479,365) divided into periods: Billions, Thousands of Millions, Millions, Thousands, Units.

Thus the figures 561,234,826,479,365 would denote five hundred and sixty-one billions, two hundred and thirty-four thousand eight hundred and twenty-six millions, four hundred and seventy-nine thousand, three hundred and sixty-five.

We have then the following

Rule for reading numbers which are expressed in figures:— Divide them into periods of three figures each, beginning at the right hand; then, commencing at the left hand, read the figures of each period in the same manner as those of the right-hand period are read, and at the end of each period pronounce its name.

The art of indicating by words numbers expressed by figures is called Numeration.

EXERCISE 1.

Write down in figures the numbers named in the following exercises:—

* In the foreign system of numeration a thousand millions is called a billion, a thousand billions a trillion, and so on.

- | | |
|--|---|
| 1. Thirty-four. | 8. Two millions, sixty-three thousand and eight. |
| 2. Four hundred and seven. | 9. Eleven thousand eleven hundred and eleven. |
| 3. Two thousand one hundred and nine. | 10. Fourteen millions and fifty-six. |
| 4. Twenty thousand and fifty-seven. | 11. Four hundred and forty millions and seventy-two. |
| 5. Fifty-five thousand and three. | 12. Six billions, six millions, six thousand and six. |
| 6. One hundred and five thousand and ten. | 13. Ninety-six trillions, seven hundred billions and one. |
| 7. Seven hundred and ten thousand three hundred and one. | |

EXERCISE 2.

Read off into words the numbers which occur in the following exercises :—

- | | | |
|-----------|---------------|-----------------------|
| 1. 3506 | 8. 2021305 | 15. 400031256 |
| 2. 6034 | 9. 4506590 | 16. 967058713 |
| 3. 90621 | 10. 1640030 | 17. 20830720000 |
| 4. 73040 | 11. 70900038 | 18. 8503467039 |
| 5. 450302 | 12. 12604321 | 19. 450670412468 |
| 6. 603260 | 13. 70003000 | 20. 58967324104325 |
| 7. 13070 | 14. 161010602 | 21. 42008120537062035 |

LESSONS IN LATIN.—I.

INTRODUCTION.

IN giving to the readers of the POPULAR EDUCATOR lessons which may enable them to learn the Latin language, with no other resources than such as may be supplied by their own care and diligence, we take it for granted that they are desirous of acquiring the necessary skill, and willing to bestow the necessary labour. If the study were not recommended as a good mental discipline; if it were not recommended as giving a key to some of the finest treasures of literature; if it were not recommended as a means of leading us into communion with such minds as those of Cicero, Virgil, Horace, Livy, and Tacitus, it would have a sufficient claim on our attention, as greatly conducing to a full and accurate acquaintance with our mother-tongue—the English. The English language is, for the most part, made up of two elements—the Saxon element and the Latin element. Without a knowledge of both these elements, we cannot be said to know English. If we are familiar with both these elements, we possess means of knowing and writing English, superior to the means which are possessed by many who have received what is called a classical education, and have spent years in learned universities. In order to be in possession of both these elements, we should, for the Saxon element, study German; for the Latin element, the lessons which ensue will suffice.

In the instructions which we are to give, we shall suppose ourselves addressing a reader who, besides some general acquaintance with his mother tongue, has acquired from the English lessons in the POPULAR EDUCATOR, or from some other source, a knowledge of the ordinary terms of English grammar, such as singular, plural, noun, adjective, verb, adverb, etc. The meaning of such words we shall not explain. But everything peculiar as between the English and the Latin shall be explained, as well as any grammatical term which, though used sometimes in English grammar, the reader possibly may not understand. In these explanations we think it safer to err on the side of superfluity rather than on the side of deficiency. We have said that we shall suppose the reader to possess a general acquaintance with the English language. But it is well to suspect oneself as being probably acquainted with it but in an imperfect manner. And this advice is given in the hope that it may lead to the constant use of a good English dictionary. In every case in which there is the least doubt whether or not the exact meaning of any word used is known, the word should be looked out in a dictionary, and put down in a note-book to be kept for the purpose, with the meaning added. When there are, say, a score of words thus entered in the note-book, they must be looked at again and again until their signification is impressed on the memory. If the reader listens to this suggestion, and continues to make progress, he will soon find numerous exemplifications of the assertion above made—namely, that a large proportion of the words of the English language are of Latin origin. Take, for instance, the last sentence. In that sentence alone the following words are derived from the

Latin—namely, *suggestion, continue, progress, numerous, exemplification, assertion, proportion, language, Latin, origin*. Of the thirty-nine words of which the sentence consists, ten are from the Latin. Should the reader ever possess an acquaintance with the science of philology, or the science of languages, he will know that in the sentence there are other words which are found in the Latin as well as in other ancient languages. Independently of this, he now learns that about one-fourth of our English words have come to us from the people who spoke Latin—that is, the Romans and other nations of Italy. In reality, the proportion of Latin words in the English language is very much greater. It should be observed, too, that these Latin words in the sentence are the long and the hard words, and what perhaps may be called “dictionary words.” These are the very words which give trouble in reading an English classic, or first-rate author. But they give a person who knows Latin no trouble. With him they are as easy to understand as any common Saxon term, such as *father, house, tree*. The reason why they have long ceased to give him trouble is, that he is familiar with their roots, or the elements of which they each consist. Having this familiarity, he has no occasion to consult the dictionary. There are thousands of English words of Latin origin, the meaning of which he knows, though he has never looked them out in a dictionary. These lessons will help to put the reader into a similar position; and although he may have no aid but such as these pages afford him, we do not despair of success in our attempt.

PRONUNCIATION OF LATIN.

We may practically regard the Latin alphabet as the same as the English; and in the pronunciation, too, we may in the main follow the best English usage, remembering always that every vowel is pronounced in Latin, and that some words which in English would be words of one syllable, are words of two syllables in Latin, owing to the distinct pronunciation of every vowel. Thus the word *mare* in English, the feminine of horse, is pronounced *ma-re* in Latin, just as we pronounce the English name Mary, and means *the sea*. The Latin language, in short, has no silent *e* as we have in English.

Every modern nation pronounces the Latin as it pronounces its own tongue. Thus there are divers methods of pronunciation. This diversity would be inconvenient if the Latin were, like the French, a general medium of verbal intercourse. At one time it was so, and then there prevailed one recognised manner of pronunciation. Now, however, for the most part, Latin is read, not spoken. Consequently the pronunciation is not a matter of consequence. Even in our own country there are diversities, but such diversities are secondary matters. To one or two remarks, however, we should carefully attend. In Latin the vowels are what is called long or short. In other words, on some the accent or stress of the voice is thrown, on others it is not thrown. The vowel *a*, for instance, is mostly long; the vowel *i* is mostly short. A long vowel is said to be equal to two short vowels. We English people, however, have no other way of marking a long vowel, except by throwing on it the accent or stress of the voice. It is also a fact that in Latin the same vowel is sometimes short and sometimes long—in other words, the same vowel sometimes has, and sometimes has not, the accent on it: thus the *i* in *dominus, a lord*, is without the accent, while the *i* in *doctrina, learning*, has the accent: the former, therefore, is pronounced thus, *dóm-i-nus*; the latter thus, *doc-tri-na*. Now observe that these words are trisyllables, or words of three syllables. Of these three syllables the last—namely, *us*—is called the ultimate; the second, *in*, is called the penult; the first, or *dom*, is called the antepenult. And the general rule for pronouncing Latin words is, that the accent is thrown on the penult, or if not on the penult, then on the antepenult. In *doctrina* the accent is on the penult, or last syllable but one. In *dóminus*, the accent is on the antepenult, or last syllable but two. In order to indicate where to lay the stress of the voice, we shall mark, as in *dóminus* and *doctrina*, on which syllable the accent lies. It will then be understood that when we put a mark thus ‘over a vowel, we mean thereby that the voice should rest, as it were, on that vowel. For example, in the word *incúr*, the accent falls on the last syllable, for the stress of the voice is thrown on the syllable *cúr*. This is indicated thus, *incúr*. So in the Latin *amicus, a friend*, the accent is on the *i*, and the word is to be pronounced

thus, *amfous*, the accent being on the penult. There is another way of marking the same fact; it is by the use of a short straight line, as *ā*, and a curve, as *ḗ*. The former denotes a long or accented syllable—for instance, *doctrīna*; the latter denotes a short or unaccented syllable—for instance, *domīnus*. We thus see that *doctrīna* and *dēctrīna*, *dōminus* and *domīnus* point out the same thing—namely, that in pronouncing *doctrīna* the stress of the voice must be laid on the *ī*, and in pronouncing *dōminus* it must be laid on the *o*.

Another practice must be pointed out. In Latin, as will presently be learnt, the endings of words have a good deal to do with their meanings. It is, on that account, usual to pronounce them at least very distinctly. Indeed, we might say, that on every terminating syllable a sort of secondary accent is laid. Thus, *dominus* is pronounced *dōminūs*. So in other forms of the word: thus, *dōmīni*, *dōmīnō*, *dōmīnūm*. The object is to mark the distinction between, say, *dominus* and *domino*, a distinction of great consequence. Another form of this word is *dominos*. For the same reason a stress is laid on the termination *os*, which accordingly is pronounced as if it were written *oase*. Words, too, which end in *es* have a secondary accent on the *e*; as *vulpes*, a *fox*, pronounced *vulpees*. In a few cases the vowel is what we call doubtful, that is, it is sometimes short and sometimes long. This peculiarity is marked thus, *ā* as in *tenēbrae*, *darkness*, when the accent may be on the penult, as *tenēbrae*, or on the antepenult, as *tēnebrae*. Observe, also, that a vowel at the end of a word is always pronounced in Latin. Take, as an example, *docēre*, *to teach*, which is pronounced as it is marked, that is, with an accent on the last syllable no less than on the last syllable but one. Care must be taken to pronounce *docēre* as a word of three syllables, *do-ce-re*, and not *do-cere*, as if it were a word of two syllables only, remembering, as we have observed before, that the Latin language has no silent *e*, as we have: for instance, in *wife*. The reader may practise himself, according to these rules, in pronouncing thus the opening lines of that fine poem, Virgil's "Æneid." The translation made by the English poet Dryden gives a fair idea of the meaning of the original.

"Arma viriūque canō, Trōjæ qui primus ab ārīs
Italiām, fātō profugūs, Lāvīnia vēnit
Littora; mūlt[um] ill[ic] et tērris jāctātus et ālto,
Vī superūm, sacrvē memorēm Jūnōis ob iram;
Mūlta quoqu[e] et bellō pāsūs dūm cōderet urbem,
Inferētiq[ue] Deōs Latīō; genus ānde Latinum,
Albāniq[ue] patrēs, atq[ue] āltæ mōenia Rōmæ."

"Arms and the man I sing, who, forced by fate,
And haughty Juno's unrelenting hate,
Expelled and exiled, left the Trojan shore.
Long labours, both by sea and land, he bore,
And in the doubtful war, before he won
The Latin realm, and built the destined town—
His banished gods restored to rites divine,
And settled sure succession in his line,
From whence the race of Alban fathers came,
And the long glories of majestic Rome."

In the above piece of Latin poetry will be noticed some letters enclosed by brackets. By certain rules which will be found in Latin prosody, these letters are dropped, or not sounded, under certain conditions of position in Latin poetry, although they are sounded distinctly in Latin prose. In pronouncing the third line, we must cut off the *um* in *multum* before the vowel *i* in *ille*; and the *e* in *ille* before the *e* in *et*. Also in the fifth line drop the *e* in *quoque* before the *e* in *et*. In the last line, too, the *e* in *atque* is dropped or elided before the vowel *a* in *altæ*, and the two words are run into one, and pronounced as if written *atq[ue]altæ*. Accuracy of pronunciation, however, is not easily acquired from any written or printed directions. The living tongue is the only adequate teacher. And it will be well for the reader to get some grammar-school-boy to read to him and hear him read the passage given above from Virgil, and the exercises, or some of them, which will be found in future lessons. Although the pronunciation of Latin is of secondary importance, yet it is well to be as correct as possible, if only from the consideration that what is worth doing at all, is worth doing well. But should any one, as he justifiably may, hope by these lessons to prepare himself for becoming even a teacher of Latin—say in a school—he would in that capacity find the pronunciation considered as a matter of consequence; indeed, a disproportionate value is, especially

in the old grammar schools, attached to the established methods of pronunciation. After all, we cannot pronounce the Latin as it was pronounced by the Latins themselves, nor can the best trained lips pronounce their poetry so as to reproduce its music.

OUR HOLIDAY.

As the possession of a healthful frame and strength of muscle and sinew is absolutely necessary to all who desire to make the most of their mental powers, we have thought it desirable to devote a portion of the POPULAR EDUCATOR to a series of papers on what is generally termed Physical Education, or, in other words, the culture of the powers of the body.

We intend, therefore, to take "Our Holiday" at regular intervals, and invite our readers on these occasions to dismiss all thoughts of graver studies for a while, and enter heartily into the consideration of the art of developing the strength, endurance, and agility of the human form by properly regulated gymnastic exercises and athletic sports and games.

We will take first a game which on its introduction into this country a few years ago attracted special attention—

LA CROSSE, THE NATIONAL GAME OF CANADA,

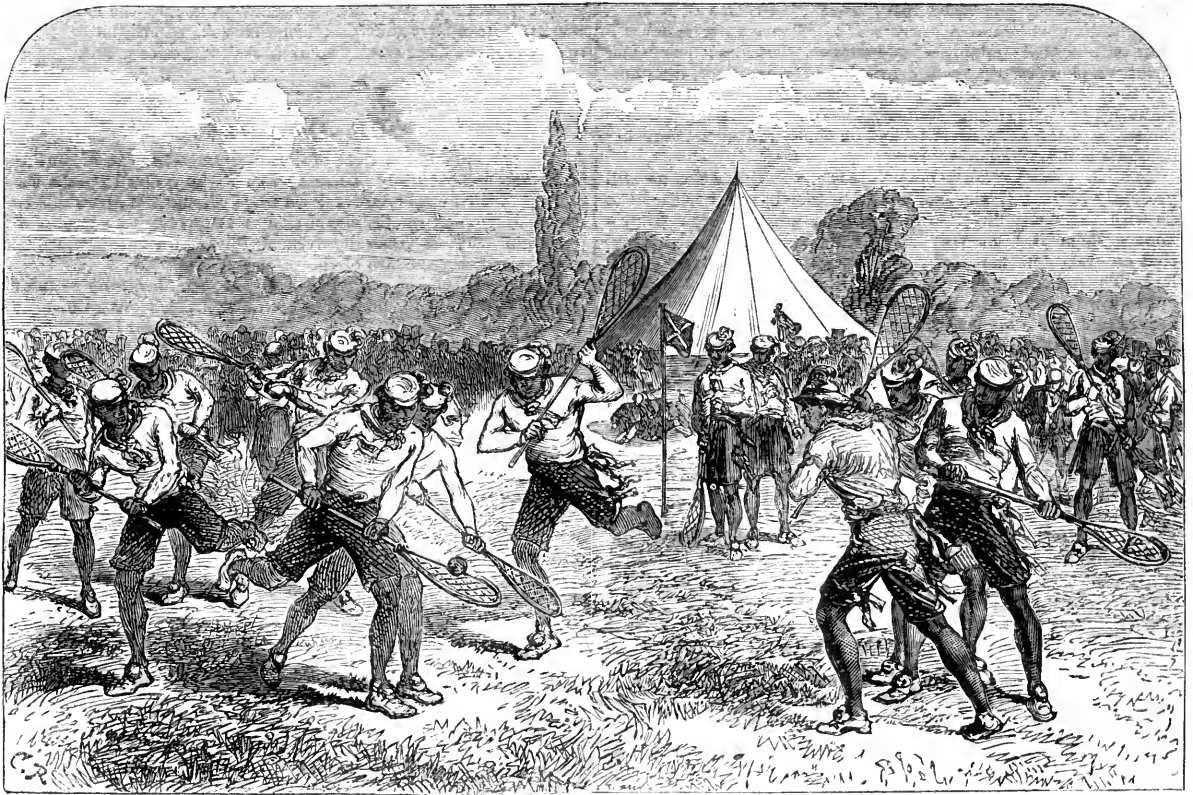
a game lately introduced into this country from the "New Dominion," where it occupies a position like that so long held by cricket in England. It is of Indian origin, and has been played here by a party of Indians brought over for the purpose. It is a ball game, and derives its name from the implement used in striking the ball, which is a long hickory stick bent at one end like a *crosse*, or bishop's crosier. Across this curve of the stick stout network is stretched, and extends nearly half-way down its length. The "crosse" has, therefore, something of the appearance of a racket-bat, but is much longer.

To the spectator the game presents the appearance of a combination of football and hockey, with some striking variations from both. It is a very animated game, interesting to the looker-on, and highly exciting to those engaged in the contest. It requires a large space of ground, not less, as a rule, than about 400 yards square, and tolerably level. Towards the two ends of this ground goal-posts are fixed, as at football, and the players are divided into two parties, each having its own goal. Each goal consists of two poles about six feet high and seven feet apart, ornamented with flags of the colour—say red or blue—chosen by the party who may take that side in the game. The distance between the two goals is optional, depending upon the space of ground in which the game may be played, and other conditions either accidental or the subject of agreement between the contending parties. The number of persons who may play is optional also, but they are usually equally divided, as in other field amusements.

The object which is pursued by either party throughout the game is to drive the ball through the opponents' goal—that is, between their goal-posts. When this is done the game is over, having been won by that side which has succeeded in the attempt. The ball used is made of hollow india-rubber, and must not be more than nine nor less than eight inches in circumference. It must, as a rule, be touched only with the "crosse," and it may either be struck with this implement or carried upon it. The crosse is about four feet long; and the network with which it is provided is nearly tight, but just sufficiently loose to hold the ball when resting on it. It is not allowed to assume the shape of a bag. Thus fashioned the ball may be readily picked up from the ground and carried upon the crosse, or flung from it towards the opponents' goal.

The principal players engaged on either side occupy the following stations:—1. Goal-keeper, who places himself near the goal, it being his duty to defend it when in imminent danger. 2. Point, some twenty or thirty yards in front of the goal-keeper. 3. Cover-point, about the same distance in advance of point. 4. Centre, who faces the centre of the field; and, 5. Home, who is stationed nearest the opponents' goal. The remaining players are called the fielders, and have no fixed position.

The game is commenced midway between the two goals, the ball being struck off by the captain of one side, as may have been decided by lot. The struggle at once ensues, one party endeavouring, by striking and following up the ball, to carry it



LA CROSSE, THE NATIONAL GAME OF CANADA.

onward until their opponents' goal is reached, and the other striving by every means in their power to beat back the ball, and force it in turn into the opponents' ground. Great agility and dexterity are required to play an efficient part in the game. Fleetness of foot and quickness of eye are the essential qualifications of a good player. When one has caught and is carrying the ball upon his crosse, it is allowed to any of the opposite side to strike the ball from his crosse with their own weapon. Thus, at the moment when, after a long contest, he may be on the point of winning the game by a dextrous fling of the ball, which he has obtained with much difficulty, it may be jerked or beaten out of his crosse in a contrary direction, and the struggle may be renewed as from the beginning.

As played by the Indians, who adopt a light and picturesque costume for the purpose, the game, as we have said, is highly interesting to the spectator. Their skill in the finer points of the game is admirable. A player, running at full speed, will frequently catch up the ball on the end of his crosse, drop it to the ground to baffle a pursuer, dextrously catch it again, and repeat this until he has either passed it on to one of his own side who is nearer the adversary's goal, or carried it well forward himself. For, contrary to the rule in football, in this game the player is allowed to do all he can to pass the ball on to another competitor on the same side who may place himself in a more favourable position.

The following are the rules to be observed in playing the game:—

The ball must not be caught, thrown, or picked up with the hand, except to take it out of a hole in the grass, to keep it out of goal, or to protect the face.

The players are not allowed to hold each other, nor to grasp an opponent's crosse, neither may they deliberately trip or strike each other.

If the ball be accidentally put through a goal by one of the players defending it, it is the game for the side attacking that goal.

If the ball be put through a goal by one not actually a player, it does not count for or against either side.

A match is decided by winning three games out of five, unless otherwise specially agreed upon.

We give an illustration of the crosse, and believe the instructions herein contained will be sufficient to enable any party of players who may not have seen the game to commence it for themselves. It has all the elements of popularity, especially as a winter amusement, and possesses many of the advantages of other games, without that element of danger which is found, for instance, in football and hockey. An accidental blow from the light stick with which the crosse is fashioned could cause no serious hurt, and beyond this, or the chance of an occasional fall, there is nothing to cause incidental injury to the players.

We conclude our notice of the game with an anecdote, from which it will be seen that it once was on the point of endangering the English rule in Canada. About the middle of the last century, after the conquest by Wolfe, the Indian chief Pontiac planned an attack on some of the principal forts, which was to be carried out by stratagem through the medium of "la crosse." The known skill of the Indians in the game frequently induced the officers of the garrison to invite them to play when they were in the locality, and occasionally some hundreds were engaged. Pontiac designed, on one of these occasions, that the ball should be struck, as if accidentally, into the forts, and that a few of the Indian party should enter after it. This was to be repeated two or three times, until suspicion was lulled, when they were to strike it over again, and rush in large numbers in pursuit. They were then to fall upon the garrison with concealed weapons. This ruse was carried into effect, and partially succeeded; but the Indians failed to enter the strongest of the fortifications, and were beaten back with much slaughter. Pontiac afterwards made friends with the English, but he was a treacherous ally, and it was a subject of congratulation when he was at last killed by one of his own race.

MECHANICS.—I.

FORCE: ITS DIRECTION, MAGNITUDE, AND APPLICATION.

THE aim of these Lessons is to make evident to ordinary intelligent persons, who will take a little trouble, the principles of Mechanics—to treat that subject in a popular way, yet so that the reader may form accurate notions about it, and be enabled to apply it to practice in solving common problems by calculation. We have much to do, but all depends on the way of doing it. The reader I desire to have is the intelligent mechanic or artisan, the country schoolmaster or pupil-teacher, the young student who wants to learn the science through a book without a master, the college B.A. or M.A. whose mechanics was made a mess of in his young days, and would be glad, without again going to a "coach," even late in life to learn it. I should not despair of finding even ladies among my scholars. More faith should be placed in the average human intellect than commonly is. It ought to be possible to teach the sciences of *form*, and *number*, and *force* to more persons than usually learn them. These are the "common things" of life, and a knowledge of the laws which regulate them ought to be within the reach of most people, if only the first principles be properly laid down and explained, consequences deduced from them in a simple and natural order, and language used which they can understand. I ask you, then, to approach the subject without fear. Study simultaneously with these lessons those upon Arithmetic; for, as we proceed, a knowledge of the four Common Rules of Arithmetic and of Proportion will be found essential. Any other mathematics you may require, I shall teach you as we go along, but the amount will be small. Observe: accurate mechanical conceptions, and the power of solving mechanical problems by construction by rule and compass or calculation, are the objects we aim at. First, then, let us ascertain what our science treats of. I believe it may accurately be described as follows:—

MECHANICS is the science of *force* applied to a *material body* or *bodies*.

This let me fully explain. Mechanics is concerned about *force*—that is its great subject. But it considers it only in the consequences which follow its application to a *body* or *bodies* which must be *material*. A force may push through an empty point of space; but, as it can make no impression on that point, Mechanics does not consider it under such circumstances. The body to which it is applied may be of any size, even an atom of matter, sometimes termed "a material point;" and Mechanics does inquire what effect forces have on such atoms. But, in the more common problems, it is concerned about bodies of visible and tangible magnitude, such as a block of stone, a beam of timber, a girder of iron, a cannon ball, the earth itself, the moon, or the sun.

This being clearly understood and agreed on, our next question is, What is *force*? I answer—

FORCE is the power, or agent, whatever be its nature, by which *motion* is produced in a body, or a *tendency to motion* accompanied by strains or pressures in its parts.

For instance, a blow is given by the bat to the cricket ball, or a bolt is fired from a cannon: the blow in the one case, and the exploding gunpowder in the other, furnish *forces*, the effect of which is the motion of the ball or bolt. Steam enters the cylinder of an engine, and away to work goes the machinery connected with it, moving and printing this POPULAR EDUCATOR. Here again is force, the elasticity of the steam, and its effect is motion. A stone is let loose at the top of a tower, or from a balloon, and it falls to the ground: what makes it fall? The great Earth does, which, by its attraction, pulls the stone towards itself. This attraction is the force producing the stone's motion. And if any of you doubt, or feel any difficulty about this, let him take a magnet and put one of its ends near a few loose iron-filings, scattered over a piece of paper, and he will see how this is possible. The filings will

move towards the magnet, and stick to it, in the very same way that the stone moves to, and sticks to, the earth until some person pulls it away by a stronger force. And so likewise does the electrified ball draw towards itself the small pieces of cork or feather we place near it. In all these cases, you see, there is, first, a body, the ball, or bolt, or stone, or iron-filing, or cork; secondly, a force applied to it; and, thirdly, motion produced.

But take now the lamp which hangs from the ceiling. It is at rest; but the earth, by its attraction, is trying to pull it down, and down it would come were we to cut the chain or rod by which it is suspended. Here, then, is *force* again, but it produces only *tendency* to motion. But observe further, that although the lamp does not move, the chain that holds it is *strained* by its weight. And not only is the chain strained, but so is the ceiling joist to which it is attached; and, as this joist rests its ends on the walls, this strain is transmitted to the walls in the form of pressures on them. There is thus tendency to motion, strain, and pressure produced as the effect of the force applied by the earth to the lamp, but no motion. And, if any of you feel a difficulty in believing in those strains, let him suppose, instead of the lamp, a ton weight of iron suspended from the ceiling: what will follow? The chain will snap, or the joist, or even ceiling, will give way, and down all will come on the floor. They snap or give way because they are *strained* beyond their strength. So, in like manner, when a train stands at rest on one of those great iron girder bridges that span our rivers, there is tendency to motion, with strains and pressures; the great Earth below pulls at the train to bring it into the water; but the bridge resists, bears the pressure of the weight on it,

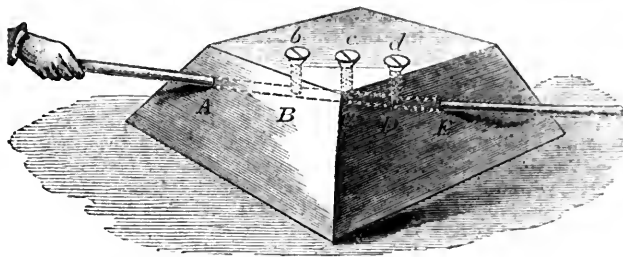


DIAGRAM ILLUSTRATING THE APPLICATION OF FORCE.

and is strained throughout its length besides. A more familiar instance is the struggle of two wrestlers. No one will doubt that in the contest great *force* is put forth by each. For a moment they are motionless, like statues; the forces are balanced, but the strain on their muscles is terrific. There is in each tendency to motion, caused by the force put forth by the other, but as yet no motion. At last one of the combatants

prevails; his force ends in producing motion, and his adversary falls to the ground.

These examples will, I trust, be sufficient to make clear to you the account I have given you of force, namely—that it is the agency by which motion is produced in a material body, or a tendency to motion with pressures or strains. You will now understand the reason why Mechanics is divided into two branches, Statics and Dynamics. Statics is the branch which treats of forces which balance each other, and produce only tendencies to motion with pressures and strains, and is so called from the Latin word *sto*, which means "to stand," or "be at rest." Forces which thus balance one another are said to be in *equilibrium*, a Latin expression which denotes the balancing of equal weights; and it is important that you should keep the expression in memory, as we shall have frequent occasion to use it. The other branch, Dynamics, treats of force or forces which do not balance one another, but produce motion, and was so named from the Greek word *δυναμις* (*du-na-mis*), power, under the mistaken notion that there was more power in force when its effect is motion, than when it produces strain. This, we have seen, is not the case; but the term "Dynamics" may, notwithstanding, continue to be used without leading to error. The two branches we may therefore define or describe as follows:—

STATICS is the branch of Mechanics in which forces are considered which equilibrate, or balance one another, producing tendencies to motion, with strains and pressures.

DYNAMICS is the branch of Mechanics in which forces are considered which produce motion.

Now it so happens that, of these branches, Statics is the simpler and easier, and more natural for the student to commence with. Questions about forces which balance each other are not so complicated as those which involve motion. The reason is, that *time* enters into all problems of motion, but

not generally into those of equilibrium. The speed or velocity of a cannon-ball must be considered at every varying moment of its flight; but the strains and pressures among and on the beams of the roof of a railway station are the same at all moments. *Time* does not affect the latter unless by wear and tear. With statics, therefore, we commence, and, of course, with the simplest class of questions, those which relate to a force or forces acting on a single point. But here I must turn back to the notion of force, and endeavour to fix it with greater accuracy in your minds. I must show you how it is said to be applied and measured to the body it moves or strains; and this will best be done under the three following heads:—

1. The Direction of a Force.
2. The Point of Application of a Force.
3. The Magnitude of a Force.

1. *The Direction of a Force.*—In Mechanics, forces are assumed to act in right lines. The assumption is made for the best of reasons—namely, that of experience. All the simpler cases of motion confirm it, and all the more complicated can be accounted for by it. A ball falls to the ground in a right line—that which points to the centre of the earth, whence the force of attraction which moves it acts. The billiard-ball moves in a right line; and the calculations of the skilful player, which are based on the supposition that it so moves, are never found to be wrong. A ship, with her sails square set and wind aft, moves in a right line; and to make it leave that line the steersman must put the helm to port or starboard, and by turning the face of the rudder against the water, cause another force to be applied to the ship across the line of its course, and at her stern, turning her round. It is true that the stone thrown obliquely into the air moves in a curved path; but in this case we know that there are two forces—not one only—acting on it, namely, the original impulse, which makes it move in a right line, and the earth's attraction, which pulls it from that line into a curved course. Moreover, all the calculations on which are based the predictions of astronomers as to the places in which the sun, moon, and planets will be on a certain day, hour, and minute, are based on this assumption, that forces act in right lines; and the predictions invariably prove true. Our first mechanical axiom may, therefore, on the ground of experience be assumed to be true—namely, that the direction in which a force acts is that of a right line. Indeed, it is not easy to conceive how it could act otherwise.

2. *The Point of Application of a Force.*—The direction of a force being disposed of, we must fix our ideas as to its point of application. The rule is, that any point on the line of its direction may be considered such; but this you must understand with a limitation, or exception, which should not be forgotten. The point of application can only be on so much of the line of direction as lies within the body. For instance, suppose a person to push with an iron rod, which he holds in his hand, at the point A (as in the diagram), against a block of iron which lies on a table. Then, clearly A is the point of application of the force with which he pushes. Let now a hole be drilled through the block in the direction of the push from A to E, into which the rod may fit closely but freely; and also other holes, downwards, \hat{O} B, c c, d d, to meet the passage, A E, into which thumbscrews, b, c, d, are fitted. Let the rod now be passed through the block so as to emerge at the other side, and clamp it down firmly by the thumb-screw, b. If it be now pushed against the block with the same force as before, it is clear that the force will be arrested by the thumb-screw, b, at B, and that B will become its point of application to the body. So, in like manner, may it be applied to c and d, by tightening in succession each screw, while the others are left loose. In all these cases the force is the same, and the direction the same; but the points of application are different. But will the effects in the several cases be different? No; for the portion of the rod within the block, and extending from A to any of the points of application, performs the same part in transmitting the force from A to the point within, as the iron which was removed did when the force was first applied directly at A. The removed iron has its place filled by an equivalent of that metal in rod, and the body is virtually in its original condition. The force of the hand may still be considered applied at A, thence to be transmitted to B, or c, or d, as we please, by the portion of rod within. The second case becomes identical with the first, and the effects, therefore, must be identical in every respect; and, nothing

being changed, intensity, direction, nor effect of the force, it is clearly *indifferent* which point we make the point of application.

Another instance is the raising of a weight by a rope. Weight and rope together make one body; and whether the lifting power be applied by engine, by horse, or by man, whether it acts over a pulley or not, every point of the strained rope may be considered a point of application. Or let the case be that of three strings attached to a ring, and pulled in different directions by three persons. It makes no difference, in this compound body of ring and strings, whether the hold taken of the latter be long or short—all their points are points of application of their respective forces.

We thus see that, in all cases, we may assume that the point of application of a force is any point on so much of its line of direction as lies within the body. To suppose it applied to a point outside would be absurd; for, as we have shown, though a force may act or push through a point of empty space, it can make no impression on that point, either in the way of strain or motion, and therefore cannot come under the consideration of Mechanics.

3. *The Magnitude of a Force.*—To find a suitable measure of the intensity or magnitude of a force, we must also look to experience. It would be very convenient to measure forces by comparing them with weights; but this is not always practicable, and, even if it were, it would not answer all the purposes of Mechanics. I may as well, therefore, explain to you the perfect method, as that is as simple as any other. Experience teaches that a double force produces a double velocity, a treble force a treble velocity, and so on, in any body to which it is applied. But then a difficulty occurs: the same force will produce different velocities in bodies of different sizes. If it make a ball of one pound weight move at a certain rate, it will give double that speed to a half-pound ball, and half to one of two pounds. As a general rule, the greater the mass of the body, the less the speed produced. Everybody is familiar with this fact. We see, then, that if we desire to measure forces by the velocities they produce, we must try them on bodies of some fixed weight or mass. Tried on this particular mass, experience teaches that that which produces the greater velocity is the greater force. Now, the mass of matter which mechanicians choose for this purpose is that of any substance which is equal in weight to a cubic inch of distilled water. That much matter is designated the Unit of Mass, and for a reason I shall hereafter more fully explain. Imagine, then, a round ball, say of ivory, whose weight is that of a cubic inch of pure water, and suppose that several forces are in succession applied to it; the velocities they produce will be accurate measures of their intensities, or of their magnitudes.

But, then, how are the velocities to be ascertained? Clearly by the spaces the ball would move over in any given time, say the unit of time—a second—on the force being applied to it. Suppose, then, the unit ivory ball, put on a perfectly smooth floor, and then suddenly struck by a blow equal to the force you want to measure. By some means—and there are many which may be devised—manage to ascertain the distance the ball moves over in one second. That space, or length of line, will be the measure of the force; and if any number of such forces be tried in the same way and on the same ball, that which causes it to move over the greater space is the greater force, over a double space a double force, and so on.

The final result, then, is that, in considering a force in Mechanics, we must first suppose drawn within the body a line representing its direction. Then, on that line, let any point be taken for its point of application. Thirdly, on the line of direction so fixed, let as many inches be measured from the point of application as, on any scale you agree to use, represents the space the force would cause the unit ivory ball to move over in one second. Then you have a line which also in magnitude represents the force. Or in fewer words—

A FORCE is represented, both in magnitude and in direction, by a finite right line passing through its point of application.

If in the above explanations I have succeeded in giving you clear notions of the aim of Mechanics, and of the nature and effects of force, you are prepared for the consideration of a force, or forces, applied to a single point, which will be the subject of our next Lesson.

LESSONS IN FRENCH.—II.

SECTION I.—FRENCH PRONUNCIATION (continued).

II. FRENCH ACCENTS.

17. THE constant use of certain marks called accents in the French language constitutes a marked peculiarity which cannot escape the attention of the student. Rarely, except in elementary works of the English language, is the syllable of any given word which requires an emphasis marked.

18. But it is not so in the French language: here, accents of various kinds are constantly meeting the eye on every page. One thing, however, must be observed, namely:—the position of the accent does not always and infallibly mark the syllable of a word which must receive the stress of voice in common pronunciation.

19. Modern French grammarians have established the following rule, namely:—to place the stress of voice on the last pronounced syllable of every word.

20. A slight inspection only of the following examples will illustrate the above remarks.

1. Dé-vo-rer (pronounced Day-vo-ray).

The first syllable of this word is marked with an accent; must the stress of voice, therefore, be placed upon the syllable *de*? No: if the rule be applied to this word, the stress of voice falls on the last syllable, *rer*.

It will then be asked, What is the use of this accent? We answer, *It modifies the sound of the vowel over which it is placed.*

2. Lé-gè-re-ment (pronounced Lay-zhair-mon, with the sound of the final *n* suspending $\grave{}$).

Again, the word used now as an example has the same kind of an accent as the word used in the previous example had; and also, it is placed over the same vowel. But it has another different accent over the first vowel of the second syllable; and, according to the rule, the stress of voice is not placed either upon the first or second syllable, but upon the last.

This second accent (observe its form and position) only serves to modify the sound of the vowel over which it is placed. Sometimes, however, an accent is placed over a vowel of the syllable which, according to the rule, receives the stress of voice, viz.:—Cé-lé-bri-té.

3. Bâ-ti-ment (pronounced Bat-tee-mon, with the sound of the final *n** stopped).

Again, in the word used here as an example, a third and still different accent is placed over the vowel *a*. Its presence affects the sound of that vowel only. It has nothing whatever to do with the proper accent of that word, as the term *accent* is understood when applied to words in the English language. As a general rule, the stress of voice is not so strong in the French as in the English language.

21. Accents, therefore, as used in the French language, are certain marks differing from each other, and placed over certain vowels only, for specific purposes.

22. There are three accents, viz.:—

- ´ called the Acute accent (thus, é)
- ˘ " Grave " (" è)
- ˆ " Circumflex " (" â)

23. The acute accent is used only over the vowel *e*, and serves two purposes:

First, to modify its sound.

Secondly, to mark the existence of a distinct and final syllable, as:—

Dé, Trom-pé,
Pé-tar-dé, Cér-é-mo-nie.

24. The grave accent is used only over the vowels *a*, *e*, and *u*, as,

à, Père, Oû,

and serves two purposes:

First, to modify the sound of the vowel *e*.

Secondly, to distinguish one part of speech from another; thus,

a is a verb.	la is an article.	ou is a conjunction.
à ,, preposition.	là ,, adverb.	où is an adverb.

25. The circumflex accent is the union of the acute and

grave accents, and is placed over each of the vowels except *y*. It indicates that the letter over which it is placed has a sound twice as long as it has without it, viz.:—

Âge, Bête, Bûche, Cête, Gîte, Mêle, Tête.

This accent also indicates the suppression of the letter *s*, after the vowel over which it is placed; thus

Bête, Fête, Tête,

were formerly written

Beate, Feste, Teste.

The *s* was not sounded, but gave to the preceding vowel that prolonged sound now represented by the circumflex accent.

The circumflex accent also serves to distinguish parts of speech from each other; thus,

Crú is a participle from the verb <i>croître</i> .	Súr is an adjective.
Cru is a noun and adjective.	Sur is a preposition.
Dú is a participle from the verb <i>devoir</i> .	Tá is a participle from the verb <i>taire</i> .
Du is an article and noun.	Tu is a pronoun.

26. Besides the three kinds of accents just enumerated, certain other marks or signs are used, called

Cedilla, Dieresis, Hyphen, and Apostrophe.

The CEDILLA ($\`$) is a peculiar mark, somewhat resembling a figure 5 inverted, and placed only under the letter *c*, before the vowels *a*, *o*, and *u*, thus: $\`$.

It indicates that the letter *c* under which it is placed, has the soft sound of *ss*, as in the word *lesson*:—

Çà pronounced <i>sa</i> .	Façonner, pronounced <i>fas-son-nay</i> .
Deçà ,, <i>dis-sà</i> .	Maçon ,, <i>mas-son</i> .
Façade ,, <i>fas-sad</i> .	Reçu ,, <i>rus-su</i> .

27. The DIERESIS (¨) consists of two dots placed over the vowels *e*, *i*, and *u*. It shows that the vowel over which it is placed is pronounced separately from the preceding vowel, thus indicating, in reality, a distinct syllable, as:—

Nâiveté pronounced	Na-ive-té.
Oûir ,,	Ou-ir.
Poëte ,,	Po-ete.

28. The HYPHEN (-) is a short horizontal mark, which is used to connect words and syllables, as:—

A-t-il, Belles-lettres, Celui-ci, Demi-kilomètre,
Fait-ou, Suis-je, Très-rarement.

Its use in connecting syllables is precisely the same as in the English language; that is, when a word is divided, so that a part of it is at the extreme right hand of a line, and the rest at the extreme left of the line following.

29. The APOSTROPHE (') is like a comma placed at the upper end of letters instead of at the lower end, or at the bottom on a line with the lower end.

Its use is to show the elision, or cutting off, of a vowel before words commencing with a vowel or *h* mute, and is much used in the French language, as:—

L'ami, instead of le ami.	L'homme, instead of le homme.
L'église ,, la église.	S'il ,, si il.

30. The EUPHONIC T is thus called on account of its peculiar position between two parts of speech, viz., the verb and the pronoun.

It is used only in asking questions, and then a hyphen is placed both before and after it, thus:—

A-t-elle?	A-t-il?	Tra-t-ou?	Demande-t-ou?
Parle-t-il?	Va-t-ou?	prouve-t-il?	

This letter cannot be translated, because it has no meaning. It is thus used merely for the sake of euphony, or agreeable sound.

31. PARENTHESIS AND PUNCTUATION.—In the French language, the marks used in punctuation, etc., are the same, and used for the same purposes, as in the English language. (See READING AND ELOCUTION.)

SECTION IV.—THE ARTICLE USED PARTITIVELY.

1. The article, preceded by or contracted with the preposition *de* [Sect. III. 1, 2], is placed in French before words used in a partitive sense. Such words may generally be known in English

* It is impossible to find, in the English language, perfect equivalents for *en*, *on*; the former sound finds a near approach in *ant* and *can't*, and the latter in *Mon-ta-gue*, *Song*, etc.

when *some* or *any* is or may be prefixed to them [§ 13 (10), § 78 (1)].

Du pain	Bread, or some bread.
De la viande	Meat, or some meat.
De l'argent	Money, or some money.

2. The French numeral adjective *un, m., une, f.*, answers to the English indefinite article *a* or *an* [§ 13 (4) (11)].

Un homme	A man.
Une femme	A woman.

3. The *e* of the preposition *de* is elided before *un* and *une* [§ 146], and replaced by an apostrophe.

D'un livre, m.	Of or from a book.
D'une maison, f.	Of or from a house.

4. When the nominative or subject of an interrogative sentence is a noun, it should be placed before the verb; and immediately after the verb in simple tenses, and after the auxiliary in compound tenses, a pronoun must be placed agreeing with the nominative in gender, number, and person [§ 76 (4) (5)].

Le médecin a-t-il de l'argent ?	Has the physician money ?
Le boucher a-t-il de la viande ?	Has the butcher meat ?
Le libraire a-t-il du papier ?	Has the bookseller paper ?
La dame a-t-elle de la soie ?	Has the lady silk ?

RÉSUMÉ OF EXAMPLES.

Avez-vous du pain ?	Have you bread ?
Vous avez du pain, du beurre, et du fromage.	You have bread, butter, and cheese.
Votre frère a-t-il une livre de beurre ?	Has your brother a pound of butter ?
Avez-vous le livre du libraire ?	Have you the bookseller's book ?
Non, j'ai le livre de la dame.	No, I have the lady's book.
La sœur du médecin a-t-elle du papier et de l'encre ?	Has the physician's sister paper and ink ?

5. It will be seen, by some of the above examples, that the article must be repeated before every noun used in a partitive sense.

VOCABULARY.

Acajou, m., mahogany.	Beurre, m., butter.	Café, m., coffee.
Acier, m., steel.	Bière, f., beer.	Cuiller, f., spoon.
Aujourd'hui, to-day.	Bœuf, m., beef.	Dé, m., thimble.
Encre, f., ink.	Libraire, m., book-seller.	Plume, f., pen.
Épicier, m., grocer.	Livre, m., book.	Sucre, m., sugar.
Fils, m., son.	Livre, f., pound.	Vin, m., wine.
Fourchette, f., fork.	Morceau, m., piece.	Votre, your.
Fromage, m., cheese.	Papier, m., paper.	Thé, m., tea.
Gant, m., glove.		

EXERCISE 5.

1. Avez-vous de la viande ? 2. Oui, Monsieur, j'ai une livre de viande. 3. Votre fils a-t-il un morceau de pain ? 4. Oui, Madame, il a un morceau de pain. 5. Le libraire a-t-il un livre ? 6. Il a de l'encre et du papier. 7. Votre sœur a-t-elle une montre d'or ? 8. Elle a une montre d'or et un dé d'argent. 9. Le boulanger a-t-il du vin ou de la bière ? 10. Le boulanger a du thé et du café. 11. Votre frère a-t-il du fromage ? 12. Il a du fromage et du beurre. 13. La dame a-t-elle une cuiller d'argent ? 14. La dame a une cuiller et une fourchette d'argent. 15. Le boucher a-t-il de la viande aujourd'hui ? Oui, Monsieur, il a un morceau de bœuf. 17. Le charpentier a-t-il une table ? 18. Oui, Monsieur, il a une table d'acajou. 19. Avez-vous le livre du médecin ? 20. Non, Madame, mais j'ai le livre de votre sœur. 21. Qui a du café et du sucre ? 22. L'épicier a du café et du sucre. 23. La sœur du libraire a-t-elle un gant ? 24. Non, Monsieur, mais elle a un livre. 25. A-t-elle une plume d'acier ? 26. Non, Monsieur, elle a une plume d'or. 27. Vous avez le porte-crayon du médecin.

EXERCISE 6.

1. Have you any tea ? 2. Yes, Madam, I have a pound of tea. 3. Who has bread ? 4. The baker has bread, butter, and cheese. 5. Has the tailor cloth ? 6. The tailor has a piece of cloth. 7. Has the physician gold ? 8. Yes, Sir, the physician has gold and silver. 9. Has the lady a silver watch ? 10. Yes, Miss, the lady has a silver watch and a gold pen. 11. Has your sister silk ? 12. Yes, Sir, she has silk and cotton. 13. Have you a knife ? 14. Yes, Sir, I have a steel knife and a silver fork. 15. Have you meat to-day, Sir ? 16. Yes, Sir, I have a piece of beef. 17. Has your carpenter a mahogany table ? 18. Yes, Sir, he has a mahogany table. 19. Has your sister a glove ? 20. Yes, Sir, my sister has a silk glove. 21.

Has the bookseller's son a gold pencil-case ? 22. Yes, Sir, he has a gold pencil-case and a steel pen. 23. Who has your sister's watch ? 24. Your brother has the gold watch and the silk hat. 25. We have gold, silver, and steel. (See Rule 5.)

SECTION V.—THE NEGATIVES, etc.

1. To render a sentence negative, *ne* is placed before the verb, and *pas* after it.

Je n'ai pas le cheval.	I have not the horse.
Vous n'avez pas la maison.	You have not the house.

2. When the verb is in a compound tense [§ 45 (8)], the first negative *ne* is placed before the auxiliary, and the second between the auxiliary and the participle.

Je n'ai pas eu le cheval.	I have not had the horse.
Vous n'avez pas eu la maison.	You have not had the house.

3. It will be seen in the above examples that the *e* of *ne* is elided, and replaced by an apostrophe, when the verb begins with a vowel [§ 146].

4. When the words *ni, neither; rien, nothing; jamais, never;* *personne, no one, nobody,* occur, the word *ne* only is used, and those words take the place of *pas* [§ 41 (3)].

Je n'ai ni le livre ni le papier.	I have neither the book nor the paper.
Avez-vous quelque chose ?	Have you anything ?
Nous n'avons rien.	We have nothing, or not anything.
Personne n'a le livre.	No one has the book.
Vous n'avez jamais le couteau.	You never have the knife.

5. A noun used in a partitive sense (Sect. IV. 1), and being the object of a verb, conjugated negatively, should not be preceded by the article, but by the preposition *de* only [§ 78 (7)].

Nous n'avons pas d'argent.	We have no money.
Vous n'avez pas de viande.	You have no meat.

6. Quelqu'un, *some one, any one* [§ 41 (7)]; quelque chose, *something, anything*, should only be used in an affirmative or interrogative sentence, or in a sentence which is negative and interrogative at the same time.

Avez-vous quelqu'un ?	Have we any one ?
Avez-vous quelque chose ?	Have you anything ?
N'avons-nous pas quelque chose ?	Have we not something ?

7. In a negative sentence, *ne—personne*, signifies *nobody, not anybody*; and *ne—rien, nothing, not anything*.

Je n'ai personne.	I have no one, not any one.
Vous n'avez rien.	You have nothing, or not anything.

8. AVOIR, TO HAVE, IN THE PRESENT OF THE INDICATIVE.

	Negatively.	Negatively and Interrogatively.
	SINGULAR.	SINGULAR.
Je n'ai pas,	I have not.	N'ai-je pas ? Have I not ?
Tu n'as pas,	Thou hast not.	N'as-tu pas ? Hast thou not ?
Il n'a pas,	He has not.	N'a-t-il pas ? Has he not ?
Elle n'a pas,	She has not.	N'a-t-elle pas ? Has she not ?
	PLURAL.	PLURAL.
Nous n'avons pas,	We have not.	N'avons-nous pas ? Have we not ?
Vous n'avez pas,	You have not.	N'avez-vous pas ? Have you not ?
Ils n'ont pas,	They, m., have not.	N'ont-ils pas ? Have they, m., not ?
Elles n'ont pas,	They, f., have not.	N'ont-elles pas ? Have they, f., not ?

RÉSUMÉ OF EXAMPLES.

Le tailleur a-t-il le bouton ?	Has the tailor the button ?
Le tailleur n'a pas le bouton.	The tailor has not the button.
Il n'a pas eu le drap.	He has not had the cloth.
Il n'a eu ni le drap ni le cuir.	He has had neither the cloth nor the leather.
Ai-je de la viande ?	Have I meat ?
Vous n'avez pas de viande. (R. 5.)	You have no meat.
Avez-vous quelque chose ?	Have we anything ?
Nous n'avons rien.	We have nothing, or not anything.
Nous n'avons jamais de café. (R. 5.)	We never have coffee.

VOCABULARY.

Ami, m., friend.	Deux, two.	Ni, conj., neither, nor.
Angleterre, f., Eng-land.	Drap, m., cloth.	Personne, m., nobody.
Aussi, also.	Du tout, adv., at all.	Quelque chose, m., something, anything.
Autre, other.	France, f., France.	Quelqu'un, m., some one, any one.
Chapelier, m., hatter.	Histoire, f., history.	Soie, f., silk.
Chien, m., dog.	Libraire, m., bookseller.	Velours, m., velvet.
Coton, m., cotton.	Marchand, m., merchant.	Voisin, m., neighbour.
Cousin, m., cousin.	Mon, m., my.	

EXERCISE 7.

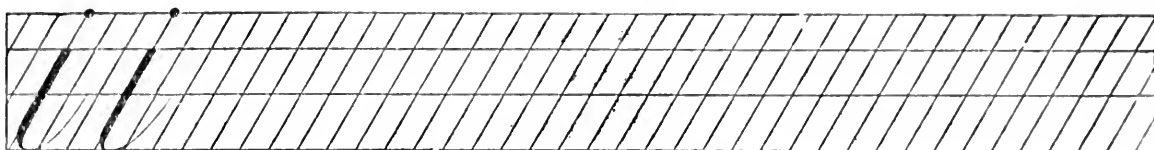
1. Le chapelier a-t-il de la soie ? 2. Le chapelier n'a pas de soie, mais il a du velours. 3. A-t-il du velours de coton ?

4. Non, Monsieur, il n'a pas de velours de coton, il a du velours de soie. 5. Avez-vous de la viande? 6. Oui, Monsieur, j'ai de la viande. 7. Le médecin n'a pas d'argent. 8. Qui a de l'argent? 9. Le marchand n'a pas d'argent, mais il a du drap, du velours, et de la soie. 10. Avez-vous quelque chose? 11. Non, Monsieur, je n'ai rien du tout. 12. Le tailleur a-t-il deux boutons d'argent? 13. Non, Monsieur, il a deux boutons de soie. 14. Qui a votre chien? 15. Le voisin a le chien de mon cousin. 16. N'a-t-il pas votre cheval aussi? 17. Non, Monsieur, il a le cheval de votre ami. 18. Avez-vous l'histoire de France? 19. Non, Madame, je n'ai ni l'histoire de France ni l'histoire d'Angleterre. 20. N'avez-vous ni le livre ni le papier? 21. Non, Mademoiselle, je n'ai ni l'un ni l'autre. 22. Qui a du papier? 23. Le libraire n'a pas de papier. 24. Quelqu'un a-t-il un livre? 25. Personne n'a de livre.

velvet. 3. Who has silk velvet? 4. The hatter has silk velvet and a silk hat. 5. Have you two silver buttons? 6. No, Sir, I have a cloth coat, a silk hat, and a velvet shoe. 7. Has your neighbour a wooden table? 8. Yes, Sir, he has a mahogany table. 9. Has your cousin a history of England? 10. No, Sir, he has a history of France. 11. I have neither the cloth nor the velvet. 12. We have neither the meat nor the coffee. 13. Has any one a book? 14. Your cousin has a book, a velvet coat, and a silk hat. 15. Have you the physician's book? 16. Yes, Madam, I have the physician's book and the lady's gold pen. 17. Has the merchant cloth? 18. The merchant has no cloth, but he has money. 19. Who has your neighbour's dog? 20. Nobody has my neighbour's dog. 21. Has any one my book? 22. No one has your book. 23. Has your cousin's brother anything? 24. No, Sir, he has nothing. 25. Who has your friend's book? 26. Your brother has my cousin's book. 27. Has he the tailor's coat? 28. He has not the tailor's coat. 29. We have neither the cloth nor the silk.

EXERCISE 8.

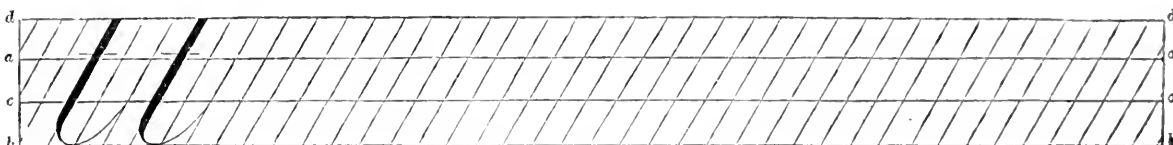
1. Has the baker velvet? 2. No, Sir, the baker has no



COPY-SLIP, NO. 2.—THE LETTER *i*.



COPY-SLIP, NO. 3.—THE LETTER *u*.



COPY-SLIP NO. 4.—THE LETTER *t*.

LESSONS IN PENMANSHIP.—II.

In our last lesson we gave the student an example of the first stroke that should engage his attention in beginning to acquire the art of writing, and explained to him that it was a down-stroke square at the top and brought downwards with an equal pressure of the pen until it narrows at the bottom into a fine hair-line, which is turned upwards towards the right. This down-stroke with a fine up-turn, or "pot-hook," as it is familiarly called, but which we shall term a *bottom-turn* for the sake of brevity, enters into the composition of no less than nine letters of the alphabet in writing, of which four—namely, *i*, *u*, *t*, *l*—consist of this stroke only, with certain slight modifications. We mention this to the self-teacher to encourage him to perseverance in the task he has undertaken, for he will see plainly enough, after a little consideration, that when he is able to imitate this bottom-turn correctly, he has not only learnt to make this simple stroke itself, but has actually advanced more than half-way towards writing the four letters we have just named, besides five others that will be pointed out in the course of future lessons.

A brief examination of the copy-slips given in this page will be sufficient to prove the truth of our statement. The letter *i*, the simplest letter in the alphabet, is merely the elementary bottom-turn shown in Copy-slip No. 1, with a dot or point a little above it in the direction of the slope of the letter, or, in other words, immediately above the letter in a straight line which passes through the centre of the thick down-stroke from top to bottom. The letter *u*, again, is merely the bottom-turn twice repeated, the fine hair-stroke of the first bottom-turn

being joined to the thick down-stroke of the second in a line passing midway between the two horizontal lines within which the letter is written; while the letter *t* is formed by the bottom-turn, commenced at the same distance above the upper of these horizontal lines as that at which the dot is placed above the letter *i*, and crossed a little above that line by a short horizontal hair-stroke.

It may be as well to say something about the form in which our Copy-slips are placed before our readers. The lines *a a*, *b b*, as in Copy-slip No. 4, are the lines between or within which what we may call the body of each letter is written. These lines and the space between them resemble in some measure the staff in music, portions of certain letters being carried above the upper line *a a* in some cases, or below the lower one *b b* in others, as ledger notes are carried above or below the staff in musical notation. The line *c c*, midway between the lines *a a*, *b b*, is that in which the letters, or component parts of letters, should be joined together, while the line *d d* shows the distance above *a a* at which the letter *t* should be commenced, or the dot placed above the letter *i*. The diagonal lines sloping from right to left show the proper inclination of the thick down-strokes of the letters, and act as guide lines to enable beginners to make all their letters of the same slope, and keep the down-strokes parallel to one another. A little trouble taken at starting to keep on the same level the heads, loops, and tails of all letters that extend above or below the lines within which the body of each is written, will go far to ensure neatness and regularity when the learner can write with ease and rapidity, and his handwriting begins to assume a character peculiar to itself.

LESSONS IN ARITHMETIC.—II.

THE ROMAN METHOD OF NOTATION.

The symbols by which the Romans expressed all numbers were:—

I	denoting	one	C	denoting	a hundred
V	"	five	D or I \bar{O}	"	five hundred
X	"	ten	M or CI \bar{O}	"	a thousand
L	"	fifty			

By combining these symbols according to the following rules all numbers can be represented:—

When two symbols are placed together, if the one denoting the less value is on the left of the other, then the less number is to be subtracted from the greater; if on the right hand, it is to be added to it. Thus IX denotes ten with one subtracted, or nine; XI denotes eleven; XL denotes forty; LX, sixty. If the symbols are of equal value, then they are simply to be added. Thus XX denotes twenty; CC, two hundred, etc. The value represented by I \bar{O} is increased tenfold by every additional \bar{O} placed on the right. Thus 5,000 is denoted by I $\bar{O}\bar{O}$, and 50,000 by I $\bar{O}\bar{O}\bar{O}$. The value of the symbol CI \bar{O} becomes increased tenfold by the addition of C and \bar{O} , one on each side of the line I. Thus 100,000 is denoted by CCCI $\bar{O}\bar{O}\bar{O}$, 1,000,000 by CCCC I $\bar{O}\bar{O}\bar{O}\bar{O}$, and so on. A straight line placed over any one of these symbols increases its value a thousand-fold. Thus \bar{I} denotes 1,000; \bar{V} , 5,000; \bar{L} , 50,000; \bar{C} , 100,000. 2,000 was usually denoted by CI \bar{O} CI \bar{O} , but sometimes by IICI \bar{O} , or IIM, or MM. Similarly, 4,000 was denoted by IVCI \bar{O} , etc.

The above remarks will sufficiently explain the following Table of Roman Numerals:—

I	denotes	one	XI	denotes	eleven	XXI	denotes	twenty-one
II	"	two	XII	"	twelve	XXII	"	twenty-two
III	"	three	XIII	"	thirteen			etc.
IV	"	four	XIV	"	fourteen	XXX	"	thirty
V	"	five	XV	"	fifteen	XL	"	forty
VI	"	six	XVI	"	sixteen	L	"	fifty
VII	"	seven	XVII	"	seventeen	LX	"	sixty
VIII	"	eight	XVIII	"	eighteen	LXX	"	seventy
IX	"	nine	XIX	"	nineteen	LXXX	"	eighty
X	"	ten	XX	"	twenty	XC	"	ninety
			DCC	denotes	seven hundred			
C	denotes	one hundred	DCCC	"	eight hundred			
CI	"	one hundred and one	DCCCC	"	nine hundred			
CX	"	one hundred and ten	M or CI \bar{O}	"	one thousand			
CC	"	two hundred	MM (or see also above)	"	two thousand			
CCC	"	three hundred	MDCCLXVII	"	one thousand eight hundred and sixty-seven			
CCCC	"	four hundred			etc., as above.			
D (see also above)	"	five hundred						
DC	"	six hundred						

EXERCISE 3.

1. Write out the names of all the numbers from one to a hundred, and express them in figures.

2. Write out the names of the numbers which immediately follow:—

- | | |
|----------------------------------|--|
| 1. One hundred. | 4. Nine thousand nine hundred and ninety-nine. |
| 2. One hundred and ninety-nine. | 5. One million. |
| 3. Four hundred and ninety-nine. | |

3. Express, in figures, the numbers named in the preceding example, and those which immediately follow them.

4. Write the names of the numbers which are next to the following numbers, and express both sets in figures:—

- | | |
|--|--|
| 1. One million and ninety-nine. | 3. Nine millions nine hundred and ninety-nine thousand nine hundred and ninety-nine. |
| 2. One million five thousand nine hundred and ninety-nine. | |

5. Read or express the following numbers in words:—

- | | | |
|-------------|----------------|--------------------|
| 1. 202 | 7. 20030208 | 13. 100010001000 |
| 2. 1001 | 8. 1010101 | 14. 3000000000000 |
| 3. 15608 | 9. 9999999 | 15. 77766655444 |
| 4. 306042 | 10. 347125783 | 16. 123456789123 |
| 5. 5678914 | 11. 202021010 | 17. 484848484848 |
| 6. 26312478 | 12. 9690909090 | 18. 10210230430400 |

6. Write or express the following numbers in figures:—

- | | |
|---|--|
| 1. Four hundred and four. | 4. Six hundred and five thousand and nineteen. |
| 2. Three thousand and thirty-two. | 5. Eleven thousand eleven hundred and eleven. |
| 3. Twenty-four thousand and eighty-six. | |

- | | |
|---|--|
| 6. Three hundred and forty-one thousand seven hundred and eighty-two. | 11. Eighty millions two hundred and three thousand and two. |
| 7. One million. | 12. Two hundred and two millions twenty thousand two hundred and two. |
| 8. Nine thousand nine hundred and ninety-nine millions, nine hundred and ninety-nine thousand nine hundred and ninety-nine. | 13. Twenty thousand millions. |
| 9. Write the number which follows this last one in order. | 14. Two hundred thousand and twenty millions two thousand. |
| 10. One trillion and three. | 15. The next number to thirty thousand billions nine hundred and ninety-nine thousand. |

ADDITION.

1. The process of uniting two or more numbers together, so as to form a single number, is called *Addition*. The number thus formed is called the *sum* of the separate numbers.

2. The sign + placed between two numbers indicates that they are to be added together. This symbol is called *plus*. The sign = placed between two numbers denotes that they are equal. Thus 2 + 3 = 5, expresses that 2 and 3 added together are equal to 5.

3. Suppose that it be required to add the two numbers 3452 and 4327 together.

These are respectively—

3 thousands, 4 hundreds, 5 tens, and 2 units,
4 thousands, 3 hundreds, 2 tens, and 7 units,

which, added together, are equal to—

7 thousands, 7 hundreds, 7 tens, and 9 units.

The sum, therefore, of 3452 and 4327 is 7 thousands, 7 hundreds, 7 tens, and 9 units, which, according to our system of notation, will be written 7779.

This is got by putting down the two numbers one under the other, the units under the units, the tens under the tens, and so on; and then adding up the lower to the upper figure in each place, thus:—

3452
4327

7779

4. In the example we have taken, the sum of the numbers of the thousands amounts only to a number expressed by one figure, namely, 7; and similarly for the hundreds, the tens, and units.

Suppose, however, that we have a case in which this is not so; for instance, to add

8976 and 4368.

These are respectively equal to

8 thousands, 9 hundreds, 7 tens, and 6 units,
4 thousands, 3 hundreds, 6 tens, and 8 units;

or, added together, to

12 thousands, 12 hundreds, 13 tens, and 14 units.

This, however, is not at present in a form which can be at once written down according to our system of notation. We must, therefore, alter its form.

Now 14 units are the same as 1 ten and 4 units; therefore 13 tens and 14 units are the same as 14 tens and 4 units.

But 14 tens are the same as 1 hundred and 4 tens; therefore 12 hundreds and 14 tens are the same as 13 hundreds and 4 tens.

But 13 hundreds are the same as 1 thousand and 3 hundreds; therefore 12 thousands and 13 hundreds are the same as 13 thousands and 3 hundreds.

Hence we see that 12 thousands, 12 hundreds, 13 tens, and 14 units, are the same as 13 thousands, 3 hundreds, 4 tens, and 4 units, which, by our notation, is written 13344.

5. The preceding process will sufficiently explain the following Rule for Addition:—

Write down the numbers under each other, so that units may stand under units, tens under tens, etc., and draw a line beneath them. Then, beginning with the units, add the columns separately. Whenever the sum of the figures in a column is a number expressed by more than one figure, write down the right-hand figure of such number under the column, and add the other figure or figures into the next column. Proceed in this way

throughout all the columns, and set down the whole sum of the last or left-hand column. Thus:—

8976
4368

13344

Adding the units, 8 and 6 are 14. Therefore write down 4 and add 1 to the tens column.

Adding the tens, 1 and 6 and 7 are 14. Therefore write down 4 and add 1 to the hundreds column.

Adding the hundreds, 1 and 3 and 9 are 13. Therefore write down 3 and add 1 to the thousands column.

Adding the thousands, 1 and 4 and 8 are 13.

N.B.—The same rule evidently applies if there are more than two lines of figures to be added together.

6. *Test of Correctness.*—There are various methods by which the correctness of the process of addition may be tested.

Perhaps the most convenient test is to add the numbers together in the reverse order; that is, to commence with the top line instead of the bottom. If the second result be the same as the first, the work may be presumed to be right; for it is highly improbable that the same error will have been made in performing the operation in two different orders.

EXERCISE 4.

1. Add together the following sets of numbers:—

- | | |
|--|---|
| 1. 75234 + 41015 + 19075 + 176. | 7. 493742 + 56710607 + 23461 + 400072 + 6811004 + 89999003 + 26501. |
| 2. 85064 + 9035 + 72358 + 919. | 8. 16075 + 250763 + 7561 + 830654 + 293106 + 2537104 + 31725. |
| 3. 1500267 + 45085 + 4652 + 4780400 + 90276 + 89760841. | 9. 142857 + 428571 + 285714 + 857142 + 571428 + 714285 + 142857. |
| 4. 40702135 + 67070420 + 670856 + 4230823 + 750642 + 8790845. | 10. 9034781 + 57 + 4897 + 309 + 587896 + 369875625 + 1876 + 398 + 79 + 8. |
| 5. 756 + 849 + 934 + 680 + 720 + 843 + 657689 + 989876498 + 8045685 + 807266780. | |
| 6. 432678902 + 310046734 + 2167005 + 327861 + 293000428. | |

2. Add together the following numbers:—

Twenty-three thousand three hundred and forty-nine; seven thousand two hundred and seven; three hundred and twenty-five; five millions two hundred and fifty-three; fifty-six billions three hundred and nine millions five hundred and thirty-one thousand six hundred and nine; four thousand and seventeen millions; four thousand and four.

3. Find the sum of all the numbers from 1 to 100.

4. Arrange the nine digits in the form of a square, that is, in three rows of three figures each, so that when the columns are added vertically (up and down), horizontally (from side to side), or diagonally (from corner to corner), they will still produce the same sum.

5. In the following square, taken from Professor De Morgan's "Elements of Arithmetic," the columns added vertically, horizontally, or diagonally, will all produce the same sum, thus affording *twenty-four* different exercises in addition:—

2016	4212	1656	3852	1296	3492	936	3132	576	2772	216
252	2052	4248	1692	3888	1332	3528	972	3168	612	2412
248	288	2088	4284	1728	3924	1368	3564	1008	2808	648
684	2484	324	2124	4320	1764	3960	1404	3204	1044	2844
2880	720	2520	360	2160	4356	1800	3600	1440	3240	1080
1116	2916	756	2556	396	2196	3996	1836	3636	1476	3276
3312	1152	2952	792	2592	36	2232	4032	1872	3672	1512
1548	3348	1188	2988	432	2628	72	2268	4068	1908	3708
3744	1584	3384	828	3024	468	2664	108	2304	4104	1944
1980	3780	1224	3420	864	3060	504	2700	144	2340	4140
4176	1620	3816	1260	3456	900	3096	540	2736	180	2376

6. The following is another example of the same kind, which

will afford *sixteen* exercises on larger numbers than those in the preceding square:—

2177956	4652906	1583968	4058918	989980	3461930	395992
494990	2276954	4751904	1682966	4157916	1088978	2870942
2969940	593988	2375952	4850902	1781964	3563928	1187976
1286974	3068938	692986	2474950	4256914	1889902	3662926
3761924	1385972	3167936	98998	2573948	4355912	1979960
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LESSONS IN BOTANY.—I.

INTRODUCTION.

AT the outset we may as well state that by the term **BOTANY** we mean the science which teaches all about plants; such as their form, their aspect, the number and structure of their flowers, their seeds, and, in short, all that in any way relates to them. The word botany is derived from the Greek, in which language *βοτάνη* (*bot'-a-ne*), signifies a plant. Our friends the Germans call the study *pflanzenlehre*, plant-teaching; and, in our opinion, they are quite right to find a name for this and many other sciences out of their own language. We English might with great propriety do the same on many occasions, but it is not the custom.

Botany is a very interesting, no less than a very useful study, and it possesses over many others the advantage of being attended with no expense.

Inasmuch as botany is the science which teaches all about plants, the learner will agree that it is necessary to set out with precise notions as to what a plant is. Nothing would appear to be more easy than this; and easy enough it is when we take extreme cases: thus, for instance, no one would ever take an oak-tree for an animal, or a horse or an elephant for a vegetable; but there are certain beings whose characteristics are so little marked, that philosophers are to this day not agreed as to the division of nature to which they ought to be referred; in other cases, again, beings have been taken out of one classification and inserted under another; this remark applies to the sponge, which, although it grows attached to rocks under the sea, is now universally considered to be an animal, or, more properly speaking, the skeleton of an animal, the soft portions of which have been dissolved away.

The great Swedish naturalist Linné, better known by the Latin form of his name—Linnæus, adopted the following pithy designation of minerals, vegetables, and animals.

"Minerals," he said, "grow; plants grow and live; but animals grow, live, and feel." A very neatly turned expression this is, we must all allow, and the task would not be easy in few words to show wherein it is insufficient. Naturalists of the present day, however, do not consider it quite correct, and, what is more, naturalists own that their ingenuity has been unable to find a distinction which is quite correct: however, the following is perhaps more nearly correct than any other. Animals are those living beings which derive their nutriment from an internal cavity (the stomach), and vegetables are those living beings which absorb their nutriment from without.

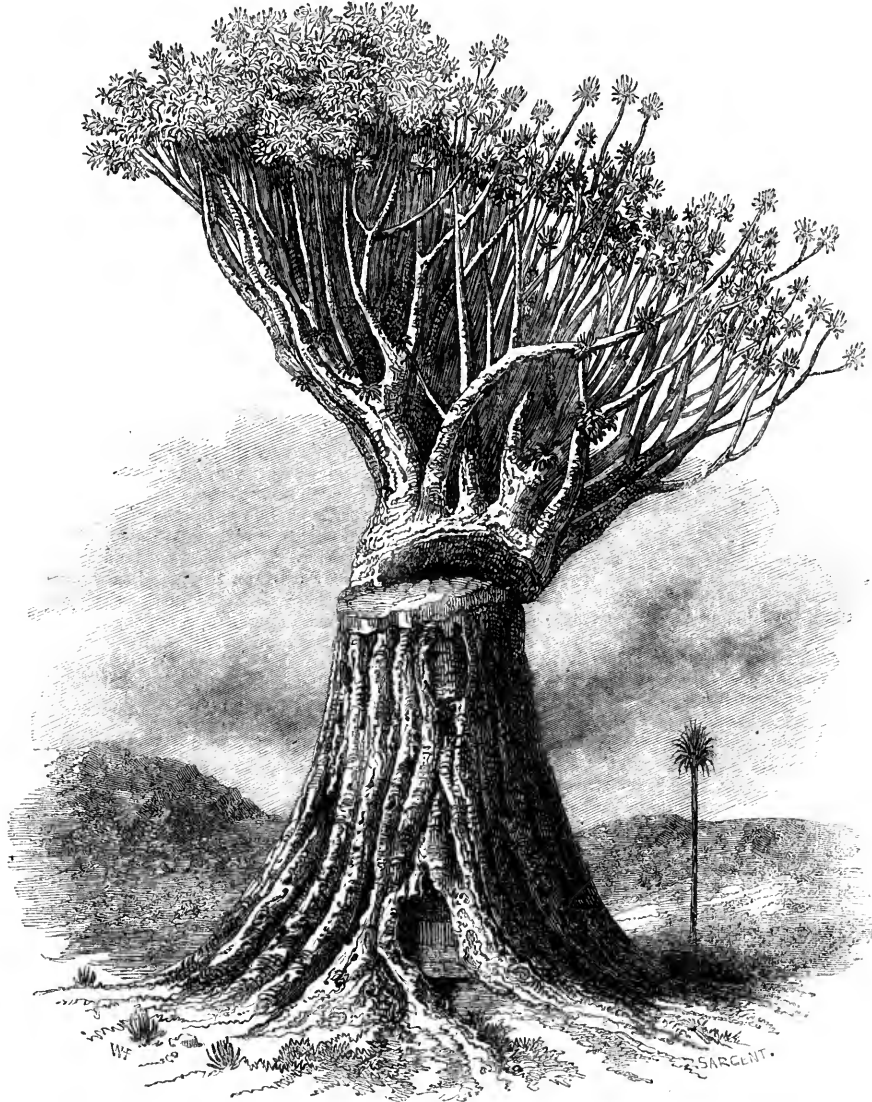
SECTION I.—ON THE PRINCIPLES WHICH SERVE FOR THE CLASSIFICATION OF PLANTS.

Whatever may be the subject of our study it requires to be classified, classification being the very key-stone of order, without which our ideas become obscure and confused: therefore it is that even the least botanical amongst us, when speaking of vegetables, make a rough sort of classification for ourselves, usually dividing them into herbs, plants, bushes, or shrubs and trees. And for many common purposes this rough and ready distinction is sufficient; but it is not very correct, and therefore will not answer the purposes of a botanist.

To prove that the distinction is not correct, we will mention two cases in point, and we are sure the learner will accede to the justice of the remark. What would the reader term a myrtle

as he sees it growing in our climate? A poor tiny thing scarcely bigger than a geranium he would not term a tree, he would call it a shrub or a bush; nevertheless, this very same species of myrtle assumes under the more genial sun of Southern Europe and Northern Africa the dimensions of a goodly tree. Again, what would the reader term the mignonette? A plant of course; yet in Northern Africa, along the Barbary coast, its stem becomes woody, and it assumes the aspect of a bush or shrub at least.

dragon-trees are amongst the largest and the oldest, if not the very largest and very oldest, of known trees. The great dragon-tree of Orotava, in the island of Teneriffe,* an accurate representation of which is given below, is of such dimensions that ten full-grown men, joining hand to hand, are scarcely sufficient to encircle its base. It is now about four hundred and seventy years ago since the island of Teneriffe was first discovered. The great dragon-tree of Orotava was then, as it is now, the twin wonder of that island, dividing its interest with that of



THE GREAT DRAGON-TREE OF OROTAVA, TENERIFFE.

When the true relations subsisting between vegetables are well considered, we shall find that the mere size of a vegetable has nothing to do with its real nature: thus the sugar-cane, which grows to the elevation of fifteen or sixteen feet, is still to all intents and purposes a grass; as in like manner is the bamboo, which assumes the dimensions of a tree. Then, again, the lily tribe. Does not the very sound of the word lily cause ideas to arise of some delicate herb-like growth, surmounted with drooping flowers? Of this kind are the lilies which grow in our climate; but all lilies are not thus. The great dragon-tree, as it is called, is still a lily; and as though Nature desired to confound our prejudices by one bold master-stroke, these

the stupendous peak. Precise accounts have been handed down to us of its size, from a consideration of which it appears that the monster has increased but very little in dimensions since that time—a probability which is still farther confirmed by

* One of the Canary Islands, a group in the Atlantic Ocean, about sixty miles S.W. from the coast of Morocco, belonging to Spain. They were supposed to have been known to the ancients as the "Fortunate Isles." The earliest discovery, however, of these islands of which we have any authentic account was made by De Bethencourt, a Norman, about 1400, and they were purchased from his descendants and annexed to Spain about eighty years after. The famous Peak of Teneriffe is 12,180 feet above the level of the sea.

observations made on young dragon-trees, the growth of which is remarkably slow. What grand, what stupendous thoughts does a contemplation of this fact awaken? When did this monster first begin to grow? How many thousand years have rolled over its weather-beaten head? We are afraid to speculate on these points, but will content ourselves by saying that, according to the most reasonable evidence which can be adduced, this great dragon-tree began to grow long, very long, before the creation of man. Yet this monster is a lily!

The student will admit that, supposing our previous remarks to be correct, our ordinary notions concerning the similarities or dissimilarities of vegetables—in other words, their alliances, and as a consequence their classification—are very incorrect. Not less incorrect are some of our common ideas regarding the similarities and dissimilarities, or the alliances, of the parts of which vegetables are composed. For example, do we not commonly speak of onions and potatoes as roots? Yet they are not roots, nor are they similar, far less identical, in character. The onion is a bulb, or underground bud, and the potato is a tuber or knotty excrescence developed underground, from which the roots and stems of the potato plant respectively spring. Why are they not roots? the learner may ask. The reason why will appear by-and-by: to explain these reasons is an object, and one of the main objects, of botany. We merely cite the example now for the purpose of making known in a striking manner the incorrectness of many notions we are in the habit of entertaining.

Again, do we not in ordinary language term the strawberry and the fig fruits? Yet neither is a fruit.

"Not a fruit!" the learner exclaims, "do we not eat them?" Well, surely, our reader would not limit the term fruit to something which grows on a vegetable, and which is good to eat. We think he will admit that the bunches of apples, as they are called, which grow on potato stems, are the fruits of the potato plant; yet potato apples are not good to eat. He will admit that the bunches which grow on ash-trees are the fruits of those trees, yet they are not good to eat. Finally, not to multiply examples unnecessarily, he will admit that acorns are the fruits of the oak-tree; and although our ancestors, the ancient Britons, are known to have eaten them, yet all we can say upon that point is, that one pities the bad taste or the hard fortune, as the case may be, of our forefathers.

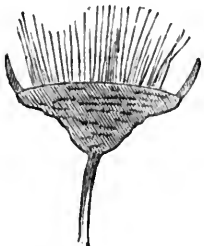
If strawberries, then, and figs are not fruits, what are they? Why, the fig is to all intents and purposes a compound flower, as much as the dandelion is a compound flower; and a strawberry is something like a fig turned inside out; but the learner shall judge for himself.

The strawberry plant bears, as we all know, a very evident, a very pretty flower, the petals or flower-leaves of which dropping off, we ultimately get something which is good to eat, and which we term the strawberry fruit.

Why, then, is it not a fruit? We will see. If it be a fruit, it should contain seeds; but on cutting it open we cannot find any. Here, then, the learner would be puzzled if botany did not come to his aid. General principles have to be appealed to, and the appeal will not be made in vain.

Whilst conjecturing within ourselves the botanical nature of the strawberry, and trying to find out the freak which Nature has been playing in order to lead us astray, we all at once bethink ourselves of the little hard protuberances on the outside of the strawberry. What are they?—of what do they consist?—what is their function?

A learner, if he had not been rendered cautious by previous experience, might all at once arrive at the conclusion that the strawberry is a fruit turned inside out, having consequently its seeds externally; and amazingly like seeds do these little protuberances appear. They are not seeds, nevertheless: they are fruits, the real strawberry fruits; but so little adapted for eating are they that the lover of strawberries wishes them very far away. Then what is the edible portion of the strawberry? Botany answers this question satisfactorily, and makes all clear. It is the juicy *torus* of the plant. The reader



1. TORUS OF THE MARIGOLD.

gains little knowledge from this remark beyond the knowledge of an, at present, unmeaning name; and as we do not intend that any names in this series of papers on the Science of Botany shall be unmeaning, we will at once proceed to explain what a torus is.

Torus, then, is the Latin word for *bed*, and signifies that portion of certain flowers upon which the flower itself reposes or grows. Take, for example, the marigold, and strip off all its floral parts; there will then remain underneath a flat, fleshy expansion, called the torus. In the case of the marigold the torus is flat; but the reader may easily conceive that it might have been round or approaching to rotundity. In the marigold it is leathery and nauseous, but the reader will as easily conceive that it might have been fleshy and delicious, as indeed we find it to be in the strawberry. Analysed thus, we find a similarity between the strawberry and the marigold that the non-botanical reader would have little suspected. Nor is the similarity forced; it is natural, and loses nothing by the fullest investigation which the learner can devote to it. Thus, we dare say, the reader has watched the progress of a marigold to maturity; has noticed the flowers blown away, one by one, and nothing but the stem, the torus, and the little seed-like things embedded upon the torus remain. These little things, like the hard excrescences on the strawberry, look so much like seeds, that they might be taken for such. However, we are never to assume because a thing is small that it is imperfect. If these so-called seeds be dissected and examined, they will be found to be real fruits, as much as the apple or the pear, and so contain seeds internally.

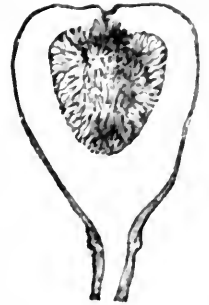
And now for our other example, the fig. What is the fig? Not a fruit certainly, although the freak of Nature here, if we may without disrespect use such a term, is different from those which have come under our notice hitherto. Let us cut open a fig; what then do we see? Why, little things very similar in appearance to flowers, at the base of each of which there is a hard nut-like thing which cracks between the teeth. Flowers indeed they are, and the nut-like things are fruits, the edible portion of the fig being a torus; so that if we assume the strawberry to have had a flat torus instead of a knob-like one, and that the flat torus had been turned outside in, in such a manner as to form a bottle with a very narrow mouth, we should have had a result very much resembling a fig in structure and general appearance.

Even the delicious pine-apple can hardly be termed a fruit. Each pine-apple certainly contains many fruits, one corresponding with each lozenge-like marking; but the main bulk of the pine-apple, that which we find so delicious to eat, is only an assemblage of juicy fruits, as botanists call them, the exact counterpart of those little scales which, when tightly compressed together, form the cup of the acorn.

We are sure, then, that sufficient has been stated to make apparent to the reader the necessity of abandoning many common notions he may have previously entertained in relation to the similarities and dissimilarities of vegetables, and the parts of which they are made up.

LESSONS IN GERMAN.—I.

THE object of the author of these Lessons in German is to unite theory and practice; to introduce, one by one, the easier forms and usages of the language; and to direct the student's attention to the more obvious differences between the German and English languages. The learner will be supplied, throughout the various exercises, with the materials necessary for their due performance. Every section is headed with the statement and illustration of all new principles involved, with an explanation of words and phrases, and a vocabulary alphabetically arranged. To render these lessons complete, there will be given at the end a series of reading lessons, each accompanied by a full vocabulary. The whole is specially intended for those



2. LONGITUDINAL SECTION OF A FIG.

who aim at the acquisition of the German language without a teacher.

SECTION I.

GERMAN ALPHABET.

German.	English Pronunciation.	Examples.
A a	a	ah
B b	b	bey
C c	c	tsay
D d	d	day
E e	e	ey (as in prey)
F f	f	eff
G g	g	gay
H h	h	hah
I i	i	i (as in pique)
J j	j	yote
K k	k	kah
L l	l	ell
M m	m	emm
N n	n	enn
O o	o	oh
P p	p	pay
Q q	q	koo
R r	r	err (as in error)
S s	s	ess
T t	t	tay
U u	u	o (as in do)
V v	v	fov (ow as in now)
W w	w	vay
X x	x	ix
Y y	y	ipsilon
Z z	z	tset

In German every letter, with the exception sometimes of e and h, is pronounced. (See 3. i, 9. ic, and 18. h)

The printed capitals of i and j, in German, are in form alike.

DIPHTHONGS. UMLAUTS (12. Ae, etc.)
ai, au, ei, eu, äu. ä, ö, ü.

COMPOUND CONSONANTS.

ck, sch, ss, st, sz, tz.

SECTION II.

SOUNDS OF THE GERMAN LETTERS.

Sounds of the Vowels.

1. A, a = a, as in *far, father*. Ex., Markt, market; Aal, eel; Bahn, road; Blatt, leaf; Abend, evening.
2. E, e = e, as in *met, ferry*. Ex., leben, to live; Meer, sea; Ehre, honour; besser, better; Messer, knife.
3. I, i = i, as in *pique, pin*. Ex., mit, to me; mit, with; ihm, him; wider, against; bitter, bitter.
4. O, o = o, as in *no, door*. Ex., Ofen, stove; Moos, moss; Kohle, coal; Port, port; Post, post-office.
5. U, u = oo or o, as in *poor, do*. Ex., Blut, blood; Du, thou; Uhr, watch; Hut, hat; gut, good.
6. Y, y = i (mostly in words from the Greek). Ex., Yjev, hyssop; Styx, Styx; Ypern, Ypres.

The sound of a vowel when doubled, is thereby lengthened; as Aal, Meer, Moos; followed by a double consonant, the vowels are usually shortened, as Blatt, Brett, Sinn, Gott, etc. See, however, 18. h.

Dissyllables (see vocabulary), unless otherwise noted, are accented on the first; as leben, Ehre, etc.

Sounds of the Diphthongs.

7. Ai, ai (sometimes aj or ay) = as nearly as in *aye*. Ex., Kaiser, emperor; Baiern, Bavaria; Mai, May.
8. Au, au = ou, as in *our*. Ex., Haus, house; Maus, mouse; laut, loud; Aaust, fist; Braut, bride.
9. Ei, ey = i or ei, as in *fine, eider*. Ex., Stein, stone; dein, thy. (ie = ie, as in *pier*, never as in *pie*. Ex., viel, etc.)
10. Ou, eu = nearly to *oi* or *oy*, as in *boil, boy*. Ex., Beute, booty; Leute, people; heuen, to hay.
11. Aeu, äu = nearly to *eu*. Ex., Aeußerst, extreme; häufen, to hoard; Käufer, buyer; Häuser, cottager.

Sounds of the Umlauts (Umlauts):

Umlaut signifies changed or modified sound. The Umlauts

are produced by a union of e with a, o, u (also au) respectively, and the e is expressed by two dots; thus, ä, ö, ü (and äu). The capitals A, O, U, are not much in use, and the student should never make use of them in writing.

12. Ae, ä, as a in *tap, tack, carry*. Ex., Aerger, vexation; Hähre, ferry.

13. Oe, ö, as u in *return*. Ex., Oel, oil; Pöbel, populace; töten, to kill; Röhre, pipe; Köhler, collier.

14. Ue, ü, has the sound of the French u in *vu, tribu, élu*. Ex., Übung, practice; müde, weary; führen, to guide.

Sounds of the Consonants.

15. B, b; D, d; F, f; K, k; L, l; M, m; N, n; P, p; Q, q; X, x, are sounded as b, d, f, k, l, m, n, p, q, x, in English.

16. C, c, before a consonant, at the end of a syllable, or before a, o, u in the same syllable, sounds like our corresponding letter in like position. Otherwise it sounds like ts. Ex., Ceder, cedar; Cigarre, cigar; Cymbal, cymbal; special, special.

17. G, g, sounds like our g in *gild, foggy*, etc., but never as in *gem, ginger*, etc. When preceded by n in the same syllable, it sounds like our y hard in like position: as in Angst, anxiety; finger, to sing; bringen, to bring; Ringel, ringlet, etc. When g, in the middle or at the end of a syllable, is preceded by any letter except n, its sound approaches that of the Greek χ (pronounced ki), or the still more guttural ch (see 26. ch): Tag, regnen, Magt, sagt, möglich, etc. The learner should avoid confounding the pronunciation of Magt, sagt, etc., with that of Macht, sagt, etc.

18. H, h, in the midst and at the end of a syllable is silent, but serves to lengthen the preceding vowel. Ex., lehren, to teach; ohne, without; Tee, tea.

19. J, j, sounds like y consonant. Ex., Jahr, year; Januar, January; jung, young.

20. R, r, is uttered with a bill or vibration of the tongue, and with greater stress than our r. Ex., Rohr, reed; Rath, council; reif, ripe.

21. S, s, at the beginning of a syllable followed by a vowel, has a sound between that of z and s. Ex., Sohn, son; sieben, seven: otherwise it sounds like s; as in Gas, gas; Strom, stream. Note that at the end of a syllable s is substituted for f; as above, Gas, etc.

22. T, t, sounds like t in *tent*. Ex., Text, text. In the position where in English t sounds like sh, t has the sound of ts. Ex., Station, station; Nation, nation.

23. V, v, sounds like f, as in *five*. Ex., Vater, father; vergessen, to forgive. It is only in words from the Latin and French that v has a sound like that of the German w (see 24. W), as in Venus, Venus; Versailles, Versailles, etc.

24. W, w, has a sound between that of our w and v. Ex., Welt, world; Wasser, water, etc.

25. Z, z, sounds like ts. Ex., Salz, salt; Zahn, tooth; Zunge, tongue; zehn, ten.

Sounds of the Compound Consonants.

26. Ch, ch, in primitive words, when followed by f, s, has the sound of k. Ex., Dachs, badger;achs, ofachs, ox. But if f, s, be added by derivation, combination, or inflection, ch has its guttural sound; as in hoch, nach, Macht, Buch, etc. Ex., Nachschiff (from nach, after, and Schiff, writing); nachsinnen (from nach and sinnen, to think), etc. In words from the Greek and French, ch retains its original sound; as in Charakter, character; Charlatan, charlatan.

27. Sch, sch, sounds like sh. Ex., Schuh, shoe; Schiff, ship; schon, already; Schule, school.

28. ff (though compounded of f and s) sounds like ff, and is used only at the end of a syllable. Ex., Maß, measure; Fluß, river, etc.

29. ts (though compounded of t and s) sounds like z, but, like ff, is only employed at the end of a syllable. Ex., Schuh, Maß, etc. Note that this letter being a double consonant, the preceding vowel is thereby shortened.

To aid in producing the sound of ch, take for experiment the above word hoch: pronounce h o precisely like our word ho; observing to give as full and distinct a breathing of the h at the close as at the beginning; thus h-o-h = hoch. Except when

preceded by a, e, or u, as will be perceived by experiment, a slight hissing sound of *h* or *ch* naturally attaches to the *ch*, as in *recht, reich, ich, Stieche, etc.*

EXERCISE 1.

- a. Altar, altar; Paar, pair; Aht, awl; Balsam, balsam; baden, to bathe; Psalm, psalm.
- e. Herr, host; mehr, more; etel, noble; Ende, end; Letter, letter; Herbst, autumn.
- i. Trinken, to drink; finden, to find; Biber, beaver; hier, here; Kind, child.
- o. Beet, boat; hehl, hollow; oft, often; Hebel, plane; Koffer, collar; Koffer, trunk.
- u. Fuß, foot; gut, good; unten, below; Pudel, poodle; Auckuck, cuckoo; Muth, courage.
- y. Nymphe, nymph; Rhythmus, rhythm; Sylbe, syllable; synonym, synonym; Syrup, syrup.
- ai, ei. Main, Maine; mein, my; Loaf, loaf; Leib, body; Cain, Cain; kein, no.
- au. Bauen, to build; Mauer, wall; grau, grey; Raum, room; rauh, rough.
- au, eu. Räumig, roomy; rufen, to rue; Haut, skins; heute, to-day; Häuptling, chieftain.
- ä, e. Aehre, ear (of corn); Männer, men; leben, to live; Ahrse, orow; nämlich, namely; nehmen, to take.
- ö. Löffel, spoon; Öffnung, opening; öfter, oftener; röthlich, reddish.
- ü. Uebel, evil; fünf, five; Rüssel, proboscis; Krüppel, cripple; Jünger, disciple.

EXERCISE 2.

- G. Classe, class; Creatur, creature; Criminal, criminal; Section, lesson; Calcutta, Calcutta; Contract, contract; Cur, cure; Cement, cement; Citer, cider; Cylindur, cylinder.
- Q. Gabe, gift; gehen, to go; Giraffe, giraffe; geben, to give; Golt, gold; groß, large; Ring, ring; bringen, to bring; grün, green; grau, grey; ruhig, quiet; ewig, eternal; Berg, mountain.
- H. Hase, hare; hart, hard; Hunger, hunger; Horizont, horizon; Mehl, flour; mehr, more.
- J. Jüngling, youth; Jude, Jew; ja, yes; Joseph, Joseph; Juli, July; Jurist, jurist.
- R. Reif, ripe; reich, rich; Rest, rest; rar, rare; Rücksicht, regard; Form, form; Räthsel, enigma.
- S. Sattel, saddle; Segel, sail; Speer, spear; Sproß, sprout; stark, strong; Strumpf, stocking; Süd, south; Reis, rice; Straße, street; wissen, to know.
- T. Tisch, table; Tarif, tariff; Tempel, temple; Truppe, troop; Titel, title; Devastation, devastation.
- V. Vampyr, vampire; Vase, vase; Vers, verse; Violine, violin; Visite, visit; Valuation, valuation.
- W. Wort, word; Wurm, worm; Wunder, wonder; Wille, will; Wagen, wagon; Wanderer, wanderer.
- Z. Zink, zinc; Zahl, number; zahm, tame; Zeit, time; Zentner, hundred-weight; Holz, wood.
- Ch. Flachs, flax; sprechen, to speak; wachsam, watchful; Chor, choir; Chauffee, turnpike-road.
- Sch. Schaft, shaft; Schatten, shadow; Schnee, snow; frisch, fresh; Schild, shield, sign.
- ß, ff. Fleiß, diligence; fließ, fleece; lassen, to let; haßen, to hate; Haß, hatred; häßlich, ugly.
- ß, s. Hitze, heat; log, log; tadeln, to tickle; schwagen, to prattle; schwitzen, to perspire; kurz, short; schwarz, black.

R ä t h e l.

Hier Jahre kleist er aus,	Erst weiß wie Schnee,
Dann kommt er nach Haus,	Dann grün wie Klee,
Und zeigt sich wieder,	Dann roth wie Blut,
Im Kreise seiner Brüder.	Dann schneet es gut.

LESSONS IN MUSIC.—I.

We have a friend, who was long persuaded by his relatives, who were all "musical," that he had "no voice." Any innocent attempt of his to unite in the vocal pleasures of the family circle was instantly checked by some compassionate expression or imploring look. He humbly acquiesced in this judgment of his friends, but found it often difficult to resist the sympathy of song, and sometimes startled the singers by adding his

honest voice to the closing strain. In public worship, too, no frowns or dissuasives could hinder him from "doing his best" to join in the praises of God. He often wondered how it was that he came to be born with "no voice," especially when he observed that the infants of the present day are so much more highly endowed, every-one of them who attends an infant-school apparently taking for granted that he "has a voice," and using it accordingly. As a religious man, also, he could not help noticing that one whole book of the Scriptures was written for the promotion of public vocal praise, and that it abounded in such expressions as this: "Let the people praise thee, O God; let ALL the people praise thee." The example of Christ and the precepts of his apostles seemed also to set forth the same duty. "It cannot be," he sometimes reflected, "that the Father of all should command us to 'sing,' in addition to 'making melody with our hearts,' and yet give to so many of his children no voice!" Such thoughts as these led him to the conclusion that it is "no practice" and "no cultivation," rather than "no voice" and "no ear," with which the majority of men are afflicted. In consequence of this, to the no small amusement of his musical acquaintance, our friend was soon found to have become an attentive and painstaking member of a singing class. He was soon deep in "thirds" and "fifths" and "sevenths," toiling at a series of the most unmusical exercises that could well be invented. But hope sweetens toil, and the expectation of conquering at last gave to our friend courage and long patience. When sixty laborious lessons, relieved by an occasional song, were over, he made the discovery that he had learnt "a system," that he had gained also some confidence and much command of the organs of voice. But what did he know of music? Could he take the plainest psalm tune (not in the key of C), unseen before, and sing it? Alas! no. His labour had not been lost, but it had produced small fruit. He could follow the "leader" more promptly and easily, but he could not go without him. There was still an indecision and uncertainty about his endeavours. He could seldom be sure whether he was right or not by half a tone. And many a choice song, and not a few tune-books, which he had purchased in his hopeful days, lay on his table unenjoyed because of this musical uncertainty in which he was left. Once more, however, our friend has "taken heart," and has promised to follow the course of effort which we shall prescribe; we, on our part, undertaking that he shall in that case be enabled to sing at first sight by himself, and to make good use of the books on his table. We shall begin at the beginning, however, for your sake, gentle reader, if you will join him in his efforts. We have no "royal road" to music. No worthy attainment is won without labour. But we have a straight and clear road, and that is a great advantage when the common road is very circuitous, and abounding with needless hindrances. We have only two things to ask of you: the first, that you will be content to learn one thing at a time, instead of being impatient for knowledge not at the moment helpful—perhaps, just then, only confusing to you; the second, that when something is set before you to be done, you will really do it, instead of supposing it to be done, and going on; for only "by doing we truly understand."

FIRST PRINCIPLES OF MUSIC.

You must allow us to lay before you certain fundamental principles of music itself—of music considered apart from any method of teaching or of writing it—principles which would be true of music if Guido had never invented the "staff," and if "crotchet" and "quaver," "flat" and "sharp," had never been heard of.

You know what is the difference between "high" and "low" in music. The "squeak" is high, the "growl" is low. Recognise this difference to yourself now by singing first a high and then a low note. Between the highest and the lowest sounds which the human ear can appreciate, an indefinite number of other sounds may be produced. But how, out of this vast chaos of possible sounds, are the distinct and choice notes of a TUNE to start into life and power? The question is thus answered. Before a TUNE can be created, a certain sound, whether high or low in pitch, must be chosen and fixed as the KEY-NOTE (sometimes called the governing note, and in books of science the tonic) of the coming tune. Immediately, according to those laws of nature by which God has tuned our ears and souls, six other notes spring forth, at measured distances from the key-note,

claiming the sole right of attendance upon it. Let this be clearly understood. Any sound may be taken for the KEY-NOTE; and that being fixed, the places of the six other notes are known.

The common human ear throughout the world is pleased when these sounds attend that key-note, and is displeased when other sounds, not holding the same relation to the key-note, and not standing at precisely the same relative pitch, are used in their stead; for even an uncultivated ear would promptly mark the difference between the accurate singer and the inaccurate, between the singer in tune and the singer out of tune.

This distinct arrangement of six sounds around a key-note is called the musical "scale." It may be high in pitch in one tune, and low in another, but the relative position of its notes remains unchanged. These notes may be reproduced in replicates or "octaves" of higher or lower pitch, but they still retain the same relation. Transition or "modulation" (which will be afterwards explained) may change the key-note in the course of a tune, but the new key-note governs its dependents exactly as the old one did. Every apparent exception only proves the rule. *This one scale is the foundation of all music.* Some speak of this scale as though it were of human invention; but if so, how is it that every newly-discovered nation is found either using it (if they are musical at all), or possessed of ears which readily approve it? How is it that the Chinese or Indians have not "invented" some other scale? The truth is, some of these nations do omit a note or two, but they do not alter the rest; and when the question is fairly examined, it is found the omissions were caused by their rude and incomplete instruments, rather than by defective ears. Again, let me ask, going back to the time of the ancient Greeks, of whose musical notation there is not a remnant from which we could have copied, how is it that we learn, from their philosophical treatises, that the scale which the people used was the same as ours? Could not that refined people have "invented" something better? Are we not right, then, in calling it *the scale of all nations and of all times*, the scale to which the ear and soul of man are tuned by the all-wise Creator?

When we examine its structure more closely, we find other proofs that it comes from the hand of God. Like many of his works—the rainbow, for instance—it seems to the careless observer irregular, but discloses a beautiful harmony and purpose to him who is more thoughtful. The *distances in pitch* (that is, highness or lowness of sound), or, in other words, the *intervals* between the notes of this scale, are very delicately arranged. In another lesson we shall be able to describe its structure more minutely; but let it suffice for the present to say, that the simplest measurement of the scale in plain figures is that which divides it into fifty-three degrees.

Such a division is only inaccurate to the extent of being about one third of a degree too large. If you will make use of the sol-fa syllables to represent the notes of this scale, DOH standing for THE KEY-NOTE OF A TUNE, at whatever pitch it is taken, then the number of such degrees between each couple of notes may be set forth by the figures at the side. Why the scale of music found most acceptable to human ears should be thus curiously and delicately formed, and why it does not exhibit a greater apparent uniformity, we cannot tell. It is an "ultimate fact" of philosophy, like the structure of the rainbow. We must take it as it is, and reverently study the laws of its structure. Sir Isaac Newton's division of the spectrum into seven colours bore some analogy to these seven notes; and in a large work written by Mr. Hay, of Edinburgh, a clear relationship has been established between the principles of beauty in the human form, and certain angles founded on the proportions of the musical scale.

Doubtless there are in the various departments of Nature certain uniting principles, certain secret affinities of things, which shall prove them all to have sprung from one creating Hand.

It may, however, be noticed here, that every note of the scale sounds pleasantly, when heard at the same time with the key-note, excepting only RAY and TE; and of these, the most difficult notes of the scale, more will be said when our lessons are further advanced.

For the present, we wish your attention confined to the three notes, DOH, ME, and SOH, the first, the third, and the fifth. They are the *strong notes* of the scale, on which, as you will afterwards learn, the others lean. We may call them "the framework of the building." When sounded together they are commonly called the "chord of the tonic," tonic being the scientific name for key-note. Chiefly by these notes your voice must be tuned. Take, then, some low sound of your voice for the key-note, or DOH, and try to sing the following exercises, pointing to the notes on the scale given above, as you sing. This pointing on the scale is more important than you would at first imagine. In no other way can you obtain so clear a notion of the relative position of notes. If previously uninstructed, you must ask some musical friend to sing these notes to you, or play them on an instrument for a pattern. Do not, on any account, however, sing with him or let him sing with you. Remember that you are learning to sing alone. Your friend will know what notes to play when you tell him D, F sharp, A, and upper D¹; or, if he prefers it, C, E, G, and upper C¹. You will notice that when a note is repeated in a higher pitch, we put this mark (!) above it; thus, DOH¹. You need not trouble yourself with the "staff" of five lines at present, except to notice that DOH is printed as a square note.

EXERCISE 1.

DOH ME SOH DOH¹

DOH¹ SOH ME DOH

Note.—Sing these notes first slowly, then quickly, and again with a sound "long drawn out." Do not be disappointed if your friend pronounces you inaccurate in the first and second notes, though they are the easiest. Let him patiently set the "pattern" of those two notes again, and, if need be, many times again. Master one note at a time. Some pupils require several lessons, with much patient "patterning" of the teacher, and much careful listening, followed by vocal effort of the learner, before this exercise is perfectly done.

EXERCISE 2.

DOH ME SOH ME SOH ME DOH¹

DOH¹ SOH ME SOH ME DOH

Note.—You observe the upright bars. Sing the note immediately after them with a stronger accent or force of voice than the others. You notice that two of the notes on the "staff" of five lines are open, and that the names beneath are followed by a stroke of "continuance." Sing those notes twice as long as the rest.

EXERCISE 3.

DOH DOH ME ME SOH SOH ME

DOH¹ DOH¹ ME ME SOH SOH DOH —

EXERCISE 4.

Sing all these exercises again, while some one else repeats the note DOH for every note you sing. This we call "tolling the bell."

DOH	5
TE	
9	
LAH	8
8	
SOH	9
9	
FAH	5
5	
ME	8
8	
RAY	9
9	
DOH	

LESSONS IN GEOMETRY.—I.

The term *Geometry*, which comes from two Greek words, $\gamma\eta$, the earth, and $\mu\epsilon\tau\rho\epsilon\upsilon$, to measure (pronounced *ghee*, and *met-rine*), literally signifies *land-measuring*, and was originally applied to the practical purpose which its name signifies, in the land of Egypt, the cradle of the arts and sciences. Herodotus, the oldest historian, with the exception of Moses, whose works have reached us, gives the following account of its origin:—"I was informed by the priests at Thebes, that King Sesostris made a distribution of the territory of Egypt among all his subjects, assigning to each an equal portion of land, in the form of a quadrangle, and that from these allotments he used to derive his revenue, by exacting every year a certain tax. In cases, however, where a part of the land was washed away by the annual inundations of the Nile, the proprietor was permitted to present himself before the king, and signify what had happened. The king then used to send proper officers to examine and ascertain, by admeasurement, how much of the land had been washed away, in order that the amount of the tax to be paid for the future might be proportional to the land which remained. From this circumstance I am of opinion that geometry derived its origin; and from hence it was transmitted into Greece." The existence of the pyramids, the ruins of the temples, and the other architectural remains of ancient Egypt, supply evidence that its inhabitants possessed some knowledge of geometry, even in the higher sense in which we now use the term; although it is possible that the geometrical properties of figures necessary for the construction of such works might have been known only in the form of *practical rules*, without any scientific arrangement of geometrical truths, such as are presented to us in the Elements of Euclid.

The word "geometry," used in its highest and most extensive meaning, signifies the *science of space*; or that science which investigates and treats of the properties of, and relations existing among, definite portions of space, under the abstract division of lines, angles, surfaces, and volumes, without any regard to the physical properties of the bodies to which they belong. In this sense, it appears to be very doubtful whether the Egyptians or Chaldeans knew anything of the science. It is to the Greeks, therefore, that we must look for the real origin of geometry, as an abstract science. Thales, the Greek philosopher, born 640 B.C., is reported, by ancient historians, to have astonished even the Egyptians by his knowledge of this science. The founder of scientific geometry in Greece, however, appears to have been Pythagoras, who was born about 568 B.C. He discovered the celebrated 47th proposition of the first book of Euclid's Elements, and various other valuable and important theorems. He was great also in astronomy, having anticipated the Copernican system of the universe. Plato, another great geometrician, and founder of the academy at Athens, who was born 429 B.C., was the first who made some advances into what is called the higher geometry. The next name super-eminent in the science of geometry is that of Euclid, whose "Elements" has been the *principal text-book* for learners during a period of more than 2,000 years. He flourished at Alexandria, in Egypt, about 300 B.C., during the reign of Ptolemy Lagus, who was one of his pupils, and to whom he made the celebrated reply, when asked if there was a shorter way to geometry than by studying his Elements:—"No, sire, there is no *royal road* to geometry."

The prince of ancient mathematicians, however, was the celebrated Archimedes, born at Syracuse B.C. 287, about the period of the death of Euclid. His discoveries in geometry, mechanics, and hydrostatics form a remarkable era in the history of the mathematical sciences; and even the remains of his works which are still extant constitute the most valuable part of the ancient Greek geometry. He was the first who attempted to solve the celebrated problem of the *rectification of the circle*—that is, finding a *straight line exactly equal* to the circumference. He found out the beautiful ratios of the cylinder to its inscribed sphere and cone, and the quadrature of one of the conic sections. His discoveries in physics, or natural philosophy, are simple, true, and beautiful. The story of the determination of the specific gravity of the golden crown of his cousin, Hiero, King of Syracuse, is well known; and the very natural shout of "Εύρηκα, εύρηκα" (pronounced *heu-ree-ka*), *I have found it, I have found it!* on coming out of the bath, has

become a "household word." Scarcely less celebrated was the famous Apollonius of Perga, in Pamphylia, who flourished from B.C. 247 to 222, at Alexandria, in the reign of Ptolemy Evergetes, another king of the same Ptolemaic dynasty, and who was called by his contemporaries the "Great Geometer." He wrote several books, full of discoveries, on the higher geometry, and greatly extended the domains of the plane geometry. Other geometricians of eminence arose in the school of Alexandria, and bequeathed the precious remains of their genius to happier times. Claudius Ptolemaeus, the author of the great work on astronomy called *Megale Syntaxis*, the *Great Construction*, or *Almagest*; Pappus, the author of the *Mathematical Collections*; and others, including Theon and his daughter Hypatia, bring us down to the period when the second Alexandrian library* was burnt by command of the Mohammedan barbarian, the Saracen Caliph Omar, in 640, and the labour and learning of ages were irrevocably destroyed. The dark ages supervened, and little was done in the advancement of science until the glorious invention of printing, and the general revival of literature about the middle of the fifteenth century.

The ancient Greek geometry was speedily made known to the moderns through the medium of translations of, and commentaries upon, the writings of the great masters. The Elements of Euclid, indeed, were reckoned so perfect, that no attempt was made to supersede them; and the only object of writers on geometry in general was to explain his works, and to make what additions they could to the science, in the same masterly style of composition. A host of names of eminent authors might be mentioned, who succeeded in establishing the *Greek geometry*, and in extending its domains. The principal of these, however, was Dr. Robert Simson, Professor of Mathematics in the University of Glasgow, who flourished in the middle of the last century. His grand endeavour was to present to modern Europe the Elements of Euclid as they originally appeared in ancient Greece. In this he succeeded to admiration, and his edition of this great work maintains its reputation to the present moment.

In giving our first lessons on geometry, we think it advisable to follow what seems to have been the natural course of events in the history of this science. The present advanced state of our geometrical knowledge was preceded in early times by a species of practical geometry gathered from experience, and suited to the wants of those who required its application, before any attempt was made to enter very deeply into the study of the theory. The latter was left to the schools of the philosophers and the academy of Plato. Accordingly, we shall precede our disquisitions on the Elements of Euclid and other geometers, both ancient and modern, by a short system of practical rules and easy explanations in this important science; and we shall endeavour to make the subject both simple and clear by plain definitions, suitable diagrams, and palpable demonstrations, after the manner of the French writers on this subject, who have even in their more elaborate treatises to a great extent abandoned the system of Euclid.

DEFINITIONS.

1. *Extension*, or the space which any body in nature occupies, has three dimensions, viz., length, breadth, and thickness. This is Euclid's definition of a *geometrical solid*.
2. A *point* is the beginning of extension, but no part of it; hence it is said to have position in space, but no magnitude.
3. A *line* is extension in one direction only; hence, it is said to have length without breadth. Hence, also, the extremities of a line are points; and lines intersect or cross each other only in points.
4. A *straight line* is said, by Euclid, to be that which lies evenly between its extreme points; and, by Archimedes, to be the *shortest distance* between any two points. Both of these definitions are defective; the defect is supplied thus: A straight line is such, that if any two points be taken in it, the part which they intercept (or which lies between them) is the shortest line that can be drawn between those points.
5. A *crooked line* is one composed of straight lines joined at

*The first library, which was founded by Ptolemy Soter, and which was said to have contained 400,000 manuscripts, was accidentally burnt 47 B.C., when Alexandria was taken by Julius Cæsar. The second library is supposed to have contained 700,000 volumes.

their extremities in any manner whatever, except that of uniform direction. A *curved line*, or *curve*, is a line whose direction varies at every point.

Straight lines, or curved lines, are generally denoted, in speaking and writing, by two letters placed commonly at their extremities; but they may be placed anywhere on the lines at a distance from each other. Thus, in Fig. 1, the letters A B denote one straight line, the letters C D another, and the letters E F a third; and these straight lines are respectively called the straight lines A B, C D, and E F. A straight line, as A B, may be divided into any number of equal parts, to serve as a standard for measuring other straight lines.

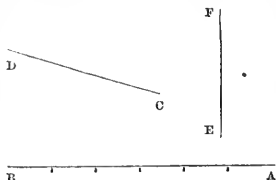


Fig. 1.

A combination of straight, crooked, and curved lines is represented in Fig. 2; A B, B C, C D, and D A, are each straight lines; the combination A D C B, beginning at A, and terminating at B, is a crooked line; and the line A M B, beginning at A, and ending at B, is a curved line.

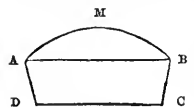


Fig. 2.

6. A *surface*, or, as it is sometimes called, a *superficies*, is extension in two directions; hence it is said to have only length and breadth. Hence, also, the extremities or boundaries of a surface are lines; and surfaces intersect or cross each other in lines.

7. A *plane surface*, or *plane*, is a surface in which any two points being taken, the *straight line* between them lies wholly in that surface; or, it is that surface with which a *straight line* wholly coincides, when applied to it in every direction. Any other surface, not composed of plane surfaces, is called a *curved surface*.

8. *Parallel straight lines* are such as lie in the same plane, and which, though produced ever so far both ways, do not meet (Fig. 3).

Fig. 3.

READING AND ELOCUTION.—I.

PUNCTUATION.

PUNCTUATION is peculiar to the modern languages of Europe. It was wholly unknown to the Greeks and Romans; and the languages of the East, although they have certain marks or signs to indicate tones, have no regular system of punctuation. The Romans and the Greeks also, it is true, had certain points, which, like those of the languages of the East, were confined to the delivery and pronunciation of words; but the pauses were indicated by breaking up the written matter into lines or paragraphs, not by marks resembling those in the modern system of punctuation. Hence, in the responses of the ancient oracles, which were generally written down by the priests and delivered to the inquirers, the ambiguity—doubtless intentional—which the want of punctuation caused, saved the credit of the oracle, whether the expected event was favourable or unfavourable. As an instance of this kind, may be cited that remarkable response which was given on a well-known occasion, when the oracle was consulted with regard to the success of a certain military expedition: "Ibis et redibis nunquam peribis in bello." Written, as it was, without being pointed, it might be translated either, "Thou shalt go, and shalt never return, thou shalt perish in battle;" or, "Thou shalt go and shalt return, thou shalt never perish in battle." The correct translation depends on the placing of a comma after the word *nunquam*, or after *redibis*.

The invention of the modern system of punctuation has been attributed to the Alexandrian grammarian Aristophanes, after whom it was improved by succeeding grammarians; but it was so entirely lost in the time of Charlemagne, that he found it necessary to have it restored by Warnefried and Alcuin. It consisted at first of only one point, used in three ways, and sometimes of a stroke, formed in several ways. But as no particular rules were followed in the use of these signs, punctuation was exceedingly uncertain, until the end of the fifteenth century, when the learned Venetian printers, the Manutii, increased the number of the signs, and established some fixed rules for their

application. These were so generally adopted, that we may consider the Manutii as the inventors of the present method of punctuation; and although modern grammarians have introduced some improvements, nothing but a few particular rules have been added since their time.

The design of the system referred to was purely grammatical, and had no further reference to enunciation, than to remove ambiguity in the meaning and to give precision to the sentence. This, therefore, is the object of punctuation, and although the marks employed in written language may sometimes denote the different pauses and tones of voice which the sense and accurate pronunciation require, yet they are more generally designed to mark the grammatical divisions of a sentence, and to show the dependence and relation of words and members which are separated by the intervening clauses. The teacher, therefore, who directs his pupils to "*mind their pauses in reading*," gives but an unintelligible direction to those who are unversed in the rules of analysis. A better direction would be to disregard the pauses, and endeavour to read the sentence with just such pauses and tones as they would employ if the sentence were their own, and they were uttering it in common conversation. Indeed, it is often the case that correct and tasteful reading requires pauses, and these too of a considerable length, to be made, where such pauses are indicated in written language* by no mark whatever. It is not unfrequently the case that the sense will allow no pause whatever to be made in cases where, if the marks alone were observed, it would seem that a pause of considerable length is required. The pupil, therefore, who has been told to *mind his pauses*, must first be taught to *unlearn* this direction, and endeavour to *understand* the sentence which he is to read, before he attempts to enunciate it.

The characters employed in written language are the following:—

The Comma,	,	The Hyphen,	-
The Semicolon,	;	The Breve,	˘
The Colon,	:	The Apostrophe,	' [ˈtis]
The Period,	.	The Brace,	{ }
The Dash,	-	The Acute Accent,	´
The Exclamation,	!	The Grave Accent,	`
The Interrogation,	?	The Circumflex Accent,	˘ or ˆ
The Quotation Marks	" "	The Caret,	^
The Dæresis,	¨	The Cedilla,	¸
The Crotchets,	()	The Asterisk,	*
The Brackets,	[]	The Section,	§
The Obelisk or Dagger,	†	The Paragraph,	¶
The Double Obelisk or Double Dagger,	‡	The Parallels,	

The Ellipsis, sometimes expressed by Periods, thus,
 " sometimes by Hyphens, thus, - - - - -
 " sometimes by Asterisks or Stars, thus, * * * * *
 " sometimes by a Dash prolonged, thus, —————

These characters, when judiciously employed, fix the meaning and give precision to the signification of sentences, which, in a written form, would be ambiguous or indefinite without them. Thus, "I said that he is dishonest it is true and I am sorry for it." Now the meaning of this sentence can be ascertained only by a correct punctuation. If it be punctuated as follows: "I said that he is dishonest; it is true, and I am sorry for it;" the meaning will be, that it is true that I said he is dishonest, and I am sorry that I said so. But if it be punctuated thus, "I said that he is dishonest; it is true; and I am sorry for it;" the meaning will be, "I said that he is dishonest; it is true that he is dishonest, and I am sorry that he is so."

A further instance of the importance of correct punctuation was afforded by a late advertisement, in which the commissioner for lighting one of the largest commercial cities of Europe, by the misplacing of a comma in his advertisement, would have contracted for the supply of but half the required light. The advertisement represented the lamps as "4,050 in number, having two spouts each, composed of not less than twenty threads of cotton." This expression implied that the lamps had each two spouts, and that the two spouts had twenty threads—that is, each spout had ten threads. But the meaning that the commissioner intended to convey was, that each spout had twenty threads; and his advertisement should have had the comma after "spouts," instead of after "each," thus: The lamps have two spouts, each composed of twenty threads, etc.

* The term "written language" of course includes printed language.

These instances might suffice to illustrate the nature and the propriety of correct punctuation; but the following instance, known to many, will show the importance of the subject. The clerk of a congregation in Scotland had a paper handed to him, as the custom is, to read just before the minister stood up to pray with and for the congregation, containing the following words, unpointed: "A man going to sea his wife desires the prayers of the congregation." The clerk read it as if a comma had been put at the end of the word *wife*, and unfortunately excited, in no small degree, the risible faculties of the people assembled:—thus, "A man going to sea (*see*) his wife, desires the prayers of the congregation."

But although the meaning of a sentence is thus materially affected by the punctuation, it will be seen in the following lessons that the punctuation alone is an unsafe guide to follow in the enunciation of any collection of words. For, in many cases, those marks indicate no pause, emphasis, or other circumstance requiring notice in the enunciation of the sentence.

The nature of the marks used in written language may also be understood by a reference to the origin of their names.

The word *Comma* is derived from the Greek language, and properly designates a section, or part *struck off* from a complete sentence. In its usual acceptation, it signifies the point which marks the smaller portions of a period. It therefore represents the shortest pause, and consequently marks the least constructive, or most-dependent parts of a sentence.

The word *Colon* is from the Greek, and signifies a *member* of a sentence, and the Latin prefix *semi* means *half*. Hence, a *Semicolon* is used for the purpose of pointing out those parts of a compound sentence which, although they each constitute a distinct proposition, have yet a dependence upon each other, or on some common clause. The *Colon* is used to divide a sentence into two or more parts, which, although the sense be complete in each, are not independent. The *Colon* is also used in chanting, to indicate the division of a verse.

The word *Period* is derived from the Greek, and means a *circuit* or well-rounded sentence. Hence, when the circuit of the sense is completed, with all its relations, the mark bearing this name is used to denote this completion.

The *Dash* is only once used in the Bible, where it is employed as an ellipsis (Exod. xxxii. 32).

The word *Interrogation* is derived from the Latin, and means a *question*. Hence this mark is put at the end of a question.

The word *Exclamation* is from the same language, and means a *passionate utterance*. Hence the mark so called is put at the end of such utterances.

The word *Parenthesis*, derived from the Greek language, means an *insertion*. A sentence, clause, or phrase, inserted between the parts of another sentence for the purpose of explanation, or of calling particular attention, is properly called a parenthesis.

It is to be remarked, however, that the name parenthesis belongs only to the *sentence inserted between brackets or crotchets*, and not to those marks themselves.

The word *Hyphen* is derived from the Greek language, and signifies *under one*, that is, *together*; and is used to imply that the letters or syllables between which it is placed are to be taken *together* as one word.

The hyphen, when placed over a vowel, to indicate the long sound of the vowel, is called the *Macron*, from the Greek, signifying *long*.

The mark called a *Breve*, indicating the short sound of the vowel, is from the Latin, signifying *short*.

The word *Ellipsis*, also from the Greek, means an *omission*, and properly refers to the words, members, or sentences which are omitted, and not to the marks which indicate the mission.

The word *Apostrophe*, also from the Greek, signifies the *turning away*, or the omission of one letter or more. The word apostrophe, as here used, must not be confounded with the same word as the name of a rhetorical figure.

The word *Diaeresis* is also from the Greek, and signifies the *taking apart*, or the separation of the vowels, which would otherwise be pronounced as one syllable.

The term *Accent* is derived from the Latin language, and implies the *tone of the voice* with which a word or syllable is to be pronounced.

The word *Section*, derived also from the Latin, signifies a *cutting*, or a *division*. The character which denotes a section seems to be composed of *ss*, and to be an abbreviation of the

words *signum sectionis*, or the sign of a section. This character, which was formerly used as the sign of the division of a discourse, is now rarely used, except as a reference to a note at the bottom of the page.

The word *Paragraph* is derived from the Greek language, and signifies a *writing in the margin*. This mark, which, like the section, was formerly used to designate those divisions of a section which are now indicated by unfinished lines or blank spaces, is employed in the English version of the Old and New Testaments to mark the commencement of a fresh subject.

It may further be remarked, that notes at the bottom of the page, in the margin, or at the end of a book, are often indicated by figures or by letters, instead of the marks which have already been enumerated.

The word *Caret* is from the Latin, and signifies *it is wanting*. This mark is used only in manuscripts.

The *Cedilla* is a mark placed under the letters *c* and *g* to indicate the soft sound of those letters.

The *Asterisk*, *Obelisk*, *Double Obelisk*, and *Parallels*, with the section and paragraph, are merely arbitrary marks to call attention to the notes at the bottom of the page.

As these marks which have now been enumerated all have a meaning, and are employed for some special purpose, it is recommended to the student never to pass by them without being assured that he understands what that purpose is. Correct and tasteful reading can never be attained without a full appreciation of the meaning which the author intended to convey; and that meaning is often to be ascertained by the arbitrary marks employed by him for the purpose of giving definiteness to an expression. At the same time, the student should consider these marks as his guide to the *meaning* only, not to the enunciation of a sentence. Correct delivery must be left to the guidance of taste and judgment otherwise acquired.

In many excellent selections for lessons in reading, the pieces have been arranged in regular order, according to the nature of their respective subjects, under the heads of Narrative, Descriptive, Didactic, Argumentative, and Pathetic pieces, Public Speeches, Promiscuous pieces, the Eloquence of the Bar, of the Pulpit, and of the Forum.

By Narrative pieces are meant those pieces only which contain a simple narration or story. Descriptive pieces are those in which something is described, chiefly from nature. Didactic pieces are those designed to convey some particular kind of instruction, whether moral, religious, or scientific. Argumentative pieces are those in which some truth is designed to be proved in an agreeable manner. Pathetic pieces are those by which the feelings of pity, love, admiration, and other passions, are excited. Promiscuous pieces are those which do not fall exclusively under any of the classes which have been enumerated, or which consist of a mixture of those classes. The Eloquence of the Bar consists of speeches (or *pleas* as they are technically called) made by distinguished lawyers in the courts of justice *in favour of* or *against* a supposed criminal. The Eloquence of the Pulpit consists of sermons or discourses delivered on religious occasions. The Eloquence of the Forum consists in the speeches, addresses, orations, etc., addressed to political or promiscuous assemblies.

To many, this information may seem superfluous or puerile. But as these lessons are designed for the young and the unlearned, it must not be forgotten that their sources of information are few, and that they will not always take the pains to inform themselves of the meaning of words, even when they are familiar to their eyes in capital letters, and in the running titles of the books before them every day. It is often the case that the teacher also, taking for granted that his pupils are familiar with the meaning of words so often presented to their eyes, neglects to question them on the subject; and in riper years it becomes a matter of surprise to the pupil himself that, in early life, words which he had heard sounded almost every day at school presented no idea to his mind beyond that of an unmeaning or rather an unintelligible sound.

The object of all education is not so much to fill the mind with knowledge as to strengthen its powers and enlarge its capacity. Those exercises, therefore, are always most beneficial in education which tend most effectually to produce this result. There is, perhaps, no branch of study connected with popular education which, when properly pursued, is more highly subservient to this end than the study of correct and tasteful reading,

as an art. It necessarily involves a complete knowledge of the subject to be read, the relation and dependencies of the phrases, clauses, and members of the sentences, the proper meaning of the words employed, and the connection between the sentences themselves. This cannot be acquired without a vigorous employment of the perceptive powers, aided by those of comparison, of analysis, of reasoning, of judgment, of taste, and of discrimination. Subordinate and auxiliary to the acquisition of this important art, the student is recommended to exercise also the

power of classification, while studying a reading lesson (which *should always be studied* previous to practising it), to ascertain under which of the above-mentioned classes—whether narrative, descriptive, didactic, etc.—the piece he is about to read belongs. The student who thus employs his faculties cannot fail to feel a vigorous growth of intellect springing up in his own mind, and will be amply compensated for his labour by a command over the stores of literature not to be gained by any other method.



THE INFLUENCE OF MORALITY AND IMMORALITY ON THE COUNTENANCE.

- | | | | | |
|---------------------------------------|----------------|--------------------------|---------------------|------------------|
| 1. THE CHILD:
What will he become? | 2. School. | 3. Literary Institution. | 4. Success. | 5. Honoured Age. |
| | 6. The Street. | 7. Drunkenness. | 8. Vice and Misery. | 9. Beggary. |

WHAT WILL BECOME OF HIM?

THE above engraving is intended to illustrate the effects which different modes of life have upon the human countenance. We have only to look around us to discover how true this picture is to that which it is intended to represent. Much has been said of the science of phrenology; but without depreciating the facts on which it is professedly based, we confess that we have a more profound faith in the doctrine of physiognomy. No one can deny that the "human face divine" has in it something expressive of that which enters into and constitutes the character of the man. It may come out in the eye, or the lip, or the nose, or the general contour of the countenance; but there it is, and no one can give himself to the closer and deeper study of this subject without being able, more or less correctly, to read the mysterious symbols of human character and destiny.

Carefully examine the above engraving. Look at the head and face of the child represented in the first figure. Who can divine what that young intelligence will become in the future of his life? Is there anything in his features to indicate that he will act a conspicuous part on the great wide stage of this world? Or is he to sink in the scale of intelligent being, till he takes on the mere animal nature, or, what is still worse, till he becomes the very personification of vice and sin? Even in the outlines of the infant countenance there may be the index of the future man. These outlines will become more marked and definite in the boy amid the studies and pursuits of the school. The period of boyhood is one of wondrous development; and if this were but carefully watched, the foundation might in many cases be laid for the erection of a true manly nobility—and that undermined, on which moral evil would otherwise rear her

temple of darkness and impurity. Look at the eye, nose, and mouth of the boy as he is at school, or as he is located in one of the worst parts of London, and who does not perceive, from the very contour of the countenance, that his destiny will very much depend on the influences by which he may be surrounded? In the one case, you see him pass into the higher and more polite circles of the educated classes, yielding himself to all the softening, subduing, refining elements of pure female society; and in the other, you see him entirely lost to all sense of decency and self-respect, rushing headlong into the scenes of dissipation, and surrendering himself to all the worst agencies of a wicked world. In the one instance you see him choosing his profession, and contemplating a settlement in life—wedding himself to a virtuous, loving, and devoted woman, and in course of time becoming surrounded by a loving and growing family, over which his presence sheds a warm and sunny cheerfulness; in the other instance you see the man emerging from the scenes of brutal intoxication to plunge into deeper, darker vices, till his conscience is burdened with guilt and misery, and life becomes a burden, from which he perhaps seeks relief in suicide; or it may be that his conduct renders him obnoxious to law, and he comes to a premature death. If he be spared this tremendous fate, he comes to beggary, and goes down to the grave unlamented and unwept. How different this from the career of the man whose happiest days are spent in the bosom of his loving family, and who grows old amid the most genial influences, honoured, revered, beloved; who sees his children's children unto the third or fourth generation, and goes down to his last resting-place amid the prayers and tears of those he loved, and whose dying moments are cheered by the hope of a happy reunion in a world where life is perfect and joy complete.

ANIMAL PHYSIOLOGY.—I.

THE EYE.

THE eye is the instrument by which the mind becomes acquainted with external and distant objects by means of the light, which is one of the most subtle and delicate forces in nature, and needs a correspondingly delicate and complicated organ to appreciate its effects.

Without inquiring into the nature of light, it is sufficient for our subject that we know some of its constant qualities, or laws, as they have been called.

In its simplest condition light travels in straight lines in all directions, from its source; hence, when we see a luminous body, we know the direction in which it lies, because it must lie in the line of the ray which reaches us.

When a ray of light thus travelling in a straight line strikes upon the surface of any object, it is affected in some of the following ways according to the nature of the object and of its surface:—

1st. It may be destroyed, as far as visual effects are concerned, partially or wholly.

2nd. It may penetrate the substance of the body, being more or less bent as it traverses the surface. This occurs when the body is transparent.

3rd. It may glance off and pursue a different direction outside the object upon which it strikes.

The first effect is called absorption; the second, refraction; and the third, reflection.

Reflected light concerns us most. The eye occupies itself with reflected rays. If light were incapable of being reflected, the sun would appear as a sharply-defined dazzling orb in a pitch-dark universe, and eyes would be of no use; for though poets tell us so, not even the eagle spends its time in so profitless and injurious an employment as gazing on the sun.

Now, as reflected light travels in straight lines from the object upon which it is reflected, it is to the eye, in all respects, the same as though that object were itself luminous. As light

proceeds from all parts of an object, and travels in straight lines, we have only to let the rays fall upon some surface which shall receive them without derangement, to get an image which will give the colour, form, and, by a little inferential reasoning, the size and distance of the object.

The first requisite in an eye, then, is a sentient mirror, which shall receive the images of objects and feel them.

This mirror must be of moderate and portable size, and well under control, so that it can be turned about.

All mirrors are perishable and delicate articles, liable to fracture; but when we conceive of a mirror whose surface and backing, and even its very frame, must be made not of hard glass, imperishable quicksilver, and durable wood, but of soft renewable tissues, and think how indispensable it is that it should be protected and kept in a state of repair, we must admit

that the problem of how to make a serviceable eye is a difficult one.

The analogy of the mirror, however, must not lead the reader to suppose that a plane surface, sensitive to light, would be conscious of distinct images, or that it would see objects as we, by the aid of the eye, see them reflected on its surface. For distinct vision, it is necessary that many divergent rays proceeding from each point in an object should be collected together again in a point, and that point must lie exactly on the retina, or sentient mirror. Thus, the instrument known as a camera,

which has a lens set into the side of a box, and a surface at the other side to receive the image, is a more perfect simile for an eye.

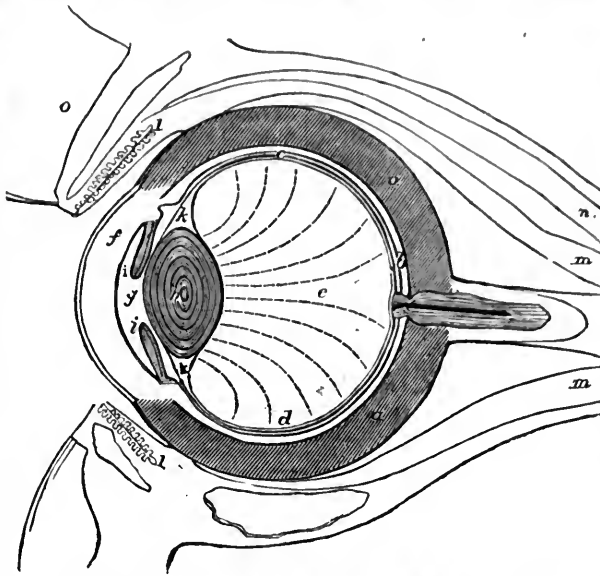
We will now describe the structure of one of the most perfect instruments for taking note of the impression produced by light with which we are acquainted—the human eye.

The human eye is globular; differing, however, from a perfect sphere in some slight but important particulars. The thick, tough capsule, which maintains the shape of the eye, and contains all the other parts necessary to perfect vision, is about one inch from front to back, and a little more from side to side and from top to bottom. This is called the *sclerotic*, or hard coat of the eye. This hard coat, which forms the eyeball, differs from a true sphere also, in that its front part, occupying about one-sixth of its circumference (in section), bulges forward far more than it would do if it were only a part of the larger globe; and this part differs from the other in texture also, for while it is equally strong

and tough, and even harder, it is purely transparent, while the rest of the eyeball is opaque and white. This front clear portion, which is let into the hinder part as a bay-window is put into the wall of a room, or as an old-fashioned watch-glass is

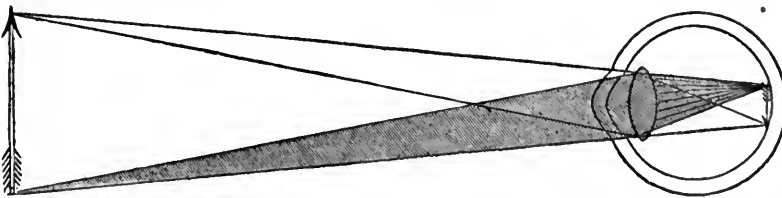
set into the rim of the watch-case, is called the *cornea*, or horny structure. Its greater projection or convexity is not a matter of accident, but highly important, for if it were not so, no near object could be seen distinctly.

Lining the inner surface of the sclerotic is a thin membrane, which supports in its outer layers the larger arteries and veins which carry the blood to and from the front and inner parts of the eye, while it has on its inner surface a very thin pavement of flat, six-sided cells; each cell filled with black grains. The grains, and even the cells which contain them, are so small and so closely set as to form what appears to any but a high magnifying power, a continuous thin black sheet, perfectly opaque. This membrane papers the inside of the eye as far forward as the place where the sclerotic joins the cornea, and is there connected firmly with this outer jacket by a strong ligament and muscle. Before it reaches this point, however, it is puckered into somewhat irregular fore-and-aft folds. Beyond this point the *choroid*, as this membrane is called, is continued as a freely-hanging curtain, shaped like a quoit, that is, round and opaque,



1. VERTICAL SECTION OF THE HUMAN EYE IN ITS SOCKET.

a, sclerotic or hard coat of the eye; b, choroid; c, retina or nervous mirror; d, membrane holding the vitreous humour; e, vitreous humour; f, cornea; g, aqueous chamber and humour; h, crystalline lens; i, iris; k, ligament to hold lens; l, meibomian glands; m, muscles to wield the eye; n, muscle to lift the eye-lid.



2. DIAGRAM SHOWING HOW OBJECTS ARE IMPRINTED ON THE RETINA.

with a hole in the middle of it, which is opposite the middle of the cornea, or window of the eye.

From the same circle of attachment, but internal to the curtain before-named, is suspended, or rather held, by a ligament, a perfectly transparent body shaped like a lentil, that is, with two convex but flattened surfaces. The quoit-like curtain is called the *iris*, and the disc the *crystalline lens*. The lens is slung at some little distance from the cornea, leaving a chamber, which is filled with watery fluid, which bathes both sides of the iris. Behind the lens, and occupying the larger part of the hollow of the eye, is a denser liquid, contained in a thin, perfectly-transparent membrane, which not only encircles it, but sends in partitions from its outer wall to divide the liquid into compartments, so that when the eye is cut into, the humour does not run out, but seems to be of the consistency of clear jelly. Both the liquid and capsule are so transparent that they are called the *hyaloid membrane* and *vitreous humour*, or the glassy membrane and humour.

All the main parts of the eye have now been described except the essential one for which all the others are made, namely, the retina: that wonderful stratum of nervous matter which receives and transmits to the brain all luminous impressions, the glories of colour, the splendid imagery of the earth, and the soft radiance of the sky.

The retina lies between the choroid and vitreous humour. It lines the choroid as closely as that membrane lines the sclerotic, and so covers the whole back part of the eye.

The retina (or sentient mirror), thin as it is, has been found under the microscope to consist of many layers of diverse structure. Not to descend into great minuteness, it may be said to consist of an outer layer of cylindrical bodies, called, from their shape, rods and cones, which run perpendicularly to the surface of junction between retina and choroid. These bodies are the instruments by which the rays are noted. It would seem that each rod or cone conveys but one impression, so that while the image of an external object may be made very small on the retina, and yet distinctly seen, because of the minuteness of these bodies, yet the image must cover a certain number of them to be an image at all. In other words, if it only covered one, the impression would be that of a single point of light.

Next comes the granular layer, the office of which is no further known than that similar structures are found wherever impressions received by the senses are modified. The innermost layer consists of nerve-fibres, which convey the impressions in some such way as the telegraph wires convey their messages. These all run to one point in the back part of the eyeball, a little on the inner or nose side of the axis, and there pass through the choroid and sclerotic, which are pierced by a great many holes, and are united behind into the optic nerve, and this runs to the brain, first, however, being joined by its fellow from the other eye, and then separating from it again, having received some of the strands of this nervous cord, and given up some of its own in return.

Let us now trace the course of a number of rays reflected from a single point in an object, before they reach the retina (see Fig. 2). These rays as they come from a single point are, of course, diverging. They strike, therefore, all over the surface of the cornea, and as they pass through it are gathered somewhat together. They then pass the aqueous humour with a slightly altered course. The outer ones are cut off by the opaque iris, but the central ones pass through the lens, which rapidly gathers them together, and they are then transmitted through the vitreous humour, all the time converging until they meet at a point exactly in or on the retina.

In saying that they meet exactly on the retina, it is meant that they will do so if the adjustment is perfect. If it be imperfect, so that the rays unite in a point either before the retina, or would unite behind it if they could traverse the choroid, the image is blurred and indistinct.

The problem of how to get a distinct image, of course, is more difficult, when the points from which the light proceeds are numerous, as from any object of appreciable form. To obtain this, the surface of the cornea, the hind and front face of the lens, and the face of the retina, must all be of definite and regular curves, or the figure would be distorted. If the cornea bulges too much, the object can only be seen at a short distance, and from this cause some persons have to lay their cheeks upon the page before they can read print. If it bulges

too little, distinct images of near objects are impossible. If the crystalline lens is too dry, or too moist, it becomes clouded with hard or soft cataract. If the pigment be not of sufficient quantity in the choroid, vision is interfered with; and from this cause albinos, or persons whose hair and skin are deficient in colouring matter, are dazzled in ordinary daylight.

Further, if the retina, or part of it fail, as it sometimes does, from some cause too subtle to be found out, the object is seen only in part; thus, some persons have this peculiar affection of half the retina, so that when they look directly at an object, they only see the half of it.

The retina, perfect in all its other functions, may not discriminate colour. The writer once played a game at croquet with a gentleman, who disclosed his infirmity thus: Two balls were lying together—one red, and the other green. He asked which was his, and being told the red one, asked which red one? On another occasion the writer was looking at a brightly-coloured geological map. A stranger who looked with him soon showed that he was quite unaware that it was other than the ordinary ordnance map.

These defects of vision call marked attention to the perfection of the instrument of vision, when perfect, as it is in most cases.

It would be difficult to determine whether the eye were made for light, or light for the eye; but that the Creator of the one was cognisant of all the wonderful qualities of the other, admits of no doubt; and this goes far to prove that the Creator of the one must have been the designer of the other.

LESSONS IN ENGLISH.—II.

SIMPLE PROPOSITIONS.

Alfred reads.

THESE two words form what is called a proposition; they form a simple proposition. Proposition is a word of Latin origin, signifying something that is put before you. As being something that is put before you, it is a statement; it is a statement of a fact or a thought; a statement of something in the mind, or something out of the mind. Here the statement is that *Alfred reads*. Such a statement is also termed a sentence. Sentence is also from the Latin, and signifies a form of words comprising a thought or sentiment. These words, then—namely, sentence, proposition, and statement, have the same signification; and they each denote an utterance, the utterance of a fact, an idea, an emotion. Observe that both words are essential to the proposition. Take away *Alfred*, you then have *reads*; but *reads* is no proposition, for nothing is stated. Take away *reads*, you leave *Alfred*; but *Alfred* by itself says nothing, makes no statement, and therefore forms no proposition or sentence. The two words must concur to make a proposition. If so, less than two words do not make a proposition; and a proposition or sentence may consist of not more than two words.

In these simple statements you have in the germ the substance of the doctrine of sentences. If you understand what I have now said, you have laid the foundation for a thorough acquaintance with language in general, and with the English language in particular; for to a form of words similar in simplicity to that which stands at the head of this lesson is all speech reducible; and that model presents the germ out of which are evolved the long and involved sentences of our old English divines, and the full and lofty eloquence of Milton's immortal essay on behalf of the liberty of the press.

The sentence as it stands is what is called an affirmative proposition; that is, it affirms or declares something—it affirms or declares that *Alfred reads*. The term affirmative is used in opposition to the term negative. Negative propositions are those in which something is denied. An affirmative may become a negative proposition by the introduction of the adverb *not*; thus, *Alfred reads not*. In English it is more common to employ also the emphatic *does*, as *Alfred does not read*. You thus see that the words *does* (*do*, or *does*, as may be required) and *not* convert an affirmative into a negative proposition. Sentences in which a question is asked we term interrogative; as, *does Alfred read?* Here by the help of the emphatic form *does*, and the inversion of the terms *does* and *Alfred*, we make an affirmative into an interrogative sentence. If into this last sentence we introduce the negative *not*, we have an interrogative negative

sentence, as *Does not Alfred read?* We put these four forms of a proposition together.

FORMS OF A PROPOSITION.

1. *Affirmative.* Alfred reads.
2. *Negative.* Alfred does not read.
3. *Interrogative.* Does Alfred read?
4. *Interrogative Negative.* Does not Alfred read?

You thus see an example of the ease and extent with which the original form may be changed and multiplied. The proposition, *Alfred reads*, is a simple proposition. Propositions are either simple or compound. Compound propositions are made up of two or more simple propositions. Of compound propositions I shall speak in detail hereafter. Here only a few words may be allowed, in order to illustrate what is meant by a simple proposition. If I were to say, *When Alfred reads, he is listened to*, I should employ a compound proposition. In these words there are two statements, and consequently two sentences. These two statements are, *Alfred reads*, and *Alfred is listened to*. The two statements, united by the term *when*, constitute a compound sentence. In one form, at least, a compound proposition may easily be mistaken for a simple proposition; namely, in this—*Alfred reads and writes*. Here, in reality, we have a compound sentence, for, when analysed, these words are equivalent to these two statements—*Alfred reads*, and *Alfred writes*. There being in the sentence these two statements, the proposition is compound.

Let us now consider the two words in their own individual character—*Alfred reads*. The first obviously represents a person, the second as clearly represents an act. Now, in grammar, words which represent persons and things are called *nouns*; and words which represent acts are called *verbs*. Noun is a Latin term, and signifies name; hence you see the noun is the name of any person or thing; and were we as wise as were the Latins, we should not employ a foreign word, but call nouns simply *names*. Thus Alfred is the name of a person. Book, also, is a name; so is house; so is pen, so is paper; these are each the name or vocal sign by which Englishmen distinguish and agree to call these objects severally. Nor is there any mystery in the term verb. Here, too, we have a Latin term which signifies simply *word*. With the Latins the verb was the word; that is, the chief word in a sentence. By us the verb might be termed *the word*. Had English grammarians employed as their scientific terms words of Saxon origin, the study of English grammar would have been very easy. We shall endeavour to simplify it by translating the Latin terms, unhappily now become indispensable, into their English equivalents. That the verb is the word, the chief word of a sentence, you may learn by reflecting on the proposition, *Alfred reads*. It is *reads*, you see, that forms the very essence of the statement. *Reads*, too, distinguishes this statement from other statements, as *Alfred runs*, *Alfred sings*.

Now let the reader look back on the several instances of propositions I have given, and endeavour to ascertain what is the quality in which they all agree. They have a common quality. That quality is averment. They all aver or declare something. This they do by means of their verbs. Accordingly, averment is the essential quality of the verb. Every verb is a word which makes an averment. Here, then, we learn that the noun *names*, and the verb *avers*. By these tokens may all nouns and all verbs be known. Whatever *names* is a noun; whatever *avers* is a verb. *Chair* is a noun, because it is the name of an object; *stands* is a verb, because it avers or declares something of chair; and the union of the noun and the verb, as *chair stands*, forms a proposition.

Sentences, then, in their simplest form consist of a noun and a verb. A noun and a verb are indispensable. Whatever more you may have, you cannot have anything less than a noun and a verb in a sentence or proposition. As a substitute for the noun you may have a pronoun. Pronoun, again, is a word of Latin origin, signifying a word which stands *instead of a noun*. Thus we may put the pronoun *he* instead of *Alfred*; e.g. (these are the initials of two Latin words, meaning *exempli gratiâ*, for example):

Alfred reads,
He reads,

where *he* holds the place of *Alfred*. We must accordingly qualify our statement, and say that sentences, in their simplest form, consist of a verb and a noun or pronoun. One or two

other qualifications might be stated; but here, at least, instead of entering into them, it will be better to put the statement in its most general form, a form in which it will embrace all particular cases, and render qualification unnecessary. I say, then, that in every sentence there must be a subject and a verb. I have thus set before you a new term. That term I must explain. *Subject* is a Latin word, and denotes that which receives, that which lies under, is liable or exposed to; from *sub*, under, and *jacio*, I throw, I place; in the passive, I lie. Accordingly, the subject of a proposition is that to which the action declared in the verb is ascribed. Hence, the subject of a proposition is the agent, the actor, the doer. The subject of a proposition answers to the question who? or what? as, who reads? Answer: *Alfred reads*. The term *subject* is used with special reference to the corresponding term, *predicate*. The *predicate* of a proposition is that which is attributed to the subject. What is attributed in our model sentence? This, namely, that *Alfred reads*. "Reads," then, is here the predicate, or that which is ascribed to, or ascribed of Alfred. Hence you see the propriety of the term *subject*, since Alfred is subject to the averment that he reads. Now, in the grammatical construction of the sentence, it matters not whether you say *Alfred reads*, or *he reads*. In both cases you have a subject and verb, or predicate; and consequently you have a complete enunciation of thought, or a perfect sentence.

The sentence thus analysed and explained may be set forth in this form:—

<i>Subject.</i>	<i>Predicate.</i>
Alfred	reads.
He	reads.

As the subject undergoes a change by passing, when necessary, into *he*, so may the predicate be modified. Instead of a predicate in one word, you may have a predicate in two words, by substituting a verb and an adjective; as

Alfred is good.

Another new term demands another explanation. What is the meaning of adjective? *Adjective* in Latin signifies that which is added to, or thrown to (*ad, to*; and *jacio, I throw*). To what are adjectives thrown or added? To nouns, as in this instance. Adjectives, therefore, in their very nature, cannot stand alone. They perform their office in being added to or connected with nouns. They are connected with nouns in order to qualify the meaning of those nouns, and to answer to the question of what kind. What kind of a boy is Alfred? Answer, "he is a good boy." An adjective, then, is an *epithet* (a Greek word, which denotes that which is attributed to a noun or a person); e.g., *green fields*, *tall men*, *hard rocks*, where *green*, *tall*, and *hard* are *epithets*, or *adjectives*, inasmuch as they assign the quality of their several subjects. Now, what we call qualities we call also attributes. The *attributes* of a body are its qualities. Attribute is a word from the Latin, denoting that which is attributed or ascribed to an object. Adjectives, therefore, describe the qualities or attributes of the persons or things they are connected with. In the instance given above, *good* is the attribute of the proposition; thus,

<i>Subject.</i>	<i>is</i>	<i>Attribute.</i>
Alfred		good.

But this explanation leaves *is* unexplained. The word *is* on reflection you will recognise as a verb, seeing that it avers; for it avers or declares that *Alfred is good*. By comparing together the two forms—

<i>Subject.</i>	<i>Predicate.</i>
Alfred	reads.
Alfred	is good.

you observe that *reads* and *is good* hold the same place and perform the same function in the two propositions. They in each case form the predicate of the sentence. The *predicate* is that which is predicated, declared, or averred of the *subject* of a proposition. In the former instance, *reads* is that which is averred; in the latter, *is good* is that which is averred. Mark that neither *is* nor *good* alone forms the predicate, for what is asserted is not that Alfred *is*—that is, *exists*—but that he *is good*. Accordingly, the predicate here consists of two words—namely, *is good*; but in the former example it consists of merely one word—that is, *reads*. Of these two words, *good*, we have seen, is the attribute. It remains to state that the word *is* forms what is called the *copula*, a Latin term which may here be rendered

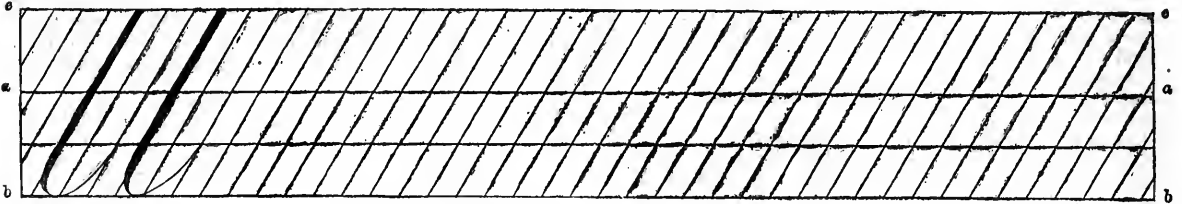
link. The term describes its office. The word is in the sentence *links* the subject with the predicate. The whole may be exhibited thus:—

Subject. Alfred	Predicate. reads.
Alfred	is good.

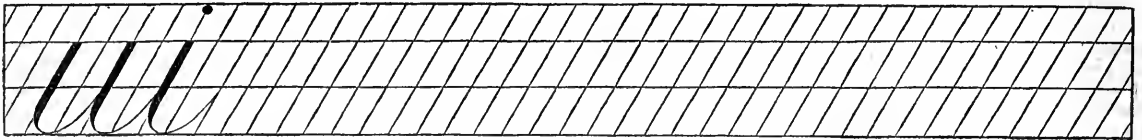
is not a nominative case. Cases pertain to nouns, moods to verbs.

But here we meet with an instance of the complexity and obscurity that have been brought into English grammar by attachment to Latin forms. Our nouns in their actual condition have but one case, the *genitive*; or, if the nominative be allowed to be a case, then two cases are the utmost that our nouns can be said to have. Why should more be assigned to them? It may be doubted, indeed, whether what is called the nominative can be properly termed a case, for it differs from the Latin nominative, which is formed from a *stem* common to all the cases through which the noun passes; whereas in English the nominative is the stem itself. However this may be in English, nouns now possess no more than two cases. This fact is in no way affected by the allegation that the Anglo-Saxon, the mother of the English, has several cases. It is with the daughter, not with the mother, that we are here concerned.

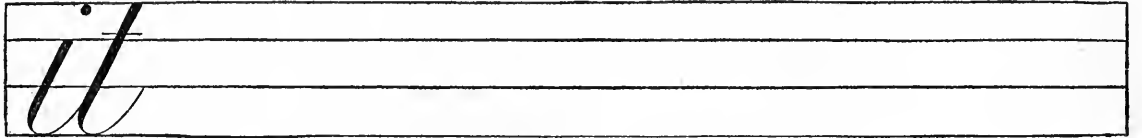
By ordinary grammarians what we have termed the subject is called the *nominative* case. The employment of such a term is objectionable, for it is incorrect by not being sufficiently comprehensive. Take, for instance, the proposition, *To ride is healthful*. *To ride* is the subject of the proposition, and the subject, therefore, to the verb *is*. But is *to ride* a nominative case? Ask the grammarians, and they will tell you that it is the infinitive mood of the verb *ride*. If an infinitive mood, it



COPY-SLIP NO. 5.—THE LETTER l.



COPY-SLIP NO. 6.—COMBINATION OF THE LETTERS u, i.



COPY-SLIP NO. 7.—COMBINATION OF THE LETTERS i, t.

LESSONS IN PENMANSHIP.—III.

We now place before our readers the letter *l*, the last of the four letters that are formed either by the simple bottom-turn itself, or by some slight modification of it. Proceeding by a regular system of gradation, the self-teacher has been led first to make the bottom-turn within the horizontal lines that contain, as we stated in our last lesson, what may be termed the body of any letter that has a head, loop, or tail extending above or below these lines; and then, after making the simple bottom-turn, he was shown how to turn this stroke into the letter *i* by placing a dot above it, to form the letter *u* by the combination of two bottom turns, and to make the letter *t* by beginning the thick down-stroke a little above the upper horizontal line, and crossing it just above the same line by a fine hair-stroke. He must now proceed to make the letter *l*, beginning the down-stroke at the line *c c*, which is placed at a distance above the line *a a* nearly equal to the distance between the lines *a a, b b*.

The chief difficulty that the learner has to encounter in making the letter *l* arises from the length of the down-stroke, which obliges him to bring his pen downwards in the same straight line for a distance nearly half as long again as the letter *t*. At first his hand will shake, and, as it is manifestly much easier to make a short stroke than a long one, his early attempts at making the letter *l* will not be quite so straight and even, perhaps, as his copies of the shorter letters arising out of the bottom-turn. His success, however, greater or less, as it may be,

in making this letter will afford an excellent test of his progress, and show him whether or not he be holding his pen in the proper way and sitting in the proper position. If he find no difficulty in repeating the letter *l* several times, and can do it with ease, making a straight and well-formed stroke with an equal pressure of the pen from top to bottom until it begins to narrow, he may be sure that his position is correct, and that he is holding his pen properly; but if, on the other hand, he find, after a few trials, that the down-strokes of his letters are uneven and crooked, owing to the shaking of his hand, and he feel pain in the ball of the thumb and the thick muscles on the opposite side of the palm of the hand, he may be sure that his position and the way in which he holds his pen is stiff, constrained, and unnatural, and requires amendment. To effect this, he must once more turn to the directions given for holding the pen, etc., in our first lesson in Penmanship, and carefully regulating the position of his hand and body by these instructions, he will soon discover the points in which he is at fault, and gradually acquire greater ease and freedom in writing.

After accomplishing the letter *l*, the learner may proceed to combinations of the letters that he has already made singly, and for this purpose we have furnished him with copy-slips, showing combinations of the letters *u, i* and *i, t*. Let him copy these and all the examples that we shall give him in future lessons again and again, remembering that in no branch of learning is constant practice more necessary, especially to the self-teacher, than in Penmanship.

LESSONS IN GERMAN.—II.

SECTION III.—GERMAN HANDWRITING.

THE pupil should invariably make himself so familiar with the meaning of the words given in the several Vocabularies and

Exercises, as to avoid the necessity of referring to them while translating. Nothing is better adapted to fix a word in the memory than the process of transcribing it; and by doing this in the German character, the requisite familiarity with the word and the peculiar *chirography* or *handwriting* of the language which is shown below, are both secured at the same time.

The Printed Letters.

The Written Letters.

The English Letters.

A B C D E F G H I J K

A B C D E F G H I J K

A B C D E F G H I J K

L M N O P Q R S T U

L M N O P Q R S T U

L M N O P Q R S T U

V W X Y Z. ST.

V W X Y Z. ST.

V W X Y Z. ST.

a b c d e f g h i j k l m n

a b c d e f g h i j k l m n

a b c d e f g h i j k l m n

o p q r s t u v w x y z.

o p q r s t u v w x y z.

o p q r s t u v w x y z.

ä ö ü ê sch ss st sz tz.

ä ö ü ê sch ss st sz tz.

ä ö ü ê sch ss st sz tz.

EXERCISE 3. Aufgabe 3.

Exercise 3. Aufgabe 3.

EXERCISE 3. Aufgabe 3.

Aachen, Berlin, Köln, Dresden,

Aachen, Berlin, Köln, Dresden,

Aachen (Aix-la-Chapelle), Berlin, Köln (Cologne), Dresden,

Ems, Frankfurt, Gotha, Hamburg,

Ems, Frankfurt, Gotha, Hamburg,

Ems, Frankfurt, Gotha, Hamburg,

Innsbruck, Jena, Königsberg,

Innsbruck, Jena, Königsberg,

Innsbruck, Jena, Königsberg,

Leipzig, Mainz, Nürnberg, Ofen,

Leipzig, Mainz, Nürnberg, Ofen,

Leipzig, Mainz (Mayence), Nürnberg (Nuremberg), Ofen,

Pesth, Quebeck, Rastatt, Stettin,

Pesth, Quebeck, Rastatt, Stettin,

Pesth, Quebeck (Quebec), Rastatt, Stettin,

Trier, Ulm, Vaduz, Wien,

Trier, Ulm, Vaduz, Wien,

Trier, Ulm, Vaduz, Wien (Vienna),

Xanton, Ypern, Zürich.

Xanton, Ypern, Zürich.

Xanton, Ypern, Zürich.

Grau, theurer Freund, ist alle Theorie,

Grau, theurer Freund, ist alle Theorie,

Grav, theurer Freund, ist alle Theorie,

Doch grün des Lebens goldner Baum.

Doch grün des Lebens goldner Baum.

Doch grün des Lebens goldner Baum.

SECTION IV.—THE ARTICLE AND THE VERB.

In German the definite Article has, in the Nominative singular, a distinct form for each gender:—

Masculine: Der Mann, the man; Der Bruder, the brother.
Feminine: Die Frau, the woman; Die Schwester, the sister.
Neuter: Das Haus, the house; Das Glas, the glass.

Some nouns, denoting *inanimate* objects, are in German, as in most languages, called *masculine* or *feminine*; and some, denoting *animate* objects, are called *neuter*:—

Masculine: Der Apfel, the apple; Der Baum, the tree;
Feminine: Die Traube, the grape; Die Nadel, the needle;
Neuter: Das Kind, the child; Das Pferd, the horse.

Many words that are treated as *masculine* or *feminine* in one language, are regarded as being of the opposite gender in

another: thus, in French, apple (*la pomme*) is *feminine*, while grape (*le raisin*) is *masculine*. In German the word *head* (*der Kopf*) is *masculine*; in French (*la tête*) it is *feminine*; and in Latin (*caput*) it is *neuter*. The word *hand* (*die Hand, la main, manus*) is *feminine* in the three languages.

CONJUGATION OF THE PRESENT TENSE SINGULAR OF HABEN

Assertively.		Interrogatively.	
Ich habe,	I have.	Habe ich?	have I?
Sie haben,	you have.	Haben Sie?	have you?
Er hat,	he has.	Hat er?	has he?

VOCABULARY.

Auch, also, too.	Brot, n. bread.	Stecker, m. butcher.
Bäcker, m. baker.	Er, das, the.	Haben, to have.
Bier, n. beer.	Er, es, he, it.	Ich, I.
Brauer, m. brewer.	Steich, n. meat.	Ja, yes.

VOCABULARY.

Kaffee, <i>m.</i> coffee.	Müller, <i>m.</i> miller.	Und, and.
Kind, <i>n.</i> child.	Nein, no.	Was? what?
Korn, <i>n.</i> grain.	Nur, only.	Wasser, <i>n.</i> water.
Mädchen, <i>n.</i> girl.	Sie, you.	Wein, <i>m.</i> wine.
Mehl, <i>n.</i> flour.	Thee, <i>m.</i> tea.	Wer? who?

RÉSUMÉ OF EXAMPLES.

Der Brauer hat Wein, Sie haben Kaffee, und ich habe Wasser. Das Pferd hat Heu, das Kind hat Brod, und das Mädchen hat Thee.

The brewer has wine, you have coffee, and I have water. The horse has hay, the child has bread, and the girl has tea.

EXERCISE 4.

1. Wer hat Brod? 2. Der Bäcker hat Mehl. 3. Hat der Bäcker Mehl? 4. Ja, er hat auch Mehl. 5. Was hat der Müller? 6. Der Müller hat Mehl und Korn. 7. Wer hat Fleisch? 8. Der Fleischer hat Fleisch. 9. Haben Sie Bier? 10. Nein, der Brauer hat Bier. 11. Haben Sie Wein? 12. Nein, ich habe Kaffee. 13. Was hat das Mädchen? 14. Das Mädchen hat Thee. 15. Hat der Brauer Korn? 16. Nein, er hat nur Bier und Wein. 17. Was hat das Kind? 18. Es hat Wasser. 19. Hat es auch Brod? 20. Ja, es hat Brod und auch Fleisch.

All German verbs are conjugated interrogatively, in the present and imperfect tenses, like *have* and *be* in English; that is, by placing the verb before its subject, without an auxiliary:—

Haben Sie das Buch?	Have you the book?
Lesen Sie das Buch?	Read you the book? (Do you read the book?)
Ist er hier?	Is he here?
Wohnt er hier?	Resides he here? (Does he reside here?)
Hatte er den Brief?	Had he the letter?
Schrieb er den Brief?	Wrote he the letter? (Did he write the letter?)
War er hier?	Was he here?
Wohnte er hier?	Resided he here? (Did he reside here?)

CONJUGATION OF THE PRESENT TENSE SINGULAR OF *lieben*.

<i>Assertively.</i>		<i>Interrogatively.</i>	
Ich liebe, I love;	liebe ich? love I? (Do I love?)		
Sie lieben, you love;	lieben Sie? love you? (Do you love?)		
Er liebt, he loves;	liebt er? loves he? (Does he love?)		

DEFINITE ARTICLE MASCULINE AND NEUTER IN THE NOMINATIVE AND ACCUSATIVE.

THE MASCULINE FORMS.

Nominativ.	Accusativ.	Nominative.	Objective.
Der Vater	liebt den Sohn,	The father	loves the son.
Der Sohn	liebt den Vater,	The son	loves the father.

THE NEUTER FORM.

Nominativ.	Accusativ.	Nominative.	Objective.
Das Kind	liebt das Mädchen,	The child	loves the girl.
Das Mädchen	liebt das Kind,	The girl	loves the child.

VOCABULARY.

Bauer, <i>m.</i> peasant.	Lehrer, <i>m.</i> teacher.	Vater, <i>m.</i> father.
Buch, <i>n.</i> book.	Lieben, to love.	Wagen, <i>m.</i> carriage.
Glas, <i>n.</i> glass.	Mann, <i>m.</i> man.	Zucker, <i>m.</i> sugar.
Kamm, <i>m.</i> comb.	Oder, or.	

RÉSUMÉ OF EXAMPLES.

Der Brauer hat den Wein, Sie haben den Kaffee, und ich habe das Wasser. Der Vater liebt das Kind, und das Kind liebt das Mädchen. Das Kind hat den Apfel, und das Mädchen hat das Kind. Haben Sie den Hut? Nein, das Kind hat den Hut. Was hat das Mädchen? Das Mädchen hat den Kamm.

The brewer has the wine, you have the coffee, and I have the water. The father loves the child, and the child loves the girl. The child has the apple, and the girl has the child. Have you the hat? No, the child has the hat. What has the girl? The girl has the comb.

EXERCISE 5.

1. Lieben Sie das Kind, oder den Mann? 2. Ich liebe das Kind. 3. Haben Sie den Zucker? 4. Nein, das Kind hat den Zucker. 5. Liebt das Kind das Mädchen? 6. Ja, und das Mädchen liebt das Kind. 7. Wer hat das Glas? 8. Das Kind hat das Glas. 9. Hat der Brauer den Wagen? 10. Nein, der Bauer hat den Wagen. 11. Wer hat das Bier? 12. Der Brauer hat das Bier und den Wein. 13. Hat der Müller das

Mehl, oder das Brod? 14. Er hat das Mehl. 15. Hat der Bäcker den Wein, oder das Wasser? 16. Er hat das Wasser. 17. Lieben Sie den Bauer? 18. Nein, ich liebe den Lehrer. 19. Haben Sie Fleisch, oder Wein? 20. Ich habe das Fleisch. 21. Haben Sie das Brod, oder den Zucker? 22. Ich habe das Brod. 23. Hat der Vater das Buch, oder den Kamm? 24. Er hat das Buch.

LESSONS IN LATIN.—II.

SECTION II.—PRELIMINARY INSTRUCTIONS IN THE VERBS.

IN regard to the exercises which I am about to give, you should first learn the vocabulary by heart. If yours is a mechanical trade, you may repeat the words over again and again while engaged in labour. Or you may make the words your own while walking to and from your employment. Among my personal friends is a gentleman who acquired the greater part of the words of the French language, while rising and dressing in the morning. Thousands of words have I myself learnt while walking for recreation.

Having thoroughly mastered the vocabulary, take a slate and write down the Latin into English; then write the English into Latin. Look over what you have done carefully. Correct every mistake and error. If you look into the exercises you will find that the English will assist you in writing the Latin, and the Latin will assist you in writing the English. When you have got both the Latin and the English into as correct a state as you can, copy them neatly into a note-book. Having done so, read them carefully over, and compare each instance with the rule or the direction, and also the example. Leave nothing until you understand the reason. All the examples or illustrations that I give, as well as the chief rules, should be committed to memory. Before you proceed to a second lesson, ascertain that you are master of the first. It would be useful to write out the rules in one consecutive view, in order that, having them all at once under your eye, you may study them in their connection and as a whole, so as to see their bearing one upon another, and the general results to which they lead. Such a practice would have a very beneficial effect on your mind, by habituating it to arrangement and order, and might be expected to afford you valuable aid, both in other studies and in your business pursuits. Carefully avoid haste and slovenliness. Do your best in all that you undertake. "Well," not "much," should be your watchword. Repeated reviews of the ground passed over are very desirable. Every Saturday you should go carefully over what you have done during the week. At the end of every month the work of the month should be reviewed. On arriving at a natural division of our subject—as for instance, when we have treated of the nouns—you should go over, and put together in your mind the substance of what has been said thereon. "Let us not be weary in well doing: for in due season we shall reap, if we faint not." (Gal. vi. 9.)

VOCABULARY.

Curro, *I run*. The chief parts are curro, *I run*; currere, *to run*; cucurri, *I have run*; cursus, *run*. The English representative, or the element in English derived from the parts, is *curr*; also *curs* or *cours*. Con, from *cum*, means *with*; *dis* signifies *in different directions*; *ex* signifies *out of*.

EXERCISE 1.—LATIN-ENGLISH.

Curro and its parts give rise to several English words, as *current* ("the current coin of the realm"); *currency* ("the circulating medium"). Another example is found in the phrase "account current."

EXERCISE 2.—ENGLISH-LATIN.

Find English words derived from some part of *curro*; find English words derived from *curro*, with *in* prefixed; also with *con* prefixed; also with *dis* prefixed; also with *ex* prefixed.

Remark.—In order to make my meaning quite clear, I will myself do this exercise in part. From *cursus* comes the English word *course*; from *in* and *curs* comes *incursion*; from *ex* and *curs* comes *excursion*. If the reader is acquainted with, or is learning French, he will do well, as he passes on, to find out French words corresponding to, and derived from, Latin words; as in *courir*, French *to run*; *cours*, a course. By comparison he may occasionally find that the same sound or word has a different meaning in French from what it has in Latin or in English. Thus, *concursum* in Latin means a coming together, as to a meeting, a *concourse* of people; but the corresponding

French, *concoars*, signifies co-operation. So concurrence in English is agreement, but in French competition. By practising comparisons such as this, you will not only meet with many curious facts, but be assisted to understand the nature of language itself, as well as receive good mental discipline. If it seems strange to you that the same letters *curr* or *curs* should bear dissimilar meanings, a little reflection on the matter will soon take away your surprise. Let us go at once to the primary meaning of *curr*. Its primary meaning is to run. Now, men may run into, or run out of, or run together, or run about, for different purposes. For instance, they may run together in harmony, and then they concur; or they may run together in rivalry, and then they are in what the French call concurrence, that is, competition.

I have thus, my fellow-student, opened out before you an immense field. It is only a hint or two that I can give; but if you follow these intimations, you will in time become not only a Latin scholar, but a good linguist.

In the former part of this lesson I had to employ the word *curro*, and in so doing I used particularly the form *curr*. This form is called the stem of the word. The stem of a word is that which contains its essential letters, or the letters which are necessary to make it what it is. Thus, *curr* is found in every form into which the verb *curro* passes. Observe that the second *r* is added merely to strengthen the word, or give force in pronunciation. You find this stem, *cur* or *curs*, for instance, in the English words *current*, *incur*, *concourse*, *concurrence*, *discourse*. Observe again, that many of our Latin words have come to us through the French. They have, therefore, entered the English in the form which they had received in the French. This is exemplified in *concourse* and *discourse*, where an *o* has been introduced by the French pronunciation, as these words come to us immediately from the French words *concoars* and *discours*.

The stem of a word is found generally by cutting off the final vowel or syllable. In *curro* you obtain the stem *curr* by taking away the *o*. The *o* in reality is the sign of the first person singular, or *I*. The word for *I* is not prefixed in Latin, except when it is required for emphasis, because the terminations of the verb show clearly what person is meant—that is, whether it is the first person, *I*, or the second person, *thou*, or the third person, *he*. In the English there is a necessity for the constant use of the personal pronoun, because the endings of the verb are not so different from each other as in the Latin. Thus, in English, we say, *I* run, *thou* runnest, *he* runs, *we* run, *you* run, *they* run. Here, out of six persons, the verb has the same termination for four—namely, *I* run, *we* run, *you* run, *they* run. But for the pronouns *I*, *we*, *you*, *they*, the reader or listener would not be aware from the use of the verb which person was intended. In the Latin, however, the verb has a peculiar ending for every person. After this explanation, we will call these terminations person-endings. These person-endings vary with the tense and the voice; that is, they are different in the past tense from what they are in the present tense; and they are different in the passive voice from what they are in the active voice. At present we will confine ourselves to the present tense and the active voice. In *curro*, the person-endings of the present tense, indicative mood, active voice, are as follow:—

PERSON-ENDINGS.

Singular.		Plural.	
1st person	-o, I	1st person	-imus, we
2nd "	-is, thou	2nd "	-itis, ye
3rd "	-it, he	3rd "	-unt, they.

Adding the person-endings to the stem, we have the following example:—

ACTIVE VOICE.—INDICATIVE MOOD.

PRESENT TENSE of the verb *curro*, I run.

1st person	<i>curro</i> , I run	1st person	<i>currimus</i> , we run
2nd "	<i>curris</i> , thou runnest	2nd "	<i>curritis</i> , you run
3rd "	<i>currit</i> , he runs	3rd "	<i>currunt</i> , they run.

These person-endings vary also in another way, which I proceed to explain. Latin verbs are commonly divided into four classes, which bear the technical name of conjugations. This division may not be the best, but it is that which is customary, and therefore I retain it. These four classes or conju-

gations are determined or characterised by the vowel which precedes the termination *re* in the infinitive mood; thus:—

The first conjugation ends in	ae, as <i>amare</i> , to love.
The second conjugation	ere, as <i>docere</i> , to teach.
The third conjugation	ere, as <i>regere</i> , to rule.
The fourth conjugation	ire, as <i>audire</i> , to hear.

We say then that the first conjugation is known by having *a* long before *re* of the infinitive; the second by having *e* long; the third by having *e* short; the fourth by having *i* long. The same fact may be put before you in a different way; thus, *a* long is characteristic of the first conjugation; *e* long, of the second; *e* short, of the third; *i* long, of the fourth. In general it may be remarked, that in the first conjugation *a* long prevails; in the second, *e* long prevails; in the third, *e* short prevails; and in the fourth, *i* long prevails.

Now, *curro*, of which I have spoken before, is of the third conjugation. The person-endings in it will not therefore be the same as they are in the verb *amo*, I love. The person-endings in *amo* are *o*, *as*, *at*; *amus*, *atis*, *ant*. In the tables or paradigms (patterns), which I am about to give, the person-endings are printed in italics, as *amo*, *amas*, *amat*; you will therefore easily recognise them, and ought in all cases to repeat them until you have imprinted them on your memory.

FIRST CONJUGATION.

ACTIVE VOICE.		PASSIVE VOICE.	
PRESENT INDICATIVE.		PRESENT INDICATIVE.	
PERSON-ENDINGS.		PERSON-ENDINGS.	
Singular.	Plural.	Singular.	Plural.
-o, I	-amus, we	-or, I	-amur, we
-as, thou	-atis, ye	-aris, thou	-amini, ye
-at, he	-ant, they	-atur, he	-antur, they

EXAMPLE.—*Amare*, to love; stem, *am*.

PRESENT ACTIVE INDICATIVE.		PRESENT PASSIVE INDICATIVE.	
Singular.		Singular.	
1st per. <i>Amo</i> , I love		1st per. <i>Amor</i> , I am loved	
2nd " <i>Amas</i> , thou lovest		2nd " <i>Amaris</i> , thou art loved	
3rd " <i>Amat</i> , he loves		3rd " <i>Amatur</i> , he is loved	
Plural.		Plural.	
1st per. <i>Amamus</i> , we love		1st per. <i>Amamur</i> , we are loved	
2nd " <i>Amatis</i> , you love		2nd " <i>Amamini</i> , you are loved	
3rd " <i>Amant</i> , they love		3rd " <i>Amantur</i> , they are loved.	

Observe, then, that in order to form any person, you must first get the stem, by cutting off the last syllable. Then to the stem thus obtained, add the proper person-ending. Suppose you have to deal with the verb *laudo*, I praise; and suppose you want to express in Latin the English *they praise*; the way to proceed is—throw away the *o* in *laudo*; by so doing, you get *laud*; now, *they praise* is in the third person plural; the person-ending of the third person plural is *ant*, as shown above; subjoin *ant* to *laud*, and you have *laudant*, which means *they praise*. Or if you have to put *laudas* into English, by looking at the table you find that its termination—namely, *as*—is the person-ending of the second person singular, and consequently *laudas* means *thou praisest*. I have entered into this full and minute explanation once for all. If you take pains to make yourself master of it, you will not require its repetition. But take care not merely to consult the tables I give; you must commit them to memory, and never pass on until you have made them in each case your own. Having learnt the form or example, learn the vocabulary, and then put the Latin exercise into English, and the English exercise into Latin. Do this also from memory; but after you have done it, compare your translation with the table or example, and correct it accordingly.

Discover and write down the English representatives of the Latin words here used; that is to say, the English words derived from these Latin words. For instance, from *delecto*, I delight, we have *delight*, *delightful*, *delightfully*; from *orno*, I adorn, we have *ornament*, *ornamentally*, *adorn*, *adornment*; from *educo* (which properly means I draw out), we have to educate, educator, education. Do the same after every separate exercise.

What I have called "the characteristic" of the verb, may be called the sign of the conjugations. Thus, of the first conjugation *a* long is the sign, and *e* is the sign of the third. These are Latin signs. Of the corresponding part of the English verb, *to* is the sign; that is, the preposition *to* is in general the English sign of the infinitive mood.

VOCABULARY.

Delecto, 1	I delight.	Orno, 1	I adorn.	Vexo, 1	I grieve.
Educo, 1	I educate.	Salto, 1	I dance.	Vitupero, 1	I blame.
Laudo, 1	I praise.	Tento, 1	I try.	Vulnero, 1	I wound.

EXERCISE 3.—LATIN-ENGLISH.

Laudo. Vituperas. Ornat. Educamus. Vexatis. Vulnerant. Tentat. Tentat saltare. Vulneraris. Vexatur. Laudamus. Ornas. Educantur. Vexaris. Vulneramini. Delecto. Delectas. Delectat. Delectamus. Delectatis. Delectant. Delector. Delectaris. Delectatur. Delectamur. Delectamini. Delectantur.

EXERCISE 4.—ENGLISH-LATIN.

I praise. Thou praisest. He praises. We praise. You praise. They praise. I am praised. Thou art praised. He is praised. We are praised. You are praised. They are praised. They delight. Thou adornest. You are grieved. They are educated. He dances. You are blamed. We try. You are tried. He is wounded. I am educated.

Now, before you go forward in this exercise, and in every other, ask yourself, and ascertain that you give the right answers to the following or similar questions, namely: Of what conjugation is the verb *amo*? of what tense is *amo*? of what person is *amo*? of what number is *amo*? of what mood is *amo*? of what voice is *amo*? Do the same with all the rest.

LESSONS IN GEOGRAPHY.—II.

NOTIONS OF THE POETS.

HOMER, who wrote his poems in the tenth century before the Christian era, appears to have been acquainted with Greece, the Archipelago, the island of Crete, and the coast of Asia on the shores of the Mediterranean. Within these limits he appears to have travelled, and he was, no doubt, personally acquainted with some of the scenes which he describes. His works, however, show that the geographical knowledge of the Greeks was at that time more limited than that of the Egyptians in the time of Moses, who lived seven centuries before him. On the south, the Greeks only knew the valley of the Nile, and that part of Africa which extends from Egypt to the west as far as Cape Bon, and the commencement of the Atlas chain of mountains; and on the east, the Syrian desert, Asia Minor, Mesopotamia, and Persia. They possessed only very confused notions of the Adriatic Sea, of Sicily, and of the south of Italy; and with the greater part of the Italian peninsula they were wholly unacquainted.

Previous to the Homeric epoch, the Greeks believed in the existence of nations who inhabited the countries situated behind the regions where the sun appeared to them to rise and to set. They imagined that these nations lived in perpetual darkness, and they called them *Cimmerians*, a word evidently derived from the Hebrew *Cimeririm* (pronounced *Kimeririm*), and signifying darkness. In proportion as they became acquainted with more regions that were enlightened by the sun (that is, as the limits of the known world were extended by voyage and discovery), they transported the Cimmerians and their dark abodes to a greater distance. In those early times the Cimmerians were supposed to inhabit the borders of the Black Sea, near the Thracian Bosphorus, Italy, and the distant countries on the east and west, where the world was supposed to terminate. The people who were supposed to live the farthest north were called *Hyperboreans*, because they were placed beyond *Boreas*, or in the extreme north; and those who lived the farthest south were called *Ethiopi*ans—literally, *sunburnt*—because they were situated more directly under the sun's rays; their country lay south of Egypt, and was afterwards called *Ethiopia sub Egypto*, or *Ethiopia*

under Egypt—under evidently signifying farther to the south than the latter country. The ancients generally believed that Africa and Asia, or rather Ethiopia and India, were united by land still farther to the south, and they consequently considered the Ethiopians and Indians as near neighbours. This is the ground on which both Virgil and Lucan have supposed the Nile to take its rise on the frontiers of India.

At the Homeric epoch the Greeks generally considered that the earth existed in the form of a disc. This disc was supposed to be centrally divided by the Euxine or Black Sea, the Aegean Sea, and the Mediterranean Sea into two parts, the one north and the other south; these parts were at a later period designated by Anaximander under the names of *Europe* and *Asia*, names which had been previously understood in a more restricted sense. The river Phasis in Colchis, or Pontus, on the east, and the Pillars of Hercules, or Strait of Gibraltar, on the west, were supposed to mark the limits of the world. The country of the *Cimmerians*, who were afterwards confounded with the *Cimbri*; and of the *Macrobian*s, so called because they were supposed to be longer-lived than other mortals; *Elysium*, a happy country which had no existence but in the fantasies of the mind; the *Fortunate Isles*, which at a later period, under the names of *Atlantis* and *Meropis*, were the object of the philosophic fictions of Plato and Theopompus; the country of the *Arimaspi*, who saw so clearly because they had only one eye; of the *Gryphons*, who guarded the precious metals of the *Riphean* mountains; *Colchis*, the country of magic, peopled with monsters and prodigies;—all these and many other ingenious fables, the offspring of the imaginations of the poets Homer and Hesiod, or rather of the people among whom they lived, were mixed up with notions purely geographical, and constituted the world at that period a scene of marvels, a receptacle of agreeable delusions on the one hand and formidable mysteries on the other.

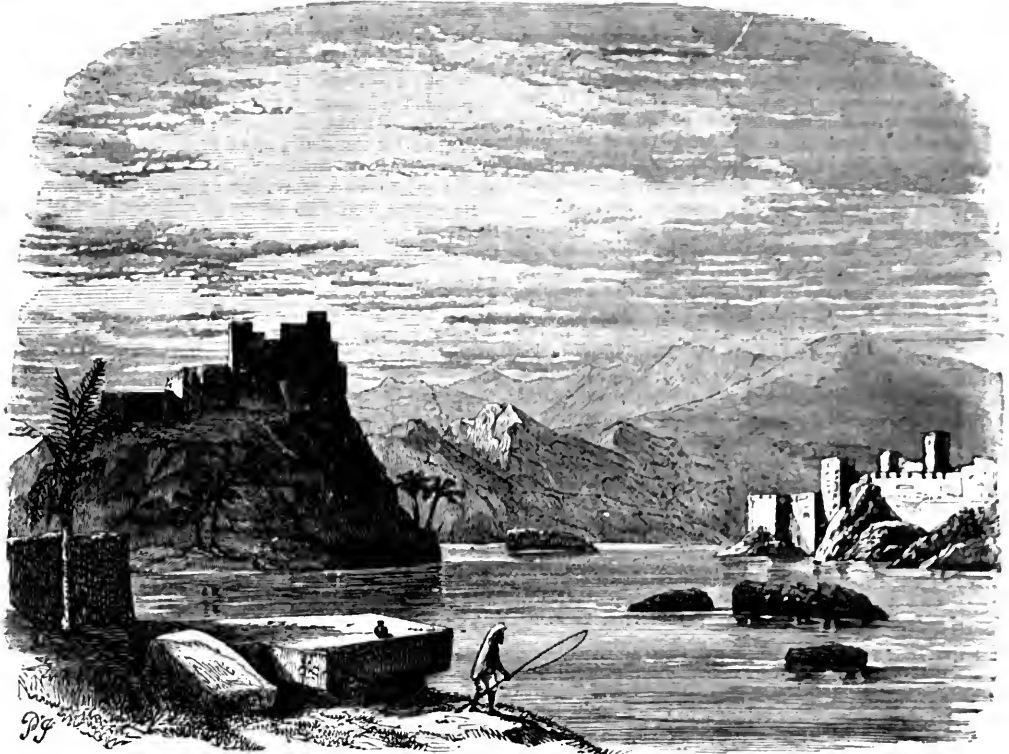
During the historic ages of Greece cosmological systems were multiplied to an endless extent. Thales said that the earth was a sphere; his disciple Anaximander taught that it was a cylinder. Leucippus said that it was a drum, and Heraclides that it was a boat. Many and curious were the notions the ancient philosophers held concerning the globe until voyages of discovery were begun. Herodotus made a great step in the descriptive geography of certain regions, especially in the east of Europe. Yet, notwithstanding his voyages into the three parts of the old world, he fills his narrative with childish tales and dreamy details. He only knew the names of Arabia, Iberia (or Spain), Gallia (or France), the islands of Albion (Great Britain), and the Cassiterides (or Scilly Isles). He had correct notions on Africa, and particularly on Egypt, but the western part of this continent was unknown to him beyond Tripoli. His details on India, besides their uncertainty, are intermingled with fables taken from

the legends or popular creeds of the extreme East. Among the tales more or less ingenious, we must not forget the ants that were as large as foxes, and that collected heaps of gold mixed with sand!

Herodotus appears to have been unacquainted with western Europe. He does not speak of Massilia (Marseilles), a city founded by the Phocæans about 600 B.C., more than a century before he was born. Rome, which had been increasing in grandeur for about three hundred years before his time, is not even mentioned by name. Of Italy he only knew the south of that part anciently called Magna Græcia. The extreme west of Africa was equally unknown to the Greeks, yet the Phenicians had made discoveries in the Atlantic Ocean, and the *periplus* (sailing round) or coasting voyage of Hanno was executed considerably before Herodotus. The African voyage of the Cartha-



THE WORLD ACCORDING TO THE GREEKS AT THE HOMERIC EPOCH.



SYENE, NOW CALLED ASSUAN, ON THE NILE.

ginian admiral, with the thirty thousand persons whom he had on board his vessels, is acknowledged to be authentic; opinions only differ as to the point where his maritime course terminated. Some will have it that, after having cleared the Pillars of Hercules, he went as far as the Gulf of Guinea, while others limit his exploratory voyage to the mouth of the Senegal river. Gosselin fixes the limit at Cape Nun.

Pytheas, a citizen of Marseilles, performed a voyage to the north before the time of Alexander the Great. He discovered Albion, or Great Britain, and always sailing in a northern direction, he reached the mysterious place called *Ultima Thule*, which he saw covered with ice, enveloped in mist, and, as it were, immersed in a horrible chaos. But what was *Thule*? This is a question which has puzzled all historians and geographers. Some have considered with good reason that this country was *Jutland* or the coasts of Norway called *Thulemark*; or perhaps Iceland, as Pytheas sailed through the Scandinavian seas, and his remarks relating to the coasts of the Baltic have been acknowledged exact. Others have claimed this appellation for the Shetland Isles on the north of Scotland.

Aristotle, the great Greek philosopher and naturalist, maintained that the earth was of a spherical form, and he even stated the measure of its circumference at 400,000 *stadia* (a Greek itinerary measure, equal to about 600 feet). Indications of the existence of *Madagascar* have been noticed in his writings. As to *Ceylon*, he mentions it under the name of *Taprobane*, and that a long time before the age of Ptolemy. The limits of the world according to Aristotle were, on the east, the Indus; on the west, the Tartessus, or the Guadalquivir; on the north, the Rhipæan Mountains, Albion, and Ierne (Ireland); on the south, Libya, in which he places the river *Chremetes*, which rises out of the same mountains as the Nile, in order to disembogue itself into the Atlantic Ocean—an idea which leads to the supposition that he confounded the Nile with the Niger. He admitted that the Caspian Sea was a great inland lake, having no communication with any other sea.

The conquests of Alexander the Great led to the most distinct and extended notions of the ancient world. The most remarkable geographical fact of his reign was the exploration of the Indus. A fleet of 800 vessels, under the command of Nearchus,

descended this river, and went along the coast of Asia to the bottom of the Persian Gulf. The expedition of Alexander opened the eyes of the Greeks, but produced at that time no results of any consequence to the science of geography. What was gained by his exploratory voyage was lost by the dismemberment of his empire; and the historians of the period relapsed into their former ignorance.

By degrees, however, geography assumed the dignity of a science. Eratosthenes, who flourished about 250 B.C., composed a treatise on the subject. He was a native of Cyrene in Africa, and the keeper of the Alexandrian Library. By means of instruments erected in the museum of the city of Alexandria, he found the obliquity of the ecliptic, to within half a degree of the truth. He was the first who attempted to determine the circumference of the earth by the actual measurement of an arc of one of its great circles. By means of sun-dials he found that Syene, near a cataract of the Nile, which was situated, as he thought, on the same meridian as Alexandria, was immediately under the tropic of Cancer, so that at the time of the summer solstice the sun was vertical to the inhabitants of Syene, and the gnomon had no shadow at noon. Thus, having measured the angle of the shadow of the gnomon at Alexandria, also at the time of the summer solstice, he found the distance of the sun from the zenith at noon to be $7^{\circ} 12'$, or one-fiftieth part of the circumference of a great circle, viz., 360° . He then computed the distance between the two places, Alexandria and Syene, and found it 5,000 *stadia*. Accordingly, he multiplied this number by 50, and found the measure of the earth's circumference to be 250,000 *stadia*. Making allowance for the errors which he committed, for want of the delicate instruments of observation which we possess in modern times, this was a tolerable approximation to the truth. Syene, indeed, was not on the same meridian as Alexandria, but on one nearly 3° east of the meridian of that city; and instead of being exactly on the tropic, it was about half a degree north of that line. Eratosthenes affirmed the spherical figure of the earth, and asserted that the immensity of the ocean would not prevent vessels from going to India by continually shaping their course westward.

Hipparchus, who flourished about ninety years later than Eratosthenes, laid the foundation of astronomical geography;

by endeavouring to determine the latitudes and longitudes of places by observations on the heavenly bodies. He constructed a catalogue of the fixed stars, and taught the projection of the sphere on a plane surface. Agatharchides, president of the Alexandrian Library, who flourished rather before Hipparchus, wrote a treatise on the navigation and commerce of the Red Sea, and an account of Egypt and Ethiopia. He was the first who gave a correct description of the Abyssinians; he mentions the gold mines wrought by the ancient kings of Egypt on the coast of the Red Sea, the process of working them, and the sufferings of the miners. He speaks, also, of the tools of copper found in these mines, supposed to have been used by the native Egyptians before the conquest of that country by the Persians. The voyages of Eudoxus of Cyzicus added new information to what was already gained respecting the East. He visited Egypt in the reign of Ptolemy Physcon, about 130 B.C.; and besides making two voyages to India, he afterwards accomplished the circumnavigation of the African continent. Strabo, who gives an account of his voyages and discoveries, attempts repeatedly to throw discredit on the truth of his statements; but they have been confirmed by those of later times.

LESSONS IN FRENCH.—III.

SECTION I.—FRENCH PRONUNCIATION (continued).

III. NAME AND SOUND OF THE VOWELS.

32. **A, a.**—Name, *ah*; sound, like the letter *a* in the English word *mark*.

Pronounce this English word *mark* aloud several times, with strict reference to the sound of the French letter *a*, until you are sure of having its correct sound.

The sound thus obtained always belongs to the French letter *a* in the alphabet; that is, whenever the French alphabet is repeated, always give the first letter the sound of *a* in the English word *mark*, that is, *ah*.

But the French *a* does not *always* and *invariably* have this sound whenever and wherever it is used in a French word.

Its sound depends upon its *position* in a word, and upon the *accent* under which it is placed, either by itself, as constituting a single word, or within a word of one or more syllables.

The letter *a* has, then, another sound, which we illustrate by the sound of the letter *a* in the English word *fat*. Pronounce this English word *fat* aloud several times, with strict reference to the sound of the French letter *a*, until you are sure of having its correct sound.

The French letter *a* has, therefore, two distinct sounds, viz.:—
A short sound, as in the English word *fat*.

A long sound, as in the English word *mark*.

In these lessons, the English letter *a* will be used to illustrate the short sound of the French vowel *a*; and *ah* will be used to illustrate the long sound of the French vowel *a*.

A has the short sound represented by *a* in the English word *fat*, when it is a word by itself, and *generally* when it begins or ends a French word. There are exceptions to this rule; but they will be readily noticed by the reader in the spelling by means of English letters, designed to illustrate the pronunciation of a given French word.

A has the long sound represented by *a* in the English word *mark*, when it is pronounced as the first letter of the French alphabet, and also when under the circumflex accent, which will be illustrated hereafter.

Exercise yourself upon the short sound of the French vowel *a*, in the following examples. Pronounce every French word in the following table aloud, and, when possible, always study your French lessons aloud:—

FRENCH.	PRON.	ENGLISH.	FRENCH.	PRON.	ENGLISH.
Abaca	A-ba-ka	Manilla hemp.	Cresse	Ka-ress	Endearment.
Alarme	A-larm	Alarm.	Dame	Da-m	Married woman.
Bal	Bal	Bal.	Masque	Mas-k	Mask.

The above examples are introduced to illustrate the short sound of the French vowel *a*. In the first word (*abaca*), be careful not to pronounce it *ay-bay-kay*, but give each *a* in each syllable the sound of *a* in the English word *fat*. In the next word, do not say *ay-lahrm*; remember to give the sound of *a* in the English word *fat*. Trill the *r* in the last syllable of the word *a-larm*. It will be perceived the final *e* of this word (*a-larme*) is not sounded.

This vowel is sometimes under a grave accent, thus—à là, voilà; but its sound is not materially affected thereby.

33. **Â, â.**—Under the circumflex accent, this vowel has the long sound represented by *a* in the English word *mark*, and is named *ah*. It has, besides, a little more than the sound just spoken of, for the sound must be prolonged, and to do this conveniently, the mouth must be opened a little wider than in uttering its short sound, represented by *a* in the English word *fat*.

Be careful, however, not to pronounce *Â â* like the sound of the English word *awe*, but give it the sound of *ah* prolonged, in the following examples, namely:—

FRENCH.	PRON.	ENGLISH.	FRENCH.	PRON.	ENGLISH.
Âge	Ah-zh	Age.	Câpre	Kah-pr'	Caper.
Âme	Ah-m	Soul.	Grâce	Grah-s	Favour.
Bâche	Bah-sh	Avining.	Mâle	Mah-l	Male.
Bâfre	Bah-fr'	Gormandising.	Mâsse	Mah-s	Stake (in betting).
Bât	Bah	Pack-saddle.	Pâle	Pah-l	Pale.

34. **E, e.**—Name, *ay*; sound, like the letters *ay* in the English word *day*.

Pronounce aloud the word *day* until you have a distinct idea of the single sound of the combination of the letters *ay*; and then pronounce the word without the *d*, namely:—

day, ay,

and thus you have the sound of the vowel *e*, which deserves the greatest attention, because of its importance in the French language. It is used more than any other letter, namely:—in five different ways, and hence it has five different names, namely:—
e silent, *e* mute or unaccented, *é* acute, *è* grave, *ê* circumflex.

35. **E, e, SILENT.**—When final, and unaccented in the French word more than one syllable, *e* is silent, as in the following words:—

FRENCH.	PRON.	ENGLISH.	FRENCH.	PRON.	ENGLISH.
Abaque	A-bak	Abacus.	Domestique	Do-mes-teek	Domestic.
Abatage	A-ba-tazh	Killing.	Passage	Par-sazh	Passage.
Algarade	Al-ga-radh	Insult.	Possible	Po-see-bl'	Possible.
Approche	A-prosh	Approach.	Spectacle	Spok-ta-kl'	Sight.
Article	A-teekl'	Thing.	Terrible	Ter-reebl'	Awful.
Ballotte	Ba-lot	Ballot.	Véritable	Vay-ri-tabl'	Genuine.

In the following words the *e* is silent:—

Celui	pronounced	Sub-lwee.
Cela	"	Suh-lah.
Prierai	"	Free-ray.

Again, in the following words, the *e* in the middle of each word is silent:—

Autrement, Entrevoir, Paiement, etc.

In the word *contenance* both *e*'s are silent; ordinarily, the *e* before *a* and *o* is silent, as in *Jean* and *Georges*.

SECTION VI.—IDIOMATIC USES OF "AVOIR."

1. The verb *avoir* is used idiomatically in French, with the words *quelque chose*, *chaud*, *froid*, *faim*, *honte*, *peur*, *raison*, *tort*, *soif*, *sommeil*.

J'ai quelque chose,	Something is the matter with me.
Il a chaud,	He is warm.
Elle a faim,	She is hungry.
Nous avons honte,	We are ashamed.
Vous avez peur,	You are afraid.
Ils ont tort,	They are wrong.
Avez-vous raison ?	Are you right ?
J'ai sommeil,	I am sleepy.

2. A noun, whether taken in a general or in a particular sense, is in French commonly preceded by the article *le* in its different forms [§ 77 (1) (2)].

Le pain est nécessaire,	Bread is necessary.
Il a le pain,	He has the bread.

3. A noun, preceded by the article *le*, retains that article after *ni*, *nor*, *neither*; but a noun taken in a partitive sense (Sect. IV. 1), takes after *ni* neither article nor preposition.

Je n'ai ni l'arbre ni le jardin, I have neither the tree nor the garden.
Nous n'avons ni arbre ni jardin, We have neither tree nor garden.

4. A noun, taken in a partitive sense, and preceded by an adjective, takes merely the preposition *de* [§ 78 (3)].

5. The following adjectives generally precede the noun:—

Bean,	hand-	Cher, dear.	Jeune, young.	Petit, small.
	some.	Grand, great,	Joli, pretty.	Vieux, old.
Bon, good.		large.	Mauvais, bad.	Vilain, ugly.
Brave, worthy.		Gros, large.	Meilleur, better.	

RÉSUMÉ OF EXAMPLES.

Avez-vous quelque chose?	<i>Is anything the matter with you?</i>
Je n'ai rien (literally, <i>I have nothing</i>).	<i>Nothing is the matter with me.</i>
Votre frère a-t-il chaud?	<i>Is your brother warm?</i>
Il n'a ni froid ni chaud.	<i>He is neither cold nor warm.</i>
Votre sœur a-t-elle faim ou soif?	<i>Is your sister hungry or thirsty?</i>
Elle n'a pas faim, mais honte.	<i>She is not hungry, but ashamed.</i>
Votre ami a-t-il sommeil?	<i>Is your friend sleepy?</i>
Mon ami n'a ni sommeil ni peur.	<i>My friend is neither sleepy nor afraid.</i>
Avez-vous raison ou tort?	<i>Are you right or wrong?</i>
Avez-vous du lait ou du vin?	<i>Have you milk or wine?</i>
Je n'ai ni lait ni vin. (R. 3.)	<i>I have neither milk nor wine.</i>
Avez-vous le lait ou le vin?	<i>Have you the milk or the wine?</i>
Je n'ai ni le lait ni le vin. (R. 3.)	<i>I have neither the milk nor the wine.</i>
Avez-vous de beau drap et de bon café?	<i>Have you handsome cloth and good coffee?</i>

VOCABULARY.

Au contraire, on the contrary.	Fusil, m., gun.	Peur, f., fear, afraid.
Bouton, m., button.	Froid, m., cold.	Poivre, m., pepper.
Capitaine, captain.	Gros, large.	Quel, what, which.
Cousin, m., cousin.	Honte, f., shame, ashamed.	Raison, f., reason, right.
Chaud, m., heat, warm.	Mais, but.	Rien, nothing.
Faim, f., hunger, hungry.	Marteau, m., hammer.	Sel, m., salt.
Ferblantier, m., tinman.	Menuisier, m., joiner.	Sommeil, m., sleep, sleepy.
	Petit, small, little.	Tort, m., wrong.

EXERCISE 9.

1. Qui a sommeil? 2. Mon frère a faim, mais il n'a pas sommeil. 3. Avez-vous raison ou tort? 4. J'ai raison, je n'ai pas tort. 5. Avez-vous le bon fusil de mon frère? 6. Je n'ai pas le fusil. 7. Avez-vous froid aujourd'hui? 8. Je n'ai pas froid; au contraire, j'ai chaud. 9. Avez-vous de bon pain? 10. Je n'ai pas de pain. 11. N'avez-vous pas faim? 12. Je n'ai ni faim ni soif. 13. Avez-vous honte? 14. Je n'ai ni honte ni peur. 15. Avons-nous du poivre ou du sel? 16. Vous n'avez ni poivre ni sel. 17. Quel livre avez-vous? 18. J'ai le livre de mon cousin. 19. Avez-vous le marteau de fer ou le marteau d'argent? 20. Je n'ai ni le marteau de fer ni le marteau d'argent, j'ai le marteau de bois du ferblantier. 21. Avez-vous quelque chose? 22. Je n'ai rien. 23. Avez-vous le gros livre du libraire? 24. Je n'ai ni le gros livre du libraire, ni le petit livre du menuisier; j'ai le bon livre du capitaine.

EXERCISE 10.

1. Are you sleepy, Sir? 2. No, Sir, I am not sleepy, but I am hungry. 3. Have you pepper or salt? 4. I have neither pepper nor salt; I have cheese. 5. Is your brother thirsty or hungry? 6. My brother is neither thirsty nor hungry. 7. Is your sister right or wrong? 8. She is not wrong, she is right. 9. Is the good joiner afraid? 10. He is not afraid, but ashamed. 11. Have you milk or cheese? 12. I have neither milk nor cheese; I have butter. 13. Have you the fine cloth or the good tea? 14. I have neither the fine cloth nor the good tea. 15. Is anything the matter with you, my good friend? 16. Nothing is the matter with me, my good Sir. 17. Have you no bread? 18. Yes, Madam, I have good bread, good butter, and good cheese. 19. Is the carpenter sleepy? 20. The carpenter is not sleepy, but the tinman is hungry. 21. Have you the tinman's wooden hammer? 22. I have not his wooden hammer. 23. Which hammer have you? 24. I have the steel hammer. 25. Have you a good cloth coat? 26. No, Sir, but I have a silk dress. 27. Has the tailor the good gold button? 28. Yes, Sir, he has the good gold button.

SECTION VII.—PRONOUNS AND PRONOMINAL ADJECTIVES.

1. The pronouns *le, him, it; la, her, it, are, in French, placed before the verb.** These pronouns assume the gender of the noun which they represent.

Voyez-vous le couteau? m.,	Do you see the knife?
Je le vois,	I see it.
Voyons-nous la fourchette? f.,	Do we see the fork?
Nous la voyons,	We see it.

2. The vowel of the pronouns *le* and *la* is elided before a verb commencing with a vowel or an *h* mute [§ 146].

Avez-vous le bâton? m.,	Have you the stick?
Je l'ai,	I have it.
Avons-nous la canne? f.,	Have we the cane?
Nous l'avons,	We have it.

* Except in the second person singular, and in the first and second persons plural of the imperative, used affirmatively.

3. The possessive adjectives *mon, m., ma, f., my; ton, m., ta, f., thy; son, m., sa, f., his, her, agree in gender with the object possessed, that is, with the noun following them [§ 21 (1) (2)].*

Mon pupitre, m.,	My desk.
Avez-vous ma lettre? f.,	Have you my letter?
Il a son fusil, m.,	He has his gun.
Il a sa cravate, f.,	He has his cravat.

4. Before a feminine noun in the singular, commencing with a vowel or an *h* mute, the masculine form, *mon, ton, son, is used [§ 21 (3)].*

J'ai mon épée, f.,	I have my sword.
C'est son habitude, f.,	It is his or her habit.
Le général a sou armée, f.,	The general has his army.

5. The adjectives *notre, our; votre, your; leur, their, are used without variation before a noun of either gender in the singular [§ 21 (1)].*

Notre argent, m.,	Our silver.
Votre canne, f.,	Your cane.
Leur terre, f.,	Their land.

6. The possessive pronouns *le mien, m., la mienne, f., mine; le tien, m., la tienne, f., thine; le sien, m., la sienne, f., his or hers, can never be prefixed to nouns. The article preceding these pronouns, and forming an indispensable part of them, takes the gender of the object possessed; mien, tien, sien, vary for the feminine—nôtre and vôtre used as pronouns have the circumflex accent.*

J'ai votre livre et le mien,	I have your book and mine.
Elle a sa robe et la mienne,	She has her dress and mine.
Vous avez votre plume et la nôtre,	You have your pen and ours.

RÉSUMÉ OF EXAMPLES.

Votre ami a-t-il le marteau?	Has your friend the hammer?
Il l'a, elle l'a.	He has it, she has it.
Il ne l'a pas.	He has it not.
N'avez-vous pas l'encrier d'argent?	Have you not the silver inkstand?
Nous ne l'avons pas.	We have it not.
Avez-vous votre fusil ou le mien?	Have you your gun or mine?
Je n'ai ni le vôtre ni le mien.	I have neither yours nor mine.
Son épouse a-t-elle sa robe ou la vôtre?	Has his wife her dress or yours?
Elle n'a ni la sienne ni la vôtre.	She has neither hers nor yours.
Ne l'avez-vous pas?	Have you it not?
Votre frère ne l'a-t-il pas?	Has not your brother it?

VOCABULARY.

Assiette, f., plate.	Crayon, m., pencil.	Parent, m., relation.
Biscuit, m., biscuit.	Cuisinier, m., cook.	Plat, m., dish.
Bœuf, m., beef.	Fourchette, f., fork.	Poisson, m., fish.
Boucher, m., butcher.	Matelot, m., sailor.	Porcelaine, f., china.
Commode, f., chest of drawers.	Mouton, m., mutton, sheep.	Sofa, m., sofa.
Couteau, m., knife.	Miroir, m., looking-glass.	Tout, all.
		Veau, m., veal, calf.

EXERCISE 11.

1. Avez-vous la fourchette d'argent? 2. Oui, Monsieur, je l'ai. 3. Le cuisinier a-t-il le bœuf? 4. Non, Monsieur, il ne l'a pas. 5. Quel mouton avez-vous? 6. J'ai le bon mouton et le bon veau de boucher. 7. Votre parent a-t-il la commode? 8. Non, Monsieur, il ne l'a pas. 9. A-t-il mon poisson? 10. Qui a tout le biscuit du boulanger? 11. Le matelot n'a ni son pain ni son biscuit. 12. A-t-il son couteau et sa fourchette? 13. Il n'a ni son couteau ni sa fourchette, il a son assiette. (R. 4.) 14. Quel plat a-t-il? 15. Il a le joli plat de porcelaine. 16. Avez-vous le mien ou le sien? 17. Je n'ai ni le vôtre ni le sien, j'ai le nôtre. 18. Avez-vous peur, Monsieur? 19. Non, Madame, je n'ai pas peur, j'ai faim. 20. Quelqu'un a-t-il ma montre d'or? 21. Non, Monsieur, personne ne l'a. 22. Qu'avez-vous, Monsieur? 23. Je n'ai rien.

EXERCISE 12.

1. Have you the silver pencil-case? 2. No, Sir, I have it not. 3. Have you my brother's plate? 4. Yes, Madam, I have it. 5. Has the butcher the good biscuit? 6. He has it not; he has the good beef, the good mutton, and the good veal. 7. Have you my knife and my fork? 8. I have neither your knife nor your fork. 9. Who has the good sailor's biscuit? 10. The baker has it, and I have mine. 11. Have you mine also? 12. I have neither yours nor his. 13. Are you hungry?

* The possessive adjective must in French be repeated before every noun [§ 21 (4)].

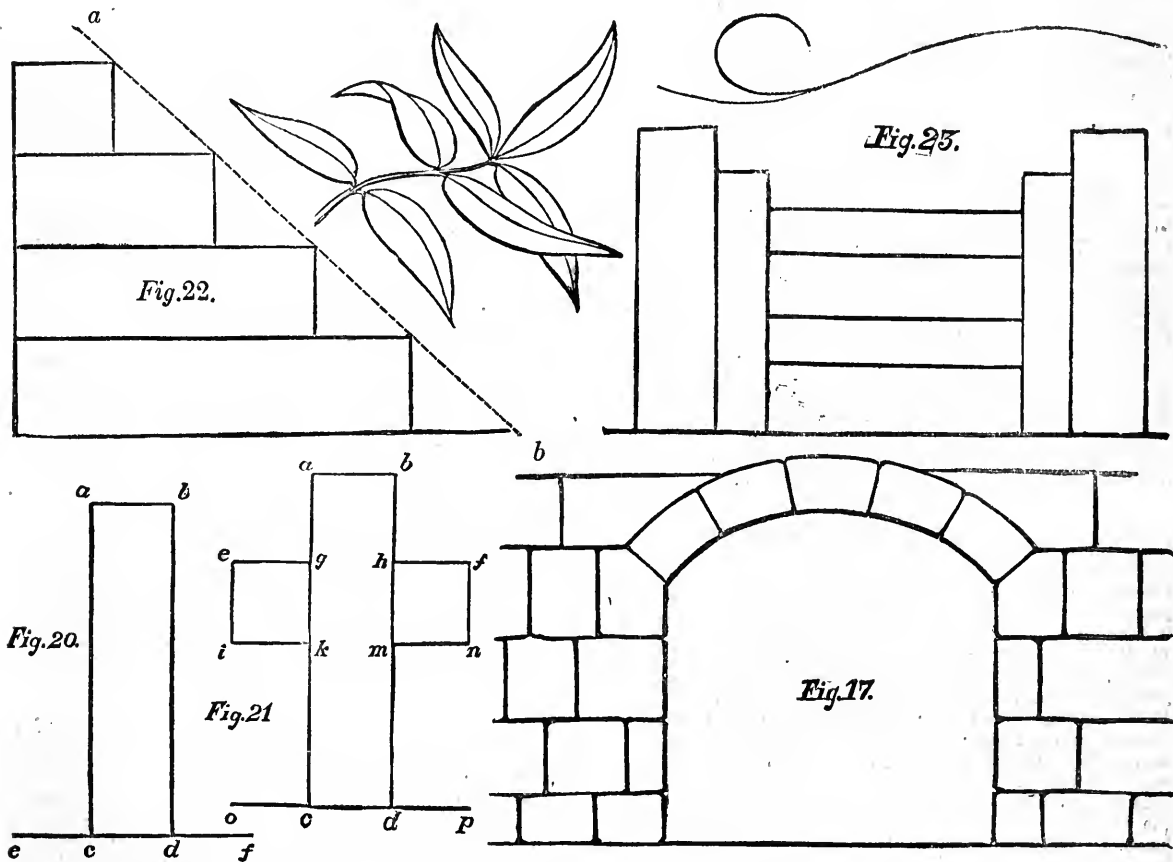
14. I am not hungry, I am thirsty and sleepy. 15. Are you not ashamed? 16. No, Sir, I am not ashamed, but I am cold. 17. Is your relation right or wrong? 18. My relation is right, Sir. 19. Has he my china dish or my silver knife? 20. He has neither your china dish nor your silver knife; he has your china plate. 21. Has any one my silver pencil-case? 22. No one has it, but your brother has your cloth coat. 23. Have you mine or his? 24. I have yours.

LESSONS IN DRAWING.—II.

THE simple example of straight lines, as shown in Figs. 20, 21, 22, 23, will now claim the attention of the pupil; in these the positions of the lines must be indicated by points, marked in the examples by the letters *a, b, c, d*, etc., taking great care that their distances from, and their positions with regard to, each

about to copy is composed; and he must also be exact in determining the relative position of the points in which these lines meet or intersect. When to these directions we have added the following—namely, that the learner must also carefully observe the *lengths* of the lines which form the angles, we have given in very few words the instructions that he chiefly requires to enable him to draw forms, such as ornamental scrolls, flowers, leaves, single figures, etc., in delineating which he can have no assistance whatever from the rules of linear perspective. Knowing from practical experience the necessity of repeating instructions whilst personally engaged in teaching, we trust the pupil will consider our repeating in various ways the more important and essential regulations which guide the mind, and consequently the hand, as intended to convey a deep impression of their importance.

Before commencing a drawing it should invariably be the practice of the pupil, when he has placed his copy before him,



other shall be correctly arranged before a line is drawn; let the letters be a guide as to the order of arrangement. For example, mark the distance between *a* and *b* (Fig. 20), taking care they shall be horizontally placed, and that *c* and *d* are respectively perpendicularly arranged under *a* and *b*. In drawing the line *a c* any number of points between *a c* may be placed, and so with regard to the line *b d*; *e* and *f* must be placed so as to allow a straight line to be drawn between them to pass through *c* and *d*. The above remarks apply to Fig. 21. In Fig. 22, which is supposed to be a profile or side view of four steps, mark the line of the inclination of the steps—namely, the dotted line *a b*: it will not be difficult to arrange the remainder of this subject, if the pupil has well practised the examples given in Figs. 20 and 21.

In every example that the learner copies, he must examine and mark with care the character and extent of the angles or openings made by the meeting or intersection of any of the lines, whether straight or curved, of which the example that he is

whether it be a drawing or the object itself, to look carefully over it for a few minutes, and examine its contours—that is, the bendings of the curves, and the forms which a combination of these curves present. By this close examination of the subject his mind will receive such an impression of it that, as he comes to understand its form, first as a whole, and the details afterwards, the hand, which is only an instrument, will readily execute the suggestions which the mind has received. There are many who make the great mistake of supposing that *the hand* is to receive *all* the attention in training; on the contrary, let the mind fully understand the subject, and then the hand will need less practice in order to fulfil its requirements. In short, educate the mind, and the education of the hand will follow.

Fig. 24, a purse, is almost entirely an example of curved lines, like the vine leaf (Figs. 18, 19), but in this there is more uniformity—that is, the opposite sides have a reversed resemblance to each other. The pupil must notice the position of *a* and *b*, *c* and *d*, also *a* and *c*, *b* and *d*, and so on, with every other

angle or remarkable change which a line takes in its curvature. Perhaps after this remark it will be better to leave the pupil to himself whilst copying this subject, as by this time he must be, we hope, able to anticipate much that would be only a repetition of the principles already laid down.

We have given a *vine leaf* as a further illustration of this method of arranging a drawing—that is, marking in its characteristic points and angles. (See Figs. 18 and 19). Fig. 18 is the first part of the work, which must be carried out as follows:—Commence at some important and leading feature of the object, say the centre, at *a*; mark in *b*; observe the inclination of *a* to *b*; join *a b*; mark in *c*; also observe the distance of *c* from *b*; join *a c*. The line *a d e* will be found not a direct line, *d* is the point where it varies; mark *d* first and *e* next; join *a d* and *d e*; *a f g* is a similar line; also *a h i*. These are the great and leading characteristic lines and points, which it would be advisable to mark in the order we have written

direct lines and curves, advising the pupil not to shade his drawings for the present, until he has gained sufficient confidence in outline.

The value and importance of a correct and ready method of drawing the simple forms of objects cannot be over-estimated. He who is master of this enviable power can apply it to any branch of art he pleases. The greatest impediment to the progress of many a pupil is most likely to arise from his impatient desire to arrive, without a moment's delay, at the power of making a drawing. Irregular and misdirected efforts in copying drawings of cottages and stumps of trees appear to be a much more pleasant task than the performance of exercises so arranged as to lead the student from the knowledge of one principle to an acquaintance with another; nevertheless, the latter is essential to him who wishes to be master of drawing. The training of the hand and the eye which such exercises are calculated to impart, will make the copying of a large number

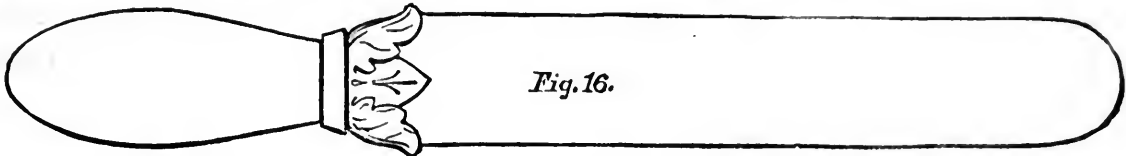


Fig. 16.

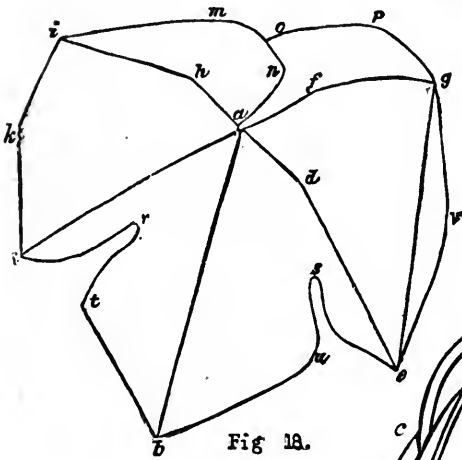


Fig. 18.

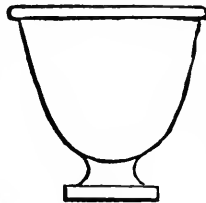


Fig. 19.

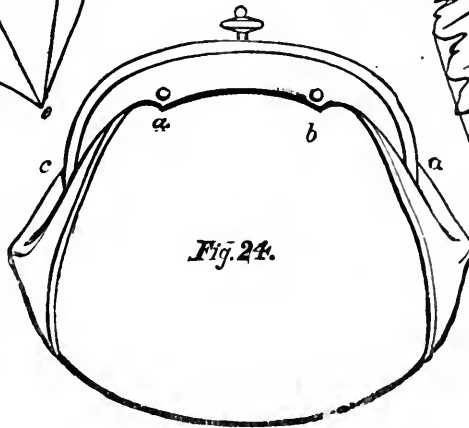
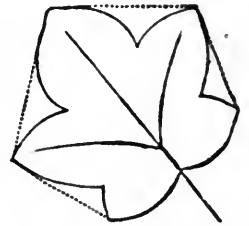


Fig. 24.



them. The secondary parts are *i k c, i m n, o p g*. The points *r* and *s, t* and *u*, must be arranged with an eye to *c, b*, and *e*. These are the minor divisions, all of which must be respectively joined together by straight lines, or in some special cases by a curve, as from *r* to *t*, or *v* to *e*. Partially rub out the arrangement—that is, "*faint it*," and then draw the finished outline as in Fig. 19, which may be, in the detail, further "*marked in*," as the points 1, 2, 3, 4, 5, etc. Let the student compare both figures as he proceeds.

As the above instructions apply to all flat objects, whether composed of straight or curved lines, we again urge most earnestly the strict observance of this practice, as so much depends upon it for the understanding and successfully carrying out of all that we shall have to advance hereafter in these lessons.

We have added in Figs. 16 and 17, and some smaller copies in outline (which are without numbers, as there is no necessity to make any special reference to them in our remarks), a few examples for practice, of subjects in the flat, composed of

of simple figures as easy as it is to make alphabetical characters by the conjunction of "straight strokes, pot-hooks, and hangers." The simple figures we are setting before the learner in these early lessons constitute in fact the alphabet of drawing, and with these, if he would make himself a sound draughtsman, he must become well acquainted; for just as the combination of letters, syllables, and words, forms in the printer's hands either a poem or an auctioneer's catalogue, so does the application of the elements of linear drawing constitute, in the hands of the artist, an historical picture, a portrait, a landscape, a design for an ornamental framework, or the plan and elevation of a building.

Unacquainted with these elements, how much industry, and even talent, has many a youth thrown away! Let us take an instance of such a youth. He makes his earliest essays, it may be, at copying some finished production, or some elaborate engraving. He tries his best to produce a neat and accurate copy, and he endeavours to give the details of his original

with a praiseworthy degree of patient labour; but when all is done that he is able to do, his copy proves to be a failure in some essential points. It is out of proportion; the perspective lines are not given correctly; the curve-lines may not be zig-zag, but they want the easy sweep of his exemplar; they are full of *shoulders* and joints; and the perpendiculars are not upright, nor are the horizontal lines at right angles to them. When the first ardour of execution has abated, he perhaps discovers these faults himself; and if he makes the common mistake of supposing that the *art* of drawing is a *gift*, and that the pencil is a magician's wand, manifesting its powers only in the hand of some rightful owner, he may then lose heart, and think that his faculties are not adapted for the pursuit of this noble art. If any of our readers have unfortunately stopped at this point of their studies, let them recover their confidence, and prosecute their favourite pursuit under our guidance. The good method of practice, and the intelligible principles which we propose to explain and set before them, will so lead their hand and their eye, that ultimately they will accomplish all their desire.

Well-directed application does wonders in other arts, and why not in drawing? What exercises does not a musician or a singer go through, before he gets command of his voice or fingers? Who expects to arrive at that dazzling rapidity of motion visible in the touch of the violin-player, certain and instantaneous though it be, by any other method than that of hard and constant practice? Would not he who should begin to learn the use of any instrument by attempting complete airs, and always turning aside from the exercises which a master prescribes, be sure to end where he began, and become no player? Think what an amount of labour is necessarily expended in *fingering* by the young pianoforte-player. Greatly less labour than is necessary in prosecuting many other arts will make an able draughtsman, fit him for the performance of many useful works, and imbue him with those principles of drawing which are applicable throughout the whole range of this art.

It is frequently asserted that the art of drawing, like that of writing poetry, is a *natural gift*; and that unless you possess this, you never can excel. It may be true that, to rise to the highest eminence in any science or art, requires a peculiar bent of the mind; but to acquire a useful practical knowledge of the art of drawing, it is by no means necessary that every one should be a genius. With regard to the sister arts—poetry and painting—it may be truly said, in regard to their elements, at least, that every man is endowed with some ability for their acquisition and their application. Every one, for instance, is poetical when he speaks on a subject with which he is well acquainted, or in which he is deeply interested; and, in like manner, every one is an artist, who is ready to make a sketch or a drawing of any object, which he wishes to explain to another, when he finds that language fails to convey his ideas. The art of drawing, therefore, may be attained to a sufficient extent for practical purposes by every one who exerts the necessary attention and assiduity. The artisan, the tradesman, or the connoisseur, may by the use of a few well-directed strokes of the pencil, convey an idea of his plans, operations, and views in relation to artistic productions, of which the most laboured and elegant composition, consisting of many hundred words, would fail to convey the slightest impression to the mind of the hearer or the reader.

LESSONS IN ARITHMETIC.—III.

SUBTRACTION.

1. If a less number be taken away from a greater, or, as it is called, *subtracted* from it, the number left behind is called the *difference* of the two numbers, or the *remainder*.

The sign — (called *minus*) placed between two numbers indicates that the one before which it stands is to be subtracted from the other.

2. When the individual figures composing the larger number are respectively larger than the corresponding figures of the smaller number, the process is evident. We have only to take the differences of the numbers of units, tens, hundreds, etc., respectively, and the resulting number can be at once written down. Thus, for instance, suppose it be required to find the difference between 9876 and 7653.

Write down the numbers one under the other, the units

under the units, the tens under the tens, the hundreds under the hundreds, and so on, thus:—

$$\begin{array}{r} 9876 \\ 7653 \\ \hline 2223 \end{array}$$

3 units { in the less } taken from 6 units { in the } leaves 3 units.

5 tens " " 7 tens " " 2 tens.
6 hundreds " " 8 hundreds " " 2 hundreds.
7 thousands " " 9 thousands " " 2 thousands.

Thus, the difference is 2 thousands, 2 hundreds, 2 tens, and 3 units, or, as it is written, according to the rules of our notation—

$$2223.$$

3. But suppose that the figures in the less number are not respectively less than the corresponding figure in the other number; we must then proceed somewhat differently.

The method we employ depends upon the following self-evident proposition, or

Axiom.—If two numbers be increased by the same quantity, their *difference* will not be altered.

4. Suppose that it be required to subtract 4789 from 5231.

Place the numbers, one under the other, as before—

$$\begin{array}{r} 5231 \\ 4789 \\ \hline 442 \end{array}$$

9 units in the less cannot be taken from 1 unit of the greater; add, however, 10 units to the 1 unit in the upper, and add 10 to the lower number by changing the 8 in the tens place into a 9. The numbers are now 5 thousands, 2 hundreds, 3 tens, and 11 units; and 4 thousands, 7 hundreds, 9 tens, and 9 units. Now, 9 units from 11 units leave 2 units.

Again, 9 tens cannot be taken from 3 tens, but if we increase the 3 in the tens place of the upper number by ten, and the 7 in the hundreds place in the lower by one, we shall be adding the same quantity (a hundred) to each number, since any figure indicates a number ten times as great as the same figure in a place immediately on its right.

Then 9 tens from 13 tens leave 4 tens.

Again, 8 hundreds cannot be taken from 2 hundreds, but if we increase the 2 in the hundreds place of the upper number by 10, and the 4 in the thousands place in the lower number by 1, we shall be adding the same quantity (a thousand) to each number, for the reason we have already mentioned above.

Then, 8 hundreds taken from 12 hundreds leave 4 hundreds. And 5 thousands from 5 thousands leave nothing.

Hence the difference of the numbers is 4 hundreds, 4 tens, and 2 units; that is, 442.

* 5. The process may also be clearly exhibited as follows:—

$$\begin{array}{l} 5231 = 5 \times 1000 + 2 \times 100 + 3 \times 10 + 1 \\ 4789 = 4 \times 1000 + 7 \times 100 + 8 \times 10 + 9 \end{array}$$

The difference between these numbers is the same as the difference between—

$$\begin{array}{l} 5 \times 1000 + 12 \times 100 + 13 \times 10 + 11 \\ \text{and } 5 \times 1000 + 8 \times 100 + 9 \times 10 + 9 \end{array}$$

For we have added the same quantity to the original numbers, namely:—

$$\begin{array}{l} 10 \times 100 + 10 \times 10 + 10 \text{ i.e., } 1110 \text{ to the upper,} \\ \text{and } 1000 + 100 + 10 \text{ i.e., } 1110 \text{ to the lower.} \end{array}$$

The difference is clearly seen to be, therefore—

$$4 \times 100 + 4 \times 10 + 2$$

i.e., according to the principles of notation, 442.

6. From the above analysis of the process of subtraction will be perceived the truth of the following

Rule for Subtraction.—Write the less number under the greater, so that units may stand under units, tens under tens, etc. Beginning at the right hand, subtract each figure in the lower number from the figure above it, and set down the remainder directly under the figure subtracted. When a figure in the lower number is larger than that above it, add 10 to the upper figure; then subtract as before, and add 1 to the next figure in the lower number.

* Articles 5 and 7 may be omitted until after the lesson on Multiplication has been read.

7. It may be remarked that, instead of adding 1 to the next figure of the lower number in a case where a figure is larger than the one standing above it, it would be the same thing to subtract 1 from the next figure of the upper number.

The truth of this will appear from exhibiting the process of subtracting 4789 from 5231, as follows:—

$$\begin{aligned} 5231 &= 5 \times 1000 + 2 \times 100 + 3 \times 10 + 1 \\ 4789 &= 4 \times 1000 + 7 \times 100 + 8 \times 10 + 9 \end{aligned}$$

The difference of these will be the same as the difference of—

$$\begin{aligned} &4 \times 1000 + 11 \times 100 + 12 \times 10 + 11 \\ \text{and } &4 \times 1000 + 7 \times 100 + 8 \times 10 + 9 \end{aligned}$$

It is evidently—

$$4 \times 100 + 4 \times 10 + 2, \text{ or } 442.$$

Here we have not added anything to either number, but have only arranged the upper one in a *different form*.

The process given in the first rule is the most convenient in practice.

The learner is recommended to analyse the process he uses in the first few examples which he attempts.

8. *Tests of Correctness*.—(1.) Add the remainder to the smaller number; if the result so obtained be equal to the larger number, the work may be presumed to be correct; for it is evident that the smaller number and the remainder are the two parts into which the larger number is divided.

(2.) Subtract the remainder from the greater of the two numbers; if the difference is equal to the less number, the working may be considered to be correct.

EXERCISE 5.

- | | |
|--|---------------------------------|
| 1. From 5843 subtract 2731 | 8. From 96531768 sub. 873625 |
| 2. From 89879 sub. 78654 | 9. From 10000000 sub. 999999 |
| 3. From 51903670 sub. 504089 | 10. From 99999999 sub. 100000 |
| 4. From 9876102 sub. 1050671 | 11. From 83567000 sub. 438567 |
| 5. From 4006723 subtract 5001 | 12. From 34200591 sub. 8888888 |
| 6. From 3601900 sub. 1000000 | 13. From 95246300 sub. 9438675 |
| 7. From 2035024 sub. 27040 | 14. From 76854313 sub. 59798109 |
| 15. From 123456789 subtract 12345678 | |
| 16. From 2468759768 subtract 1123344567 | |
| 17. From 1000000000 subtract 123456789 | |
| 18. From 142857142857 subtract 42857142858 | |
| 19. From 6764 + 3764 take 6500 + 2430 | |
| 20. From 2890 + 8407 take 4251 + 3042 | |
| 21. From 8564 — 2573 take 4431 — 1735 | |
| 22. From 7561 — 2846 take 4734 + 2056 | |
| 23. From 9687 — 3401 take 3021 + 1754 | |

24. What number is that to which 3425 being added, the sum will be 175250?

25. A man having 55000 pounds, paid 7520 pounds for a house, 3260 pounds for furniture, 2375 pounds for a library. How much had he left?

26. A man worth 163250 pounds bequeathed 15200 pounds apiece to his two sons, 16500 pounds to his daughter, to his wife as much as to his three children, and the remainder to an hospital. How much did his wife and how much did the hospital receive?

27. A man bought three farms: for the first he paid 5260 pounds, for the second 3585, and for the third as much as for the first two; he afterwards sold them all for 15280 pounds. How much did he gain or lose?

28. A jockey gave 150 crowns for a horse, and meeting an acquaintance, changed horses with him, giving 37 crowns to boot; meeting another he changed again, receiving 28 crowns to boot; he finally changed again, giving 78 crowns to boot, and then sold his last horse for 140 crowns. What did he lose?

29. Find the difference between every two successive numbers in the squares contained in Ex. 3 on Addition (page 23), taking care always to place the larger number uppermost—that is, for the minuend.

30. Find the difference between a million and a thousand and one.

31. From 4850902 subtract 98998; from the remainder subtract the same number; and from every successive remainder subtract the same number, until a remainder at last be obtained from which it cannot be subtracted; and then, tell how many times the subtraction has been performed.

32. What is the difference between a hundred thousand and ten millions one thousand, and a hundred millions ten thousand and one?

OUR HOLIDAY.

GYMNASTICS.—I. THE BAG AND THE RING EXERCISES.

It is an old and undisputed truth, though one which has frequently been lost sight of, that no system of education is complete unless it provides for the development and strengthening of the bodily powers as well as the mental faculties. Physical training is, in fact, of as much importance as intellectual culture; and, for the real welfare of the individual, the two should go hand in hand. Knowing this, the Greek sought strength as ardently as he strove for wisdom, and the Roman expressed his idea of human perfection in the phrase *mens sana in corpore sano*—"a sound mind in a sound body." It is our design, in our papers on Gymnastics, to give the student some assistance in the practice of physical training, not only as a relief and diversion from his studies, but also as a means of acquiring vigour to pursue them with success. For the influence of the condition of the body upon the powers of the mind is well known, and it will frequently be found that one hour's physical effort in a right direction will do much to assist the scholar in his progress with his books.

Gymnastic training is designed to secure health and strength by the equal development and exercise of the limbs and muscles of the body. Some exercises are better adapted to this purpose than others, the best being those which bring the greater number of organs into play simultaneously; and the student should select for himself, or under the advice of an experienced friend, those which are best suited to his constitution and degree of physical strength. As in the present paper we shall describe only some of the simpler forms of gymnastics, we shall not have occasion now to mention any that may not be practised with advantage by all beginners; but the case may be otherwise with the more advanced exercises to be mentioned hereafter.

One never-failing principle to be observed in all these pursuits, if real advantage is sought to be gained by them, is that a violent or undue strain upon any portion of the body should always be avoided. The exercises should partake of the character of natural and graceful movements; they should proceed by easy gradations from the less to the more difficult; and when the gymnast is really fatigued they should cease at once. These principles we cannot too emphatically impress upon our readers. They should remember that more benefit is derived from moderate exertion than by excessive effort. The modern system of gymnastic training, which has done and is doing so much to make physical education popular and useful, is one of *light gymnastics* chiefly. Some of these exercises we proceed now to describe. We commence with that class of exercises which may be practised without implements or training of any kind. For these as well as for the higher gymnastics the best form of dress is a pair of loosely-fitting trousers or knickerbockers, fastened round the loins by a belt, and a flannel shirt. It is an advantage for the trousers as well as the shirt to be of flannel.

1. The first thing to be done is to acquire the habit of standing in an erect position. Place the legs close together, the heels touching, and the toes turned out at right angles. Hold the head well up, with the eyes looking straight in front; throw the shoulders back, and the chest well forward. Let the arms hang down the sides, the elbows and the little fingers touching the body, and the palms open to the front. Practise this position until it becomes easy and natural.

2. Next, from this position, bring the arms gradually forward, without bending the elbows, until they are level with the chest, and the points of the fingers meet. Then raise the extended arms above the head as far as you can in the form of a semi-circle, bending the elbows as little as possible in the movement. Reverse these actions, bringing the arms back to the body as before.

3. Raise the arms until they are level with the shoulders; then bring them forward until the thumbs meet, and extend them somewhat rapidly back as far as possible, still without bending the elbows. The constant practice of this simple exercise will do much to expand the chest.

4. Practise the same movement, making the palms of the hands meet behind the back each time.

5. Starting from the erect position, bring the arms together with the fingers pointing to the ground; then, keeping the arms

and legs perfectly straight, bend the body forward, with the head towards the ground, and touch the feet with the points of the fingers. When this can be done with ease, touch the floor in the same position. This will be difficult at first, but it will soon be accomplished with a little practice.

6. Place the arms "akimbo;" that is, with the elbows out and the hands resting on the hips. Sink down to the floor until you sit upon your heels, and then rise to the erect position. Repeat this several times in succession.

7. Bring the right arm level with the shoulder; then throw it back, and whirl it round at full length from the body. Exercise the left arm and shoulder in the same way. Then begin by throwing the arm forward, and whirl it as before. Practise the same movements with both arms simultaneously.

8. With the hands on the hips, raise each knee as high as you can, keeping the other leg perfectly straight. Then extend each leg sideways as far as possible, remaining a few seconds in that position.

9. Hop on one foot several times successively, then on the other, keeping the body erect.

These exercises will do much for the beginner in gymnastics, and will also suggest others of a similar description which he may practise with advantage.

We would remark here that the importance of regular walking exercise as a means of strengthening the frame and keeping the system in health must not be lost sight of, in the attention given to purely gymnastic pursuits. No exercise is more salutary in its effects, and it has

the additional recommendation of taking the pedestrian into the fresh air, which is as necessary to the preservation of life and health as a proper supply of food.

We now come to the various kinds of gymnastic exercises which are practised with the aid of apparatus, and will mention first those which require only the simplest appliances, but are still of high utility.

For the introduction of two of these we are indebted to an American physician,



Fig. 1.



Fig. 2.

Dr. Dio Lewis, who has bestowed great attention on gymnastics from a physiological point of view, and whose teaching and principles are being widely adopted in Europe as well as in America. These are the Bag and the Ring exercises, which we shall now describe.

The Bag Exercises, which may be used in families with great benefit, are practised simply with bags filled with beans, the directions for making which are given as follows by Dr. Lewis:—The material is a strong bed-ticking. Bags for young children should be, before sewing, seven inches square; for ladies, nine inches; for ladies and gentlemen exercising together, ten inches; for gentlemen alone, twelve inches. Sew them with strong linen or silk thread, doubled, nearly three-quarters of an inch from the edge, leaving a small opening at one corner to pour in the beans. Fill the bags three-quarters full, and they are ready for use. If used daily, once in two weeks they should be emptied and washed. To allow them to be played with after they are soiled is pretty sure to furnish much dust for the lungs of the players, beside soiling the hands and clothes. There cannot be too much care exercised in regard to this point of cleanliness. Before the beans are used the first time they should be rinsed with water until it runs from them quite clean, when they must be dried; and every month or two afterwards this cleansing should be repeated.

The Bag Exercises should be performed by two persons practising together; and it is an advantage, when the practice is in-doors, to have suspended from the ceiling a hoop or rings,

through which the bags may be thrown. This, however, is not necessary, although it tends to increase the interest of the players in the exercise.

The design of the exercise is to give freedom to the muscles of the chest and arms, and promote a healthy movement of the body generally. For this purpose the bags are thrown from one player to the other, in a variety of positions, which may be left in some measure to their own taste and inclination, provided it be remembered, as a rule, to keep the legs perfectly straight, the body upright, and the chest well thrown forward. This position is exemplified in Fig. 1. Standing thus, the bag may be thrown first with the right arm, then with the left, then with left and right alternately; now, with both hands brought back behind the neck, throw the bag over the head; or, with the bag in the right hand, throw it from behind round the left arm, which is kept straight to the body; throw with the left hand in the same manner; and so on. Fig. 2 represents a more difficult position, from which the bag is thrown over the head. This will come easy to the learner with a little practice.

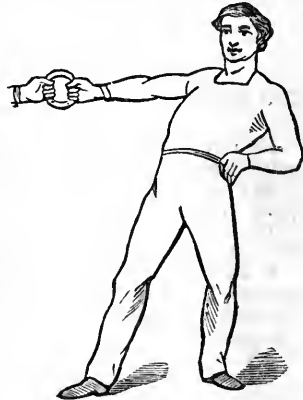


Fig. 3.

We pass on now to the Ring Exercises, which have received very high eulogium, and prove highly amusing as well as beneficial to the players. The ring is made of wood, usually cherry, and is one inch in thickness and six inches in diameter. This is sufficient to enable two persons to grasp it and use it with freedom. All the ring exercises are for two players, who should be of equal or nearly equal strength. Two rings are required in the course of the exercises, each player grasping one in either hand. The rings should be well polished. They are inexpensive articles, being sold occasionally as low as one shilling per pair; and any wood-turner will supply them at a little more than this sum.

We give two figures as examples of the exercises that may be practised with either one or both hands. In the first, the players, standing in the position shown in Fig. 3, both pull hard with the right hand, and draw the right arm from right to left and from left to right; afterwards performing the same movements with the ring held in their left hands. Remember to keep the head well up and the shoulders back, with the feet placed at right angles, in all these movements. In the second example, the players first stand back to back, with the rings held downwards; then each lunges forward with the right leg, and the hands are raised over the head, as shown in Fig. 4. They return to the back-to-back position, and step forward with the left leg in the same manner.

Among other ring exercises may be mentioned the following: The players, standing face to face, and with one foot well advanced, the other thrown back, both pull with one hand and push with the other, alternately; one arm thus being extended to its full length, and the other drawn back as far as possible, at each movement. Then, standing in the same way, draw back with both arms, your partner pushing his as far forward as he can, and each doing this alternately. Standing in an erect position, each raise one hand and lower the other as far as possible, being careful not to bend the elbows. Raise and lower the arms alternately from the position represented in Fig. 4.

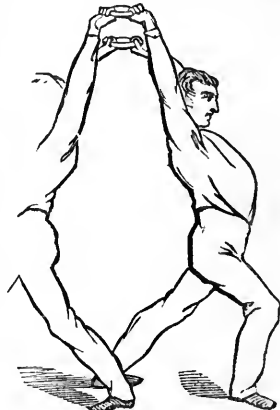
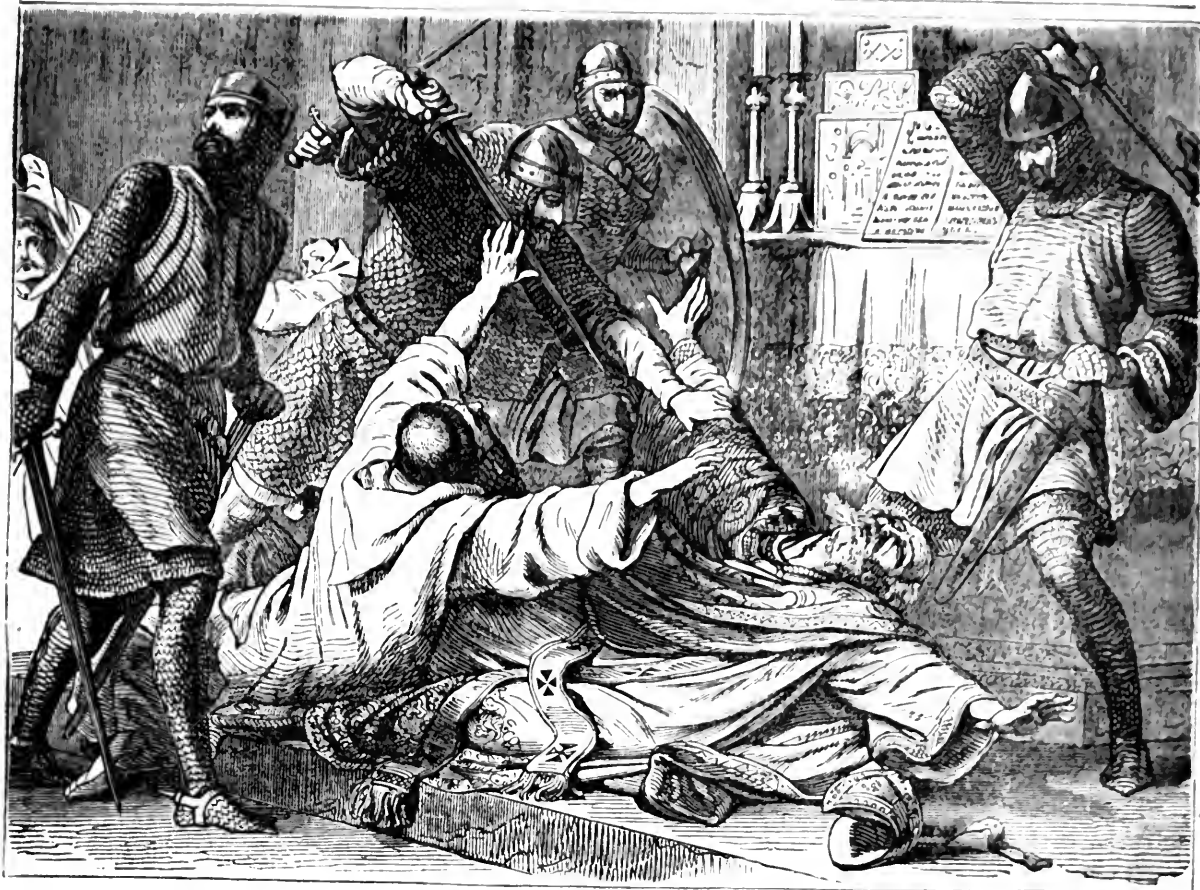


Fig. 4.



THE MURDER OF THOMAS À BECKET.

HISTORIC SKETCHES.—II.

THOMAS À BECKET AND THE CONSTITUTIONS OF CLARENDON.

It was a grand scene that presented itself in Westminister Hall when, in the spring of the year 1163, King Henry II. met Thomas à Becket, Archbishop of Canterbury, and the rest of the bishops of England. On the one side appeared, in all the pomp and magnificence of prelates of the Roman Church, the whole of the representatives of spiritual power in the country; on the other appeared, in an equally magnificent simplicity, the highest representative of the temporal power. Church and State were confronted. Why?

The king had a question to ask the bishops, one in which not he only, nor the people living at the time, but we also, had a keen personal interest; and in order that he might get their collective answer at one and the same time, he bade them meet him at Westminister in a body. The question he had to ask was very simple, but also very important: "Would the bishops conform to the law and ancient customs of the land, or would they not?" Timely warning had been given to the bishops of the nature of the question to be asked, and, under the guidance of the Archbishop of Canterbury, they had framed an answer. They would observe the law and the ancient customs of the realm, *saving their own order*. Only one prelate, Hilary, Bishop of Chichester, was found to give an unqualified answer in the affirmative, and for doing so he received the warm upbraidings of the primate.

Henry, who thought by putting a straightforward question to get an equally straightforward answer, was exceedingly disgusted at the trick of the primate, which left the whole matter as much at large as it had been before the meeting. In vain he tried to change the mind of the bishops; and, baffled in his hope of binding them by their own admissions, he left the hall in a rage, and determined to take other means of bringing them to

submission. To submission! But in what were the bishops opposed to him? What law or ancient custom of the kingdom had they disregarded? What need was there to summon them to Westminister, and to catechise them so severely? Above all, what harm was there in the saving clause inserted by the prelates in their answer, that it should so greatly incense the king? Let us see.

For many years the clergy had been striving to effect in England what they had actually effected in other countries—an independence of the civil courts, and a recognition of their superiority above the civil power. Steadily they worked towards the attainment of these great objects, their doctrine of the superiority of the spiritual over the temporal power ultimately blooming out into an assertion of right even to depose princes, and to absolve subjects from their allegiance. As yet this monstrous claim had not been advanced in England, but steps were being taken which were meant to lead up, and actually did lead up, to it. With some show of colour, perhaps, the clergy claimed that all questions of right to present to ecclesiastical benefices should be tried in the ecclesiastical courts. They also claimed that, as guardians of property which was held for religious purposes, they should not be taxed nor be compelled to do military service, whether in kind or by commutation, nor should they be obliged to sit with laymen in the grand council of the kingdom—that was to say, a House of Lords. The deans and chapters of cathedrals claimed the sole and exclusive right to elect the bishop of their see; privilege of sanctuary both to person and property was claimed for all churches and churchyards; and the clergy also asserted the unquestioned right to excommunicate whomsoever they pleased. These and certain other privileges, of which the tendency was to render clerks in holy orders independent of the state, were not, though pertinaciously advanced, sufficient to arouse the resolute opposition of Henry II. There were two other claims of the churchmen

which, if once allowed, would not only have made the clergy quite independent, but would have given them the opportunity and the means of wholly subverting the kingly power. They said that if a man contracted with another to do a thing, and confirmed his promise by an oath, the fact that the oath was binding only on the conscience gave them jurisdiction, and in this way they drew before the spiritual courts many questions of ordinary contracts, disputes about which ought rightly to have been tried in the king's courts of law, which were open to all comers, and from which an appeal lay to the king himself. The last and most important of the clerical claims, however, was that which asserted that no clergyman could be brought to trial in the king's courts, civil or criminal, for any breach of agreement, however gross, or for any crime, however heinous. If a clerk was accused of crime, and was arraigned before the king's judges, the bishop of the diocese in which the prisoner dwelt sent an order to the judge, notifying him that the man was in orders, and requiring him to surrender the fellow to the bishop's officer. When brought before the spiritual court the prisoner was often allowed to clear himself on his simple oath, uncorroborated by any witness, to the effect that he had not done that of which he was accused. If he confessed, or if the case was clearly proved against him, he was put to penance, sometimes he was put in prison, and sometimes—but rarely—he was degraded from his ecclesiastical rank. In this way crimes of the most abominable kind, and which, if committed by laymen, were punishable with death, were done with comparative impunity when clerks were the offenders. Nor was this all. By means of an absurd test, persons who were not, nor ever meant to be, in holy orders, were admitted to the "benefit of clergy." Ability to read or write, no matter how imperfectly, was taken to be of itself sufficient proof that a man was a clerk, so that a layman arraigned before the king's justices had only to show that he could read or write what was afterwards appropriately called "the neck verse," and he was forthwith handed over to the ordinary to be put to his purgation in the ecclesiastical court.

This monstrous immunity, with its yet more monstrous abuses, was like the last straw that broke the camel's back. So flagrantly unjust was it, both in principle and practice, that all honest men were indignant, and cried aloud for some check upon it. The king, who was by means of it and the other pretended rights of the clergy gradually ceasing to be master in his own dominions, resolved to apply a curb, and to wipe away the scandal. From the time when he mounted the throne in 1154 he had striven to restrain the power of the clergy, and, aided by the clear head and bold hand of his bosom friend Thomas à Becket, had striven not unsuccessfully. Great had been the wrath poured on Becket's head when, as Lord Chancellor of England, he had made havoc altogether of many a pet clerical abuse. Under the idea that he would continue the same policy in a sphere where that policy would have the largest possible scope, Henry offered Becket the archbishopric of Canterbury when that see was vacant in 1161. Becket, it must in fairness be admitted, was very averse to accept the offer, and for thirteen months held out a persistent refusal. Finally, however, he yielded to the earnest solicitations and orders of the king, and was duly installed as Primate at Canterbury.

To the surprise of all men, and to the infinite disgust of the king, Becket from the day of his consecration pursued a totally new course to that he had formerly taken. Nowhere was there so bold an asserter of clerical rights, nowhere a more untiring worker on behalf of the power of the Church. He claimed lands which had once belonged to the see of Canterbury, but which had long been independent and in laymen's hands; he excommunicated* the owner of an advowson for ejecting a priest who had been presented by himself; he asserted the right of the spiritual courts to inquire into questions of contract confirmed by oath; and in every respect he proved himself

to be the exact opposite of what Henry had looked for in him. The case which induced the king to try conclusions with Becket and the clerical party was an exceedingly gross one. A priest in Worcestershire had violated a gentleman's daughter, and afterwards murdered her father. When the scoundrel was about to be brought to trial before the king's justices, Becket claimed him as a clerk, and getting possession of him, degraded him from his priest's office, and then insisted that he could not be tried again in the king's court for the same offence.

These were the circumstances under which King Henry summoned the bishops to Westminster; and the meaning of the words "saving our own order" is sufficiently clear. Henry left the hall in a rage, but it was not an impotent one. By promises, by threats, by various means, he detached most of the prelates from their primate, and he won over the Archbishop of York by significant hints about the next incumbent of the see of Canterbury. Last to give in was Becket, who yielded only to the universal pressure brought to bear upon him, and repented as soon as he had assented. But repentance or no repentance, he did assent, and with the rest of the prelates professed his willingness to observe "the ancient customs of the kingdom"—which did not recognise the clerical claims—and to withdraw the saving clause.

Henry knew with whom he had to deal. He knew that a confession of this sort was quite useless unless it could be embodied in some visible instrument. Taking advantage of his success, of the schism in the Papacy (there were at this time two Popes, one at Rome, the other in France, and Henry played off one against the other), and of the resolute support of the barons, who were only too glad to give the spiritual lords a kick down, Henry summoned the primate and all the bishops to meet him at Clarendon, a village in Wiltshire, and there, being backed, like Stephen de Langton on a later occasion, by "the whole nobility of England," he required their sworn assent to what have been called the Constitutions of Clarendon.

The "Constitutions" were dreadfully hard eating for the bishops, divesting them as they did of nearly all their invidious privileges, some of which it must be confessed were sanctioned by those "ancient customs" which the king had sworn the bishops to observe. Suits concerning advowsons and rights of presentation were to be decided in the civil courts; no clerk, no matter of what rank, was to quit the kingdom without the royal permission; the pretended right to try questions of contracts made on oath was to be renounced; excommunicated persons were not to be made to find security for their residence in any appointed place; laymen were not to be tried in spiritual courts except by approved good witnesses; no chief tenant of the crown to be excommunicated without the king's assent; the final appeal in all spiritual causes to be in the king; prelates to be regarded as barons of the realm, and to be taxed accordingly; bishops not to be elected without the royal assent; the privilege of sanctuary to be curtailed; and clerks accused of any crime to be tried in the king's courts, like other men.

The Great Council of the barons unanimously approved the Constitutions, and, sour as the food was, all the prelates, except the primate, swore to accept it "legally, with good faith, and without fraud or reserve." Becket was resolute, though alone; friends as well as foes besieged his constancy, still he held out; and it was not till Richard de Hastings, Grand Prior of the Templars, a man who seldom bent his knee, even in prayer, went down on his knees and besought him, that he gave in. Unwillingly, and in hope of getting the Pope to annul his oath, he swore like the rest to accept the Constitutions "with good faith, and without fraud or reserve."

Pope Alexander refused to ratify the treaty; he released all who had sworn from their oaths, and threatened to excommunicate everybody who should try to support the king's demands. A long trial of strength ensued. Becket got over to France, and plotted there against his former friend; Henry took the revenues of the hostile bishops into his own hands, and by dint of perseverance managed to keep the clergy in check; and it is probable he would have done very much more than he did had it not been for the brutal murder of Thomas à Becket, which was a blunder as well as a crime.

In the autumn of 1170 Becket had returned to Canterbury, nominally reconciled to the king; but the old question—which should be the greater—being revived, Henry is reported to have said in a hasty moment, "Is there not one of those who eat my

* Excommunication was the expulsion of a man, by the highest ecclesiastical authority, from the communion of Christian men. The rights and comforts of the Church were refused to the excommunicated; the sacraments were not allowed to be administered to him; he was reckoned accursed; and, in times of superstition, he was supposed to be eternally lost if he died without absolution. Excommunication was the great weapon of ecclesiastics, and it was a powerful one in the age of ignorance and moral darkness.

bread that will rid me of this trouble?" To Canterbury with their followers went four knights of Henry's court, and, acting entirely on their own responsibility, slew the archbishop on the steps of the altar.

The outcry raised in England, where the archbishop was looked upon with favour, not only on account of his bold conduct in standing up for his order, but also because he was supposed to be the champion of the Anglo-Saxon against the Norman Englishman, was loud and sincere. Abroad, the feeling of grief was more than equalled by anger, and a sort of holy horror was felt at the bare notion of slaying an archbishop. King Henry, there is every reason to think, was genuinely sorry for the violence that had been done. Though his "guide and his companion, and his own familiar friend" had proved to be the sharpest thorn in his side, he remembered too well the former days to wish him any personal harm. Notwithstanding, on him was charged the whole guilt of the murder. Penance the most severe, disclaimers the most solemn, and ceremonies the most humiliating scarcely served to clear him. Purposely the Papal Court, which saw in Henry the strongest opponent of its pretensions, availed itself of the handle given to it, and strove to crush the king under a load of obloquy. To a very great extent it succeeded. Never again did Henry appear as the same strong champion of Stato rights as when he forced an assent to the Constitutions of Clarendon. The ghost of Thomas à Becket, now St. Thomas of Canterbury, haunted him, and the dead man's hand deprived the conqueror of his victory.

The Constitutions of Clarendon were disregarded, the death of Becket making it impossible for the king to fly in the face of the papal veto upon them. Some little submission of the clerical to the kingly power was made, but the work marked out by Henry II., the entire subjection of the clergy to the head of the state, was left unaccomplished till the dawn of the Reformation in England, when it was renewed and carried out in the fullest possible manner by that "stately lord who broke the bonds of Rome," and who was saved by natural causes from committing, in the case of Cardinal Wolsey, the egregious blunder committed by the knights of Henry II. when they plunged their swords into the bosom of Thomas à Becket at Canterbury.

SYNOPSIS OF EVENTS IN THE LIFE AND REIGN OF HENRY II.

Henry II., son of Geoffrey Plantagenet, Count of Anjou, and Maud, daughter of Henry I., was the fifth King of England after the Conquest, and the first of the Plantagenet dynasty.

Born at Mans, Normandy . . . 1133	Murder of Thomas à Becket
Succession secured to Henry by Stephen . . . 1153	Dec. 30, 1170
Began to reign . . . Dec. 19, 1154	England divided into Judges' Circuits . . . 1176
Becket made Archbishop of Canterbury . . . 1163	Subjugation of Ireland by Henry . . . 1172-5
Conference at Clarendon, Wiltshire . . . Jan. 25, 1164	Died at Chinon, Normandy July 6, 1189

SOVEREIGNS CONTEMPORARY WITH HENRY II.

<i>Denmark, Kings of.</i>	<i>Norway, Kings of.</i>	<i>Scotland, Kings of.</i>
Canute V. . . 1147	Sigurd III. . . 1134	Malcolm IV. . . 1153
Waldemar the Grt. 1157	Magnus V. . . 1164	William . . . 1163
Canute VI. . . 1182	Sverre . . . 1184	
<i>Eastern Empire.</i>	<i>Portugal, Kings of.</i>	<i>Spain, Kings of.</i>
Manuel I. . . 1143	Alfonso I. . . 1139	Alfonso VIII. . . 1126
Alexius II. . . 1169	Sancho I. . . 1183	Sancho III. . . 1157
Andronicus I. . . 1183		Alfonso IX. . . 1158
Isaac II. . . 1185	<i>Rome, Popes of.</i>	
<i>France, Kings of.</i>	Anastatinus IV. . . 1153	
Louis VII. . . 1157	Adrian IV. . . 1154	<i>Sweden, Kings of.</i>
Philip II. . . 1189	Alexander III. . . 1159	Swerker I. . . 1129
<i>Germany, Emperor of.</i>	Lucius III. . . 1181	Eric I. . . 1155
Frederick Bar-barossa . . . 1152	Urban III. . . 1185	Charles VII. . . 1161
	Gregory VIII. . . 1187	Canute. . . 1167
	Clement III. . . 1183	

READING AND ELOCUTION.—II.

PUNCTUATION (continued).

I. THE PERIOD.

1. The Period is a round dot or mark which is always put at the end of a sentence.

2. In reading, when you come to a period, you must stop as if you had nothing more to read.

3. You must stop only as long as you can count *one, two, three, four.*

4. You must pronounce the word which is immediately before a period, with the falling inflection of the voice.

5. The falling inflection (or bending) of the voice is commonly marked by the grave accent, thus, '.

Examples.

- Charles has bought a new hat.
- I have lost my gloves.
- Exercise and temperance strengthen the constitution.
- A wise son makes a glad father.
- The fear of the Lord is the beginning of wisdom.

II. THE NOTE OF INTERROGATION.

?

6. The note or mark of Interrogation is a round dot with a hook above it, which is always put at the end of a question.

7. In reading, when you come to a note of interrogation, you must stop as if you waited for an answer.

8. You must stop only as long as you do at the period.

9. You must in most cases pronounce the word which is placed immediately before a note of interrogation, with the rising inflection of the voice.

10. The rising inflection of the voice is commonly marked by the acute accent, thus, '.

Examples.

- Has Charles bought a new hat?
- Have you lost your gloves?
- Hast thou an arm like God?
- Canst thou thunder with a voice like him?
- If his son ask bread, will he give him a stone?
- If he ask a fish, will he give him a serpent?

11. In general, read declaratory sentences or statements with the falling inflection, and interrogative sentences or questions with the rising inflection of the voice.

Examples.

- Interrogative. Has John arrived?
- Declaratory. John has arrived.
- Interrogative. Is your father well?
- Declaratory. My father is well.
- Interrogative. Hast thou appealed unto Cæsar?
- Declaratory. Unto Cæsar shalt thou go.

12. Sometimes the sentence which ends with a note of interrogation should be read with the falling inflection of the voice.

Examples.

- What o'clock is it?
- How do you do to-day?
- How much did he give for his book?
- Where is Abel thy brother?
- How long, ye simple ones, will ye love simplicity?
- Where wast thou, when I laid the foundations of the earth?

Sometimes the first part of an interrogative sentence should be read with the rising inflection of the voice, and the last part with the falling inflection. These parts are generally separated by a Comma, thus, ,

14. At the comma, the rising inflection is used, and at the note of interrogation the falling inflection.

Examples.

- Shall I give you a peach, or an apple?
- Are you going home, or to school?
- Last Sabbath, did you go to church, or did you stay at home?
- Whether is it easier to say, Thy sins are forgiven, or to say, Arise and walk?
- Why did the heathen rage, and the people imagine vain things?
- Is your father well, the old man of whom ye spake?

15. Sometimes the first part of an interrogative sentence must be read with the falling inflection of the voice, and the last part with the rising inflection.

Examples.

- Where have you been to-day? At home?
- Who told you to return? Your father?
- What is that on the top of the house? A bird?
- What did you pay for that book? Three shillings?
- Is not the life more than meat? and the body than raiment?
- What went ye out to see? A man clothed in soft raiment?
- What went ye out to see? A prophet?
- How often shall my brother sin against me and I forgive him? Until seven times?

16. In the following exercises some of the sentences are questions requiring the *rising*, and some the *falling* inflection of the voice. A few sentences also ending with a period are inserted. No directions are given to the pupil with regard to the manner of reading them, it being desirable that his own understanding, under the guidance of nature alone, should direct him. But it may be observed that questions which can be answered by *yes* or *no*, generally require the *rising* inflection of the voice; and that questions which cannot be answered by *yes* or *no*, generally require the *falling* inflection.

EXERCISE 1.

John, where have you been this morning?
Have you seen my father to-day?
What excuse have you for coming late this morning? Did you not know that it is past the school hour?
If you are so inattentive to your lessons, do you think that you will make much improvement?
Will you go, or stay? Will you ride, or walk?
Shall you go to-day, or to-morrow?
Did he resemble his father, or his mother?
Is this book yours, or mine? His, or hers?
Do you hold the watch to-night? We do, sir.
Did you say that he was armed? He was armed.
Did you not speak to him? I did.
Art thou he that should come, or do we look for another?
Why are you so silent? Have you nothing to say?
Who hath believed our report? To whom hath the arm of the Lord been revealed?

III. THE NOTE OF EXCLAMATION.

!

17. The note or mark of Exclamation is a round dot with an upright dash or stroke above it, which is always put at the end of a sentence expressing surprise, astonishment, wonder, or admiration, or other strong feelings.

18. In reading, when you come to a note of exclamation, you must stop in the same manner as if it were a note of interrogation.

19. You must stop only as long as you do at a period.

20. You must generally pronounce the word which comes immediately before a note of exclamation with the *falling* inflection of the voice.

Examples.

How cold it is to-day!
What a beautiful house that is!
How brightly the sun shines!
How mysterious are the ways of God!
How are the mighty fallen in the midst of the battle!
How are the mighty fallen, and the weapons of war perished!
Would God I had died for thee, O Absalom, my son, my son!
Oh, what a fall was there, my countrymen!
It is a dread and awful thing to die!
Oh! deep enchanting prelude to repose!
The dawn of bliss the twilight of our woes!
Lovely art thou, O Peace! and lovely are thy children; and lovely are thy footsteps in the green valleys!

21. In our remarks on the period, the student was taught that when he comes to a period, he must stop, as if he had nothing more to read. At the end of a paragraph, whether the period or any other mark be used, a longer pause should be made than at the end of an ordinary sentence. The notes of interrogation and exclamation generally require pauses of the same length with the period.

It may here be remarked, that good readers always make their pauses long; but whatever be the length of the pause, the pupil must be careful that every pause which he makes shall be a total cessation of the voice.

EXERCISE 2.

The sentences to be read as if marked.

George is a good boy. He learns his lesson well. He is attentive to the instructions of his teacher. He is orderly and quiet at home.

A good scholar is known by his obedience to the rules of the school. He obeys the directions of his teacher. His attendance at the proper time of school is always punctual. He is remarkable for his diligence and attention. He reads no other book than that which he is desired to read by his master. He studies no lessons but those which are appointed for the day. He takes no toys from his pocket to amuse himself or others. He pays no regard to those who attempt to divert his attention from his book.

Do you know who is a good scholar? Can you point out many

in this room? How negligent some of our fellow-pupils are! Ah! I am afraid many will regret that they have not improved their time!

Why, here comes Charles! Did you think that he would return so soon? I suspect that he has not been pleased with his visit. Have you, Charles? And were your friends glad to see you? When is cousin Jane to be married? Will she make us a visit before she is married? Or will she wait until she has changed her name?

My dear Edward, how happy I am to see you! I heard of your approaching happiness with the highest pleasure. How does Rose do? And how is our whimsical old friend the Baron? You must be patient and answer all my questions. I have many inquiries to make.

The first dawn of morning found Waverley on the esplanade in front of the old Gothic gate of the castle. But he paced it long before the drawbridge was lowered. He produced his order to the sergeant of the guard, and was admitted. The place of his friend's confinement was a gloomy apartment in the central part of the castle.

Do you expect to be as high in your class as your brother? Did you recite your lessons as well as he did? No! Lazy boy! Careless child! You have been playing these two hours. You have paid no attention to your lessons. You cannot say a word of them. How foolish you have been! What a waste of time and talents you have made!

LESSONS IN GEOMETRY.—II.

DEFINITIONS (continued).

9. An *angle* is the inclination of two straight lines to each other, which meet in a point, and are not in the same direction. The point in which they meet is called the *vertex* of the angle, and each of the two straight lines is called a *side* or *leg* of the angle. The angle itself is generally called a *plain rectilineal angle*, because it necessarily lies in a plain, and is formed of straight lines. *Curvilineal angles* are such as are formed on the surface of a sphere or globe; but the consideration of such angles belongs to the higher geometry. The magnitudes of angles do not depend on the lengths of their legs or sides, but on the degree or amount of aperture between them, taken at the same distance from the vertex.

An angle is generally represented by three letters, one of which is *always placed* at the *vertex*, to distinguish it particularly from every other angle in a given figure, and the other two are placed somewhere on the legs of the angle, but generally at their extremities; and in reading or in speaking of the angle, the letter at the vertex is always placed between the other two, and uttered or written accordingly. Thus, in Fig. 4, which represents an angle, the name of the angle is either B A C or C A B: the point A is called its vertex; and the straight lines B A, C A, its sides or legs.

10. Angles are divided into two kinds, *right* and *oblique*, and oblique angles are divided into two species, *acute* and *obtuse*.

When one straight line meets another, at any point between its extremities, and makes the adjacent or contiguous angles equal to each other, each of them is called a *right angle*, and the legs of each of these angles are said to be *perpendicular* to one another. Thus, in Fig. 5, the straight line A B meets the straight line C D in the point A, and makes the adjacent angles C A B, D A B, equal to each other; each of these angles is therefore called a *right angle*; and the straight line A B is said to be *perpendicular* to the straight line A C, or D A, and consequently A C or A D is perpendicular to A B.

When one straight line meets another, at any point between its extremities, and makes the adjacent angles unequal to each other, each of them is called an *oblique angle*; that which is greater than a right angle is called an *obtuse angle*; and that

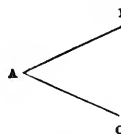


Fig. 4.

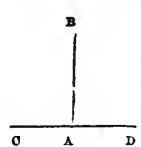


Fig. 5.

which is less than a right angle is called an *acute angle*. Thus, in Fig. 6, the straight line A B meets the straight line C D in the point A, and makes the adjacent angles unequal to each other; each of these angles is therefore called an *oblique angle*; the angle C A B, which is greater than a right angle, is called

obtuse; and the angle $D A B$, which is less than a right angle, is called *acute*.

11. A *plane figure*, in geometry, is a portion of a plane surface, inclosed by one or more lines or boundaries. The sum of all the boundaries is called the *perimeter* of the figure, and the portion of surface contained within the perimeter is called its *area*.

12. A *circle* is a plane figure contained or bounded by a *curved line*, called the *circumference* or *periphery*, which is such that all straight lines drawn from a *certain point* within the figure to the circumference are equal to each other. This point

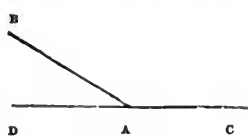


Fig. 6.

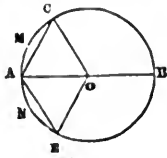


Fig. 7.

is called the *centre of the circle*, and each of the straight lines is called a *radius* of the circle. The straight line drawn through the centre and terminated at both ends in the circumference, is called the *diameter of the circle*.

It is plain, from the definition, that all the radii must be equal to each other, that all the diameters must be equal to each other, and that the diameter is always double the radius. In speaking or writing, the circle is usually denoted by three letters, placed at any distance from each other, around the circumference; thus, in Fig. 7, the circle is denoted by the letters $A C B$, or $A E B$; or by any three of the other letters on the circumference. The point O is the centre; each of the straight lines $O A, O B, O C, O E$, is a radius, and the straight line $A B$ is a diameter.

13. An *arc of a circle* is any part of its circumference; its *chord of an arc* is the straight line which joins its extremities.



Fig. 8.



Fig. 9.



Fig. 10.



Fig. 11.

14. A *segment of a circle* is the surface inclosed by an arc and its chord.

15. A *sector of a circle* is the surface inclosed by an arc, and the two radii drawn from its extremities.

Thus, in Fig. 7, the portion of the circumference $A M C$, whose extremities are A and C , is an arc; and the remaining portion $A B C$, having the same extremities, is also an arc; the straight line $A C$ is the chord of either of these arcs. The surface included between the arc $A M C$ and its chord $A C$, is the segment $A M C$; there is also the segment $A B C$. The surface included between the radii $O C, O B$, and the arc $C B$, is called the sector $C O B$; the remaining portion of the circle is also a sector.

16. A *semicircle* is the segment whose chord is a diameter. Thus, in Fig. 7, $A C B$ or $A E B$ is a semicircle. The term *semicircle*, which literally means *half a circle*, is restricted in

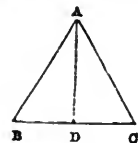


Fig. 12.

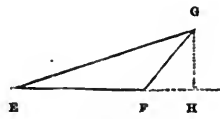


Fig. 13.

geometry to the segment thus described; but there are many other ways of obtaining half a circle.

17. *Plane rectilinear figures* are described under various heads; as *trilateral* or *triangular*; *quadrilateral* or *quadrangular*; and *multilateral* or *polygonal*.

18. A *triangle* (Figs. 8, 9, 10, and 11) is a *plane rectilinear figure* contained by three straight lines, which are called its sides. No figure can be formed of two straight lines; hence, an angle is not a figure, its legs being unlimited as to length. Triangles are divided into various kinds, according to the relation of their sides or of their angles: as *equilateral* (Latin,

aequus, equal, and latus, a side); *isosceles* (Greek, *isos, equal, and skelos, a leg*); and *scalene* (Greek, *skalēnos, unequal*), *right-angled*, *obtuse-angled*, and *acute-angled*.

19. An *equilateral* (equal-sided) triangle is that which has three equal sides (Fig. 8).

20. An *isosceles* (equal-legged) triangle is that which has only two equal sides (Fig. 9).

21. A *scalene* (unequal) triangle is that which has all its sides unequal (Fig. 10).

22. A *right-angled triangle* is that which has one of its angles a right angle (Fig. 11), in which the angle at A is the right

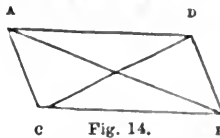


Fig. 14.

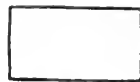


Fig. 15.



Fig. 16.

angle. The side opposite to the right angle is called the *hypotenuse* (the subtense, or line stretched under the right angle), and the other two sides are called the *base* and the *perpendicular*; the two latter being interchangeable according to the position of the triangle.

23. An *obtuse-angled triangle* is that which has one of its angles an obtuse angle (Fig. 10).

24. An *acute-angled triangle* is that which has all its angles acute; Figs. 8 and 9 are examples as to the angles, but there is no restriction as to the sides.

In any triangle, a straight line drawn from the vertex of one of its angles perpendicular to the opposite side, or to that side produced (that is, extended beyond either of its extremities in a continued straight line), is called the *perpendicular of the triangle*; as in Fig. 12, where the dotted line $A D$ is the perpendicular of the triangle $A B C$; and in Fig. 13, where the dotted line $G H$ drawn from the point G to the dotted part of the base produced is the perpendicular of the triangle $E F G$.

25. A *quadrilateral figure*, or *quadrangle*, is a *plane rectilinear*

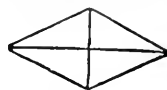


Fig. 17.

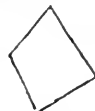


Fig. 18.

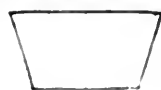


Fig. 19.

figure contained by four straight lines, called its sides. The straight line which joins the vertices of any two of its opposite angles, is called its *diagonal*. Quadrangles are divided into various kinds, according to the relation of their sides and angles; as *parallelograms*, including the *rectangle*, the *square*, the *rhombus*, and the *rhomboid*; and *trapeziums*, including the *trapezoid*.

26. A *parallelogram* is a *plane quadrilateral figure*, whose opposite sides are parallel; thus, Fig. 14, $A C B D$, is a parallelogram, and $A B, C D$, are its diagonals.

27. A *rectangle* is a *parallelogram*, whose angles are right angles (Fig. 15).

28. A *square* is a *rectangle*, whose sides are all equal (Fig. 16).

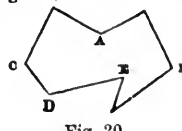


Fig. 20.



Fig. 21.



Fig. 22.

29. A *rhomboid* is a *parallelogram*, whose angles are oblique. The *opposite angles* of a rhomboid are equal to one another (Fig. 14).

30. A *rhombus*, or *lozenge*, is a *rhomboid*, whose sides are all equal (Fig. 17).

31. A *trapezium* is a *plane quadrilateral figure*, whose opposite sides are not parallel (Fig. 18).

32. A *trapezoid* is a *plane quadrilateral figure*, which has two of its sides parallel (Fig. 19).

33. A *multilateral figure*, or *polygon*, is a *plane rectilinear figure*, of any number of sides. The term is generally applied to any figure whose sides exceed *four* in number. Polygons are

divided into *regular* and *irregular*; the former having all their sides and angles equal to each other; and the latter having any variation whatever in these respects. The sum of all the sides of a polygon is called its *perimeter*, and when viewed in position its *contour*. Irregular polygons are also divided into *convex* and *non-convex*; or, those whose angles are all *salient*, and those of which one or more are *re-entrant*. The irregular polygon (Fig. 20) has its angles at B, C, and D, salient; and its angles at A and E, re-entrant.

34. Polygons are also divided into classes, according to the number of their sides; as, the *pentagon* (Fig. 21), having five sides; the *hexagon* (Fig. 22), having six sides; the *heptagon* having seven sides; the *octagon* having eight sides; and so on. According to this nomenclature, the triangle is called a *trigon*, and the quadrangle a *tetragon*.

LESSONS IN ARITHMETIC.—IV.
MULTIPLICATION.

1. THE repeated addition of a number or quantity to itself is called *multiplication*. Thus, the result of the number 5, for instance, added to itself 6 times, is said to be 5 multiplied by 6. $5 + 5 + 5 + 5 + 5 + 5 = 30$, or 5 multiplied by 6 is 30.

When the numbers to be multiplied are large, it is evident that the process of addition would be very laborious. The process of *multiplication* which we are going to explain is therefore, in reality, a short way of performing a series of additions. Let it, then, be borne in mind, that multiplication is, in fact, only addition.

2. *Definitions*.—The number to be repeated or *multiplied* is called the *multiplicand*. The number by which we multiply is called the *multiplier*: it, in fact, indicates how many times the multiplicand is to be repeated, or added to itself. The number produced by the operation is called the *product*. The multiplier and multiplicand are also called the *factors* of which the product is composed, because they *make* the product.

Thus, since 5 multiplied by 6 is 30, 5 and 6 are called factors of the number 30.

The sign \times placed between two numbers means that they are to be multiplied together.

3. Before proceeding farther, the learner must make himself familiar with the following table, which gives all products of two numbers up to 12:—

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

To determine the product of any two numbers by the above table, find one of the numbers in the top line reading across the page, and then find the other in the line on the left hand which runs down the page. Follow the column down the page in which the first number stands, and the column across the page in which the second number stands. The number standing in the square where these two columns meet is the product of the two numbers.

Thus, to find the product of 4 multiplied by 6; 4 in the top

line and 6 in the left-hand line stand in lines which meet in a square containing 24, which is therefore the product of 4 multiplied by 6.

It may be observed that 6 in the top line and 4 in the left-hand side line stand in lines which meet in a square also containing 24. The reason of this is that when the product of two numbers is required, it is indifferent which we consider to be the multiplier and which the multiplicand. Thus, 4 added to itself 6 times, is the same as 6 added to itself 4 times. The truth of this may be seen, perhaps, more clearly as follows:—

If we make four vertical rows containing six dots each, as represented in the figure, it is quite evident that the whole number of dots is equal either to the number of dots in a vertical row (6) repeated 4 times, or to the number of dots in an horizontal row (4) repeated six times. And the same is clearly true of any other two numbers.

Hence we talk of two numbers being multiplied together, it being indifferent which we consider to be the multiplier and which the multiplicand.

4. If several numbers be multiplied together, the result is called the *continued product* of the numbers. Thus, 30 is the continued product of 2, 3, and 5, because $2 \times 3 \times 5 = 30$.

N.B. On learning the multiplication table, let the following facts be noticed:—

The product of any number multiplied by 10 is obtained by adding a cipher to the number.

The results of multiplying by 5 terminate alternately in 5 and 0. The first nine results of multiplying by 11 are found by merely repeating the figure to be multiplied. Thus, 11 times 7 are 77.

In the first ten results of multiplying by 9 the right hand figure regularly decreases, and the left hand figure increases by 1; also, the sum of the digits is 9. Thus, 9 times 2 are 18, 9 times 3 are 27.

5. It is evident that [as $2 \times 3 \times 5 = 30$, and $2 \times 3 = 6$, and $6 \times 5 = 30$] in multiplying any number, 5, for instance, by another, 6, for instance, it will be the same thing if we multiply it successively by the factors of which the second is composed. Thus, the product of any number multiplied by 28 might be got by multiplying it first by 7, and then multiplying the result by 4.

The product of any number multiplied by 10 is obtained by annexing a cipher to the number. The product of any number, therefore, multiplied by 100 will be obtained by adding two ciphers, because $10 \times 10 = 100$; first multiplying by 10, adds one cipher, and then multiplying the result by 10 adds another cipher. Similarly a number is multiplied by any multiplier which consists of figures followed by any number of ciphers, by first multiplying by the number which is expressed by the figures without the ciphers, and then annexing the ciphers to the result. Thus, 5 times 45 being 225, we know that 500 times 45 is 22500.

6. The process of multiplication which we now proceed to explain, depends upon the self-evident fact that if the separate numbers of which a number is made up be multiplied by any factor, and the separate products added together, the result is the same as that obtained by multiplying the number itself by that factor. Thus—

$$5 + 4 + 2 = 11$$

$$7 \times 5 = 35, 7 \times 4 = 28, 7 \times 2 = 14.$$

$$35 + 28 + 14 = 77 = 7 \times 11.$$

7. We shall take two cases: first, that in which the multiplier consists only of one figure; and, secondly, when it is composed of any number of figures.

Case 1.—Required to multiply 2341 by 6.

$2341 = 2$ thousands + 3 hundreds + 4 tens + 1 unit.

Multiplying these parts separately by 6, we get 6 units, 24 tens, 18 hundreds, and 12 thousands, which, written in figures and placed in lines for addition, are—

6
240
1800
12000

Giving as the result 14046

The process may be effected more shortly, as follows, in one line; the reason for the method will be sufficiently apparent from the preceding explanation:—

Writing the numbers as in the margin, proceed thus: 6 times 1 unit are 6 units; write the 6 units under the figure multiplied. 6 times 4 tens are 24 tens; set the 4 or right-hand figure under the figure multiplied, and carry the 2 or left-hand figure to the next product, as in addition. 6 times 3 hundreds are 18 hundreds, and 2 to carry make 20 hundreds; set the 0 under the figure multiplied, and carry the 2 to the next product, as above. 6 times 2 thousands are 12 thousands, and 2 to carry make 14 thousands. There being no more figures to be multiplied, set down the 14 in full, as in addition. The required product is 14046.

Before proceeding to the second case, the learner is requested to make himself familiar with the process of multiplying any number by one figure, by means of the following

EXERCISE 6.

- (1.) Multiply 83 by 7; 549 by 5; 6879 by 9; 7891011 by 8; 567893459 by 3; 9057832917 by 11, and the result by 7.
- (2.) Find the continued product of 1, 2, 3, 4, 5, 6, 7, 3, 9.
- (3.) Find the products of the number 142857 by the nine digits.
- (4.) Find the products of the number 98998, the smallest number contained in the second square in Ex. 4, page 23, by the nine digits, and you will find these products in the same table.
- (5.) Multiply 857142 by 9; 76876898 by 2; 1010400600 by 7; 79806090 by 8; and 99999999999 by 5.
- (6.) Multiply the following numbers first by 2 and then by 3:—

1. 58745	4. 900195	7. 1967311	10. 29007633
2. 63294	5. 354764	8. 4192093	11. 42765401
3. 82563	6. 823073	9. 8765437	12. 22663973

- (7.) Multiply the following numbers first by 4 and then by 5:—

1. 42837	4. 323599	7. 9988776	10. 19977991
2. 54012	5. 765102	8. 4039007	11. 83215946
3. 89645	6. 358455	9. 2595139	12. 18671868

- (8.) Multiply the following numbers first by 6 and then by 7:—

1. 54735	4. 839768	7. 9611437	10. 73689202
2. 49236	5. 467453	8. 3902914	11. 12345678
3. 36523	6. 370223	9. 7856374	12. 91223344

- (9.) Multiply the following numbers first by 8 and then by 9:—

1. 73924	4. 995323	7. 6778899	10. 79911997
2. 21045	5. 201567	8. 7129304	11. 64951238
3. 54698	6. 554853	9. 9315925	12. 89012345

(10.) I have a box divided into two parts; in each part there are three parcels; in each parcel there are four bags; in each bag there are five marbles. How many marbles are there in the box?

(11.) There are six farmers, each of whom has a grazing farm of seven fields; each field has eight corners, and in each corner there are nine sheep. How many sheep do the farmers own, and how many are feeding on their farms?

Case 2.—To multiply 675 by 337:—

Since 337 is 300 + 30 + 7, if we multiply 675 by 7, by 30, and by 300 successively, we shall obtain the required product. Arrange the work as in operation (1):—

(1.)	675	(2.)	675
	337		337
	4725 = 675 × 7		4725
	20250 = 675 × 30		2025
	202500 = 675 × 300		2025
			227475
	Hence 227475 = 675 × 337		

In working by this method it is unnecessary to write down the one nought at the end of the second line, and the two noughts at the end of the third line, etc., as in operation (1), if we only place each line one figure to the left of the one preceding, so that the work appears as in operation (2):—

The above examples will be sufficient to explain the truth of the following

Rule for Multiplication.—

- (1.) When the multiplier consists of one figure, write it down under the unit's place of the multiplicand. Begin at the right hand, and multiply each figure of the multiplicand by the multiplier, setting down the result and carrying as in addition.
- (2.) When the multiplier consists of more than one figure, write down the multiplier under the multiplicand, units under units, tens under tens, etc. Multiply each figure of the multiplicand by each figure of the multiplier separately, beginning with the units, and write the products so obtained in separate lines,

placing the first figure of each line directly under the figure by which you multiply. Finally, adding these lines together, their sum will be the whole product of the two given numbers.

8. Method of testing the Correctness of the result.—Multiply the multiplier by the multiplicand, and if the product thus obtained be the same as the other product, the work may be presumed to be correct.

9. Multiplication by reversing the Multiplier.—It may be remarked that multiplication may be performed by commencing with the last figure (that is, the extreme left-hand figure) of the multiplier, instead of with that in the unit's place. In this case however, as will be seen from an example, we must set down each line one figure to the right of the preceding line.

Thus, in multiplying 2221 by 1234, we may proceed as follows, as in operation (1), beginning with the left-hand figure of the multiplier; or we might, to avoid confusion, reverse the multiplier, as in operation (2), and proceed in the same way. The ciphers which we omit in practice are added in the last operation, to explain the truth of the process.

EXERCISE 7.

- (1.) Find the products of the following numbers:—

1. 463 × 45	18. 1534993 × 4703
2. 348 × 62	19. 142857 × 70909
3. 793 × 86	20. 7050969 × 70508
4. 959 × 99	21. 10101910 × 29292
5. 75 × 42 × 56	22. 98549050 × 97290
6. 84 × 37 × 69	23. 53970099 × 75300
7. 7198 × 256	24. 99999999 × 99099
8. 93186 × 445	25. 6785634999 × 1000000
9. 99999 × 999	26. 3959925683 × 799301
10. 7422153 × 463	27. 7684929999 × 100007
11. 76854 × 890	28. 1428578983 × 987654
12. 99763 × 700	29. 999599995 × 2468103
13. 3854 × 3854 × 3854	30. 14285714287 × 7985941
14. 9264997 × 9584	31. 10101010990 × 100101000
15. 9597340 × 7071	32. 707699999 × 9999970
16. 999999 × 9999	33. 399919993999 × 40010002000
17. 6922967 × 9900	

- (2.) Multiply 2354 by 6789, and 23789 by 365, by reversing the multiplier.

- (3.) Multiply 857142 by 19, by 23, by 48, by 97, by 103, by 987, and by 4567.

- (4.) Find the products of the number 98998 by all the numbers from 11 to 49 inclusive. The answers will be found in the second square given in Ex. 4, page 23, on Addition.

LESSONS IN BOTANY.—II.

SECTION II.—ON THE SCIENTIFIC CLASSIFICATION OF VEGETABLES.

THE observer who takes a survey of the various members of the vegetable world becomes cognisant of at least one prominent distinction between them. He soon perceives, that whilst certain vegetables have flowers others have not; or perhaps, more correctly speaking, if the second division really possess flowers, they are imperceptible.

This distinction was first laid hold of as a basis of classification by the celebrated Linnæus, and to this extent the classification adopted by that great philosopher was strictly natural; beyond this, however, it was altogether artificial, as we shall find hereafter.

Now, taking advantage of this distinction, the great Swedish naturalist termed the evident flowering vegetables *phanogamous*, from the Greek word φαειναι (*phai-nai*), I appear; or, *phanerogamous*, from the Greek word φανερός (*phan'-er-os*), evident; and he designated the non-flowering, or more correctly speaking, the non-evident flowering plants, by the word *cryptogamic*, from the Greek word κρυπτός (*kryptos*), concealed. The further classification of Linnæus was artificial, as we have already stated. The nature of this classification we cannot study with advantage just yet. Hereafter we shall proceed to explain the principles on which it was based; but in these

lessons the artificial system of Linnæus will not be adopted as a basis for teaching the science. In point of fact, the Linnæan system may now be considered as obsolete. In making this division of plants into evident-flowering and non-evident flowering, or phanogamous and cryptogamic, the learner must take care not to fall into mistakes. He must greatly expand his common notions of a flower, and not restrict the appellation to those pretty floral ornaments which become objects of attraction, and of which bouquets are made. On the contrary, he must admit to the right of being regarded as a flower any floral part, however small, even though a lens should prove necessary for the discovery. Thus, in common language, we do not usually speak of the oak, and the ash, and the beech, elm, etc., as being flower-bearing trees; but they are, nevertheless; and consequently belong to the first grand division of *evident flower-bearing*, or phanogamous or phanerogamous plants. In point of fact, the learner may remember as a rule, to which there are no excep-

and-by)—let him turn the lower surface of the frond uppermost, and there will be seen many rows of dark stripes. These are termed *sporidia*, and they contain the sporules of the plant, which sporules therefore may be got by opening the sporidia. Sporules, when regarded by the naked eye, look almost like dust; when examined under a microscope, however, their outline can be easily recognised. The difference between a *sporidium* (singular of *sporidia*) and a real seed may be thus explained. A seed has only one part (the embryo or germ) from which the young plant can spring; whereas a sporule does not refuse to sprout from *any* side which may present itself to the necessary conditions of earth and moisture.

Although the sporules are thus easily discoverable in the fern tribe, yet the botanical student must not expect to find them thus readily in other members of the cryptogamic tribe, in various members of which not only does their position vary, but their presence is totally undiscoverable.



THE BANYAN TREE.

tions, that every member of the vegetable world which bears a fruit, and consequently seeds, belongs to the phanerogamous division. By following the indications of this rule, we restrict the *cryptogamic*, or non-evident-flowering plants, to the seemingly narrow limits of ferns, mushrooms, mosses, and a few others, all of which are devoid of seeds, properly so called, but are furnished with a substitute for seeds, termed *sporules* or *spores*. Sporules, then, the learner may remember, are, so to speak, the seeds of flowerless and therefore seedless plants. In the study of botany we meet with a great many hard, but useful terms; they will spring up in our path often enough, therefore let us shoot them flying whenever we have a chance, and fix them on some sort of memory-peg, even although the latter may be a joke.

If the reader wishes to ascertain what these sporules are like, let him take the leaf of a fern—which, by the way, is no leaf at all, but a frond (we will explain the meaning of this term by-

SECTION III.—ON THE ORGANS OF VEGETABLES.

Vegetable organs admit of the very natural division into those intended for nutriment and growth, and those intended for propagation. Hence we may speak of them as nutritive and reproductive organs. Nutritive organs consist of leaves, stems, branches, roots, and various appendages to all of these, hereafter to be described; whilst the reproductive organs of vegetables are flowers and their appendages.

The Root.—We have already seen that it does not suffice to constitute a root that the portion of the vegetable treated of be underground. Thus, for example, as it was remarked in the preceding lesson, the potato is not a root, but a tuber; an onion is not a root, but a bulb.

A root may be defined as a filamentous or thread-like (Latin *filum*, a thread) offset from the descending axis of the plant, differing from the stem itself in certain relations of a botanical structure, and each filament ending in a soft absorbent tuft

denominated the spongiole, the function of which consists in absorbing moisture, and conveying it into the structure of the plant. Hence the chief and primary use of the root is that of nutrition; but it also serves as a means of enabling the plant to take firm hold of the earth in which it grows. Representations of various roots are shown in Figs. 5, 6, 7, 8, and 9.

In most cases, the part at which the stem ends and the root begins is well defined. It is denominated the *collar*. Although the general characteristic of the root is to seek the ground, as the characteristic of the stem is to seek the air, nevertheless stems frequently assume a tendency to become roots, and roots to become stems. A very remarkable example of the former tendency is furnished by the banyan tree, or *ficus religiosa*, a native of India. This tree has a natural tendency to shoot down prolongations from its stem, which, taking root, cover the ground with an arbour-like growth of most fantastic appearance. The opposite tendency is recognisable in certain varieties of the elm, which shoot up sprouts from the root over large tracts of ground in the vicinity of the parent trunk, very much to the annoyance of the farmer, whose land is thus considerably damaged. Although the essential characteristic of a stem is to ascend into the air, yet certain forms of stem in some vegetables exist underground; of this kind are ginger, and the so-called orris-root. Stems of this kind are known in botany by the appellation of *rhizomes* (Fig. 3).

Usually the root is attached by the collar to an ascending stem, from which latter proceed the leaves; in certain plants, however—for instance, the primrose—there is no ascending stem, but an horizontal, underground one (the rhizome) takes

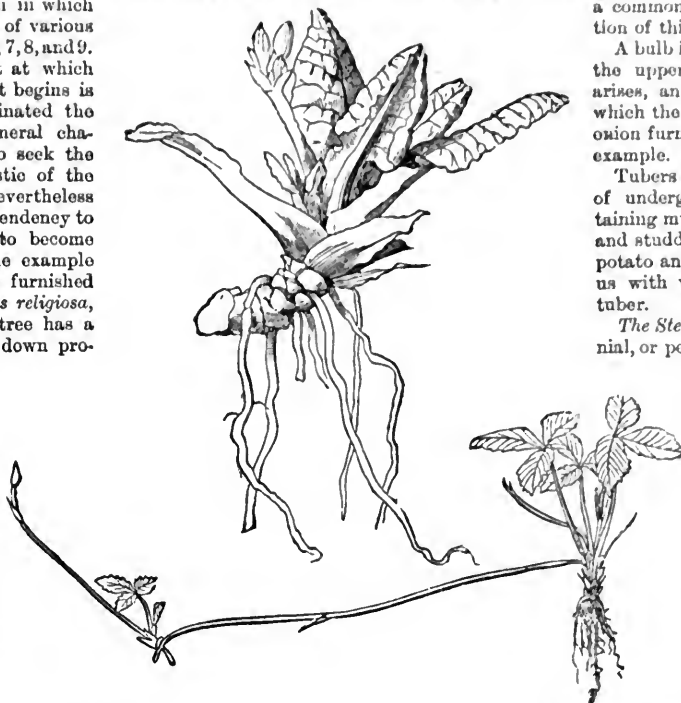
say, *stole*-bearing, which expression requires the previous explanation of the word *stole*. A *stole*, then, is a little stem which springs from the axilla (literally, arm-pit), or point at which the leaves spring from the stem. The strawberry (Fig. 4) affords a common and well-marked illustration of this kind of root.

A bulb is an underground bud, from the upper part of which the stem arises, and from the lower part of which the root descends (Fig. 7). The onion furnishes us with a very familiar example.

Tubers or tubercles are expansions of underground stems, usually containing much fecular or starchy matter, and studded with eyes or buds. The potato and the dahlia (Fig. 8) furnish us with very familiar examples of a tuber.

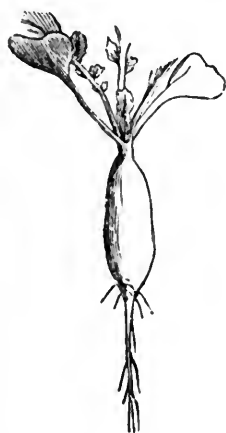
The *Stem* may be either annual, biennial, or perennial. It is termed annual when it becomes developed in the spring and dies before the winter, as, for instance, is the case with wheat; biennial, when it lives two years; of this kind is the carrot, which during the first year only produces leaves, and having lived two years flowers and dies. Perennial stems are those which live many years, as is the case with trees in general. As regards their hardness, trunks or stems are usually divided into herbaceous (Latin, *herba*, grass), sub-ligneous, and ligneous

(Latin, *lignum*, wood). Herbaceous stems are those in which woody fibre is almost altogether absent, and which are therefore soft and juicy; of this kind is the stem of parsley, hemlock, etc. Subligneous stems are those in which woody fibre, although present, does not exist in the smaller shoots; of this kind are sage and rue, the bases of the stems of which are hard and woody, and therefore continue for many years, whereas the

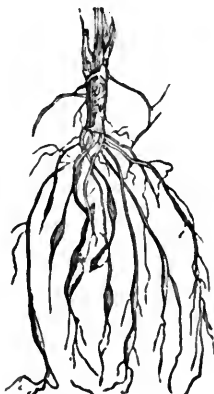


3. RHIZOME AND ROOT-LEAVES OF THE PRIMROSE.

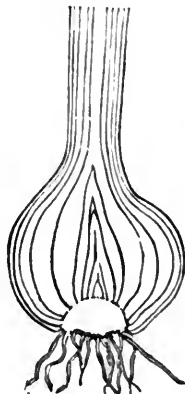
4. STOLONIFEROUS ROOT OF THE STRAWBERRY.



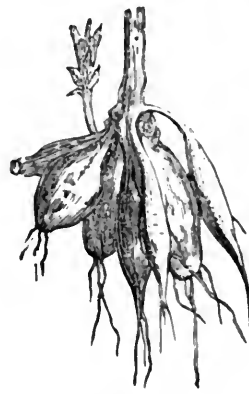
5. RADISH. SPINDLE-SHAPED ROOT.



6. DROPWORT. KNOTTY ROOT.



7. ONION. BULB WITH FILAMENTOUS ROOT.



8. DAHLIA. TUBEROUS ROOT.



9. PASTURE GRASS. FIBROUS ROOT.

its place, and from this the leaves immediately grow; such leaves are then termed "radical," that is to say, proceeding from the root, and the plant itself is said to be acauliferous, from the Greek privative α , without, and the Latin word *caulis*, a stem.

Sometimes the root is said to be "stoloniferous," that is to

smaller branches and their extremities annually perish, and as often become renewed.

Shrubs are ligneous plants, the stems of which throw off an undergrowth of stems and flowers at their base, and which never attain any considerable dimensions. Of this kind, for example, are rose-trees.

LESSONS IN FRENCH.—IV.

SECTION I.—FRENCH PRONUNCIATION (continued).

III. NAME AND SOUND OF THE VOWELS (continued.)

36. BEFORE proceeding to the illustration of the sound and use of *e* mute or unaccented, let us commend the following extract to the careful perusal of the pupil. Speaking of the unaccented *e*, it is said—"Several of our best orthoepists express themselves thus on that subject:—"The proper utterance of the unaccented *e* characterises, in part, the pronunciation of the gentleman, as the vicious one marks the low-bred and ignorant. The unaccented *e* is sometimes pronounced and sometimes not; and in that consists a great difficulty for foreigners, who, always pronouncing it full, are long before they are able to follow a French conversation, and thence are inclined to believe that the French speak much faster than any other people. The truth is that the French, taking them in general, do not speak faster than other people; but in conversation, and in familiar reading, they drop the unaccented *e* as often as they can do it, and thus go quicker through a sentence than does a foreigner, who gives the full sound of *u* in *tub* to every unaccented *e* he meets with. Thus the word *contenance*, and the phrase *je n'ai pas reçu tout le vêtement*, will be pronounced by a foreigner and a Frenchman native of Gascony, *con-te-nan-ce—je né pa re-çu tou le vé-te-men*; whereas a well-bred Frenchman will pronounce, *cont-nans—jiv pa rsu toul vét-men*, sounding in the first word two syllables only, where the others would sound four; and in the sentence sounding six syllables, where the others would sound ten."

The French custom of clipping or shortening words as much as possible, in ordinary reading and common conversation, is well illustrated in the following sentence, namely:—

"Quand vous serez le même, vous me trouverez le même."

This sentence contains thirteen syllables in prose, namely:—*Quand-vous-se-rez-le-même-vous-me-trou-ve-rez-le-même*. In poetry, *même* would have two syllables. However, in familiar reading and conversation, it is pronounced in eight syllables only, viz.:—*Quand-vou-srel-mém-voum-trouv-rel-mém*. The suppression of this *e* is precisely the reason why foreigners imagine that the French speak so very quickly.

37. **E, O, MUTE OR UNACCENTED.**—Name, *uh*; sound, like the sound of the letter *u* in the English word *nut*; or, like the sound of the last syllable *er* in the words *over* and *water*, when spoken quickly.

The *e* mute or unaccented "is a mere emission of the voice without any distinct sound. It either succeeds a consonant, by the articulation of which it becomes sensible, or comes after a vowel, of which it may be considered the prolongation."

It is confessedly difficult to illustrate the sound of this vowel by the aid of English letters, yet it is worthy an honest attempt. True, it may be acquired from a teacher, by *sheer imitation*; but alas, all learners are not good imitators! If it can be illustrated by analogous English sounds, it seems quite reasonable to suppose that through this process many more students would understand and acquire it, than if they were left merely to the doubtful policy of imitation. Let us try.

Before the pupil attempts to pronounce the French words used for examples, let him observe most carefully the sound of the last syllable of the following words, when uttered as they usually are in common conversation, namely:—

Moth-er, Broth-er, Nev-er, Sis-ter, Wa-ter.

Take any one of the above English words, viz.:—the first, *moth-er*. Pronounce it *naturally* and aloud with a full voice several times, until the common sound of the last syllable in particular is familiar to the ear. Take each of those words, and thus practise, by pronouncing aloud carefully, but naturally, observing at the same time the sound of the last syllable.

Now, by what combination of letters would you represent that sound? By *ur*, as in the first syllable of the English word *mur-mur*? or by *uh*? Manifestly the latter. Below are a few French words, which you will now proceed to pronounce aloud, giving to the vowel *e* in each example the last syllable of the word *nev-er*. Pronounce each of the following French words quickly and abruptly, as if an exclamation mark were placed over each one of them, namely:—

Ce like *sub*.

That is, a combination of the letter *s*, with the usual sound of the last syllable of the English word *moth-er*.

De like *dub*.

That is, a combination of the letter *d*, with the usual sound of the last syllable of the same word, *moth-er*.

Je like *zhuh*.

That is, a combination of the letters *zh*, with the same sound mentioned in the first example; or like the sound of the last syllable of the word *pleas-ure*, as usually pronounced, but without the sound of the *y*, which is sometimes heard; *i.e.*, *pleas-ure*, and not *pleas-yure*.

Le like *lub*.

That is, a combination of the letter *l*, with the same sound mentioned in the first example.

Me like *muh*.

That is, a combination of the letter *m*, with the same sound mentioned in the first example; or like the sound of *mu* in the first syllable of the English word *mutter*.

Nc like *nuh*.

That is, a combination of the letter *n*, with the sound mentioned in the first example; or like the sound of *nu* in the English word *nut*. Pronounce *nu* in the word *nut*, and you have the correct pronunciation of the French word *ne*.

Se like *sub*.

That is, exactly like the pronunciation of *ce* as given in the first example.

Te like *tuh*.

That is, exactly like the sound of the last syllable of the English word *wa-ter*.

Que like *kuh*.

That is, like the sound of the last syllable of the English word *baker*, pronounced rather carelessly.

Take, if you please, another illustration, viz.: the sound of *u* in the English word *nut*, as explained above, in illustrating the sound of the French word *ne*. This will give the correct sound of *e* mute or unaccented.

The sound of *e* mute or unaccented resembles the sound of the letter *e* of the word *the*, which is heard in pronouncing *quickly* these two words, viz.—*the man*. Apply the sound of this *e*, thus pronounced, to the *e* in the following words, viz.:—*ce, de, je, me, ne, se, te, que, etc.*

Or lastly, the sound of *e* mute or unaccented is based upon the sound of the English *a* pronounced naturally. Let the organs within the mouth maintain as nearly as possible the same position, whilst the lips are protruded as if to *pout* or *whistle*. Then, whilst the mouth is in this position, endeavour to pronounce the English *a* again; this, in a majority of cases, will give the correct sound of *e* mute or unaccented. Practise frequently on this last-mentioned plan aloud, and the ear will soon detect the viciousness or correctness of the sound. Most pupils find it more or less difficult to acquire *this* sound; but perseverance will, in due time, overcome every obstacle.

In illustrating the sound of *e* mute or unaccented, the following signs will be used, sometimes one, again the other, viz.:—*uh*, and the apostrophe, thus:—

Je by *zhuh*, or by *j'*.

Se by *sub*, or by *e'*.

SECTION VIII.—DEMONSTRATIVE ADJECTIVES AND PRONOUNS.

1. The demonstrative adjectives *ce, m., cette, f., this or that*, are always placed before nouns; they agree in gender with these nouns [§ 20 (1)].

Avez-vous ce parapluie? *m.*, Have you this or that umbrella?
N'avez-vous pas cette bouteille? *f.*, Have you not this or that bottle?

2. Before a word masculine singular, commencing with a vowel or *h* mute, *cet* takes the place of *ce* [§ 20 (1)].

N'avez-vous pas cet argent? Have you not this or that money?
Vous avez eu cet honneur, You have had this or that honour.

3. When it is deemed necessary to express in French the difference existing in English between the words *this* and *that*, the adverbs *ci* and *là* may be placed after the nouns [§ 20 (2)].

Je n'ai pas ce parasol-ci, j'ai ce I have not this parasol, I have that
parasol-là.

4. The demonstrative pronouns, *celui, m., celle, f., this or that*, are used to represent nouns, but are never joined with them like adjectives [§ 36, § 37 (1)].

J'ai mon parapluie et celui de votre frère, Vous avez ma robe et celle de ma sœur.

J have my umbrella and your brother's —i.e., that of your brother. You have my dress and my sister's —i.e., that of my sister.

5. The pronouns *celui, celle*, with the addition of the words *ci and là*, are used in the sense of *this one, that one, the latter, the former* [§ 37 (3)]. They agree in gender with the word which they represent.

Vous avez celui-ci, mais vous n'avez pas celui-là.

You have this one (the latter), but you have not that one (the former).

6. The pronouns *ceci* and *cela* are used absolutely, that is, without a noun, in pointing out objects.

Nous n'avons pas ceci, nous avons cela. Ceci ou cela.

We have not this, we have that. This or that.

RÉSUMÉ OF EXAMPLES.

Avez-vous le livre de cet homme? Je n'ai pas son livre, j'ai le mien. Le cuisinier a-t-il ce parapluie? Il n'a pas ce parapluie-ci, il a ce parapluie-là. (R. 3.)

Avez-vous celui de votre frère? Je n'ai pas celui de mon frère, j'ai celui de ma sœur. (R. 4.)

Avez-vous celui-ci ou celui-là? Je n'ai ni celui-ci ni celui-là. Quelle robe avez-vous? f. J'ai celle-ci.

Avez-vous ceci ou cela? (R. 6.)

Have you that man's book? I have not his book, I have mine. Has the cook that umbrella? He has not this umbrella, he has that umbrella. Have you your brother's?—i.e., that of your brother. I have not my brother's, I have my sister's;—i.e., that of my brother, that of my sister. Have you this one or that one? I have neither the latter nor the former. Which dress have you? I have this (one). Have you this or that?

VOCABULARY.

Ardoise, f., slate.	Encrier, m., inkstand.	Parapluie, m., umbrella.
Balai, m., broom.	Fromage, m., cheese.	
Bois, m., wood.	Jardinier, m., gardener.	Plomb, m., lead.
Bouteille, f., bottle.	Lait, m., milk.	Plus, no longer.
Dame, f., lady.	Lettre, f., letter.	Poulet, m., chicken.
Etranger, m., stranger, foreigner.	Malle, f., trunk.	Salière, f., salt stand.
	Parasol, m., parasol.	Volaille, f., poultry.

EXERCISE 13.

1. Votre frère a-t-il son encrier d'argent? 2. Il ne l'a plus, il a un encrier de plomb. 3. Avons-nous la lettre de l'étranger? 4. Oui, Monsieur, nous avons celle de l'étranger. (R. 4.) 5. Votre sœur n'a pas son ardoise, mais elle a son chapeau de satin. 6. Le menuisier a-t-il votre bois ou le sien? 7. Il n'a ni le mien ni le sien, il a celui du jardinier. 8. Avez-vous mon bon parapluie de soie? 9. J'ai votre parapluie de soie et votre parasol de satin. 10. Avez-vous ma bouteille? 11. Je n'ai pas votre bouteille, j'ai la malle de votre sœur. 12. Le domestique a-t-il cette salière? 13. Il n'a pas cette salière-ci, il a celle-là. 14. Avez-vous le bon ou le mauvais poulet? 15. Je n'ai ni celui-ci ni celui-là. 16. Quel poulet avez-vous? 17. J'ai celui du cuisinier. 18. Le boulanger a-t-il de la volaille? (Sect. IV. 1.) 19. Le boulanger n'a pas de volaille, il a du lait. (Sect. V. 5.) 20. Avez-vous votre fromage ou le mien? 21. Je n'ai ni le vôtre ni le mien, j'ai celui du matelot. 22. Quelqu'un a-t-il faim? 23. Personne n'a faim. 24. Avez-vous quelque chose? 25. Non, Monsieur, je n'ai rien. 26. Avez-vous le sofa d'acajou de mon menuisier? 27. Non, Monsieur, je ne l'ai pas. 23. J'ai son joli miroir et son bon crayon.

EXERCISE 14.

1. Has your brother that lady's umbrella? 2. My brother has that lady's umbrella? 3. Have you this parasol or that one? 4. I have neither this (one) nor that (one). 5. Have you the stranger's good watch? 6. No, Sir, I have the baker's. 7. Who has my slate? 8. I have your slate and your brother's. 9. Has the cook a silver salt stand? 10. The cook has a silver salt stand, and a silver dish. 11. Has the cook this poultry or that? 12. He has neither this nor that. 13. Has he this bread or that? 14. He has neither this nor that, he has the baker's good bread. 15. Have you my cotton parasol? 16. I have not your cotton parasol, I have your silk parasol. 17. Has the gardener a leather trunk? 18. The gardener has a leather trunk. 19. Who has my good cheese? 20. Nobody has your cheese, but some one has your brother's. 21. Have you mine or his? 22. I have neither yours nor his, I have the stranger's. 23. Has the cook this bottle or that broom? 24. He has this bottle. 25. Have you a lead inkstand? 26. No, Sir, I have a china inkstand. 27. Has the stranger poultry?

23. The stranger has no poultry, but he has money. 29. Your brother is hungry and thirsty, afraid and sleepy. 30. Is any one ashamed? 31. No, Sir, nobody is ashamed. 32. Is your brother right or wrong? 33. My brother is right, and yours is wrong. 34. Your sister has neither her satin hat nor her velvet hat. 35. Has the baker the mahogany chest of drawers? 36. He has it not, he has the mahogany sofa. 37. Has the tinman my plate? 38. He has not your plate, he has mine.

SECTION IX.—THE PLURAL OF NOUNS (§ 8).

1. The plural in French is generally formed, as in English, by the addition of *s* to the singular.

Un homme, une femme, Deux hommes, deux femmes.

A man, a woman. Two men, two women.

The form *le* of the article becomes plural by the addition of *s*, and may be placed before plural nouns of either gender.

Les hommes, les femmes, *The men, the women.*

2. 1st EXCEPTION TO RULE 1.—Nouns ending in *s, z, x*, remain unchanged for the plural.

Le bas, les bas, La voix, les voix, Le nez, les nez.

The stocking, the stockings. The voice, the voices. The nose, the noses.

3. 2nd EXCEPTION.—Nouns ending with *au* and *eu*, take *z* for the plural.

Le bateau, les bateaux, Le lieu, les lieux.

The boat, the boats. The place, the places.

4. 3rd EXCEPTION.—The following nouns ending in *ou* take *x* for the plural:—bijou, jewel; caillou, pebble; chou, cabbage; genou, knee; hibou, owl; joujou, plaything.

Les bijoux, les cailloux, les choux, Les hiboux, les genoux, les joujoux.

The jewels, the pebbles, the cabbages. The owls, the knees, the playthings.

5. 4th EXCEPTION.—The following nouns ending in *ail* change that termination into *aux* for the plural:—bail, lease; corail, coral; émail, enamel; soupirail, air-hole; sous-bail, under-lease; travail, labour.

Les baux, les coraux, les émaux, Les soupiraux, les travaux, les sous-baux.

The leases, the corals, the enamels. The air-holes, the labours, the under-leases.

6. 5th EXCEPTION.—Nouns ending in *al* form their plural in *aux*.

Le cheval, les chevaux, Le général, les généraux.

The horse, the horses. The general, the generals.

Bal, ball; carnaval, carnival; chacal, jackal; régal, treat, follow the general rule.

7. 6th EXCEPTION.—Ciel, heaven; œil, eye; and aïeul, ancestor, form their plural irregularly.

Les cieux, les yeux, les aïeux, For further rules see § 8, § 9, and § 10, of Part II.

The heavens, the eyes, the ancestors.

RÉSUMÉ OF EXAMPLES.

Les Anglais ont-ils les chevaux du général? Les généraux n'ont pas les bijoux. Les enfants ont-ils les cailloux? Les yeux de l'enfant. Les tableaux de cette église. Avez-vous les oiseaux de ce bois? Avez-vous les encriers d'argent de ma sœur? J'ai les bijoux d'argent et d'or de l'étranger. Les rois n'ont-ils pas les palais de marbre?

Have the English the general's horses? The generals have not the jewels. Have the children the pebbles? The child's eyes. The pictures of that church. Have you the birds of that wood? Have you my sister's silver inkstands? I have the gold and silver jewels of the foreigner. Have not the kings the marble palaces?

VOCABULARY.

Baril, m., barrel.	Général, m., general.	Moulin, m., miller.
Bas, m., stocking.	Gilet, m., waistcoat.	Morceau, m., piece.
Bijou, m., jewel.	Grand, adj., large, great.	Oiseau, m., bird.
Chocolat, m., chocolate.	Jardin, m., garden.	Paire, f., pair.
Chou, m., cabbage.	Joujou, m., plaything.	Petit, adj., small.
Dans, in.	Légume, m., vegetable.	Poivre, m., pepper.
Enfant, m., child.	Marchand, m., merchant.	Qu', que, what.
Fer, m., iron.	Marchand, m., blacksmith.	Rien, nothing.
Fils, m., son.	Mauvais, e, bad.	

EXERCISE 15.

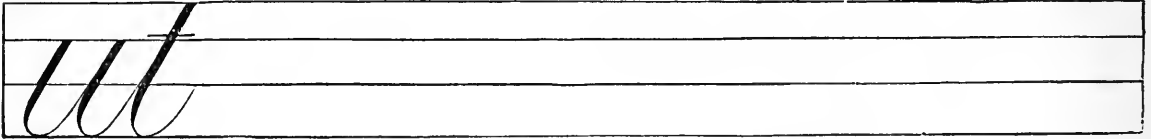
1. Avez-vous les marteaux du charpentier? 2. Nous avons les marteaux du maréchal. 3. Les maréchaux ont-ils deux marteaux de bois? 4. Ils ont deux marteaux de fer. 5. Les généraux ont-ils les chapeaux de soie de l'enfant? 6. Ils ont

les bijoux et les joujoux de l'enfant. 7. Les enfants ont-ils les oiseaux de votre bois? 8. Ils n'ont pas les oiseaux de mon bois, mais ils ont les chevaux de mon général. 9. Le maréchal a-t-il une paire de bas de laine? 10. Le maréchal a deux paires de bas de laine. 11. Monsieur, n'avez-vous pas froid? 12. Non, Monsieur, j'ai chaud. 13. Avez-vous du café ou du chocolat? 14. Je n'ai ni café ni chocolat. 15. N'avez-vous pas les choux de mon grand jardin? 16. J'ai les légumes de votre petit jardin. 17. Votre fils, qu'a-t-il? 18. Mon fils n'a rien. 19. Avez-vous deux morceaux de pain? 20. Le meunier a un morceau de pain et deux barils de farine. 21. L'épicière a-t-il du café, du thé, du chocolat, et du poivre? 22. Il a du thé et du café, et le chocolat et le poivre de votre marchand. 23. Qui a de l'argent? 24. Je n'ai pas d'argent, mais j'ai du papier. 25. Avez-vous de bon papier? 26. J'ai de mauvais papier.

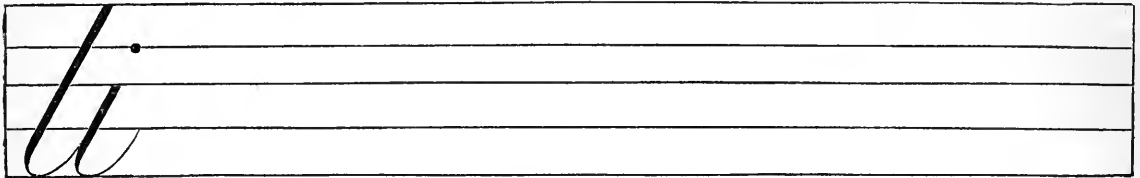
EXERCISE 16.

1. Have you my brother's horses? 2. I have not your

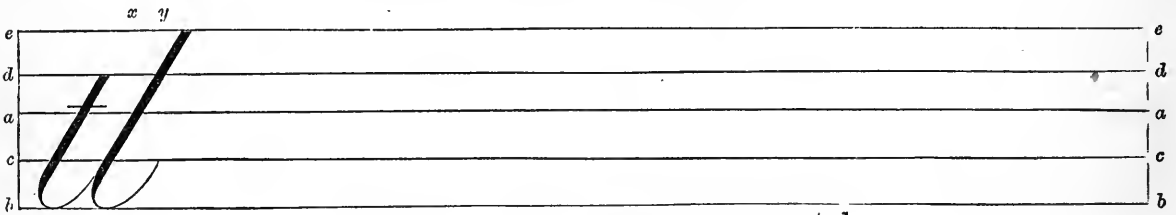
brother's horses, I have your cousin's hats. 3. Have the blacksmiths good iron? 4. The blacksmith has two pieces of iron. 5. Have you two pairs of stockings? 6. I have one pair of stockings and two pairs of gloves. 7. Has your sister the gold jewels? 8. My sister has the gold jewels and the paper playthings. 9. Have you the cabbages in your garden? 10. We have two cabbages in our garden. 11. Have you the silk hats? 12. The generals have the silk hats. 13. Have you coffee or sugar? 14. We have neither coffee nor sugar. 15. Are your brothers ashamed? 16. My brothers are neither ashamed nor afraid. 17. Who has two barrels of flour? 18. The miller has two barrels of flour. 19. Have the birds bread? 20. The birds have no bread. 21. Has the merchant tea, chocolate, sugar, and pepper? 22. He has sugar and pepper, but he has neither tea nor chocolate. 23. What has your sister? 24. She has nothing. 25. What is the matter with your brother? 26. Nothing is the matter with him. 27. Is he not cold? 28. He is not cold, he is warm.



COPY-SLIP NO. 8.—COMBINATION OF THE LETTERS u, t.



COPY-SLIP NO. 9.—COMBINATION OF THE LETTERS l, i.



COPY-SLIP NO. 10.—COMBINATION OF THE LETTERS t, l.

LESSONS IN PENMANSHIP.—IV.

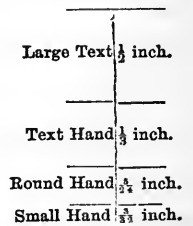
As it is impossible for any one who is attempting to teach himself the art of Penmanship to write well without practice, we now give three more combinations of pairs of the four letters that the reader has already learned to make, before passing on to other letters of the alphabet in writing, for whose formation strokes are required that differ in shape and character from the first elementary stroke that forms the basis of the letters i, u, t, l.

At this stage of our Lessons in Penmanship, it may not be out of place to say something about the kind of handwriting that the students of this part of the POPULAR EDUCATOR are practising, and to give those who may feel disposed to rule paper for themselves, in imitation of our copy-slips, a few brief instructions that will enable them to do so.

First, with regard to the kind or description of handwriting that is set before our readers in our present series of elementary copy-slips, it should be said that it is called Large Text, and that it is the largest, plainest, and boldest of the four kinds of handwriting usually practised by learners. The three hands that yet remain to be named are termed Text Hand, Round Hand or Half Text, and Small or Running Hand. Of these, Large Text is usually written between lines half an inch apart; Text Hand, between lines one-third of an inch apart; Round Hand, between lines five-twenty-fourths of an inch apart, or

rather less than one-fourth of an inch; and Small Hand, on single lines, and sometimes between double lines thirty-seconds of an inch apart, or rather less than one-eighth of an inch. For those who may not have a graduated scale of inches, we append a printed scale, showing the respective widths of the four kinds of writing that have been named.

Now, to show our readers how to rule a page wherein to copy any of the examples that have been or will be given, let us suppose that the learner wishes to prepare paper for copying t l, as in Copy-slip No. 10. First rule two lines, one on either side of the page, close to the margin, from top to bottom, taking care that they are parallel to each other—that is to say, at equal distances from each other all the way down. Then rule a line across the top of the page, also close to the margin and at right angles to the parallel lines at the sides of the paper, or "square with them," as a joiner would say, and, commencing from this line, set off with compasses along the side lines distances equal to e d, d a, a c, c b, in order, as in Copy-slip No. 10, and repeat this as often as the length of the paper will allow, taking care to leave a space of one-fourth of an inch between the last of each set of five lines and the first of the next which



follows. The distances *ed*, *ac*, *cb*, are each equal to one-fourth of an inch, and *da* to three-sixteenths of an inch.

By following the above instructions, the learner will be enabled to rule his paper in sets of five horizontal and parallel lines, five lines being required in each set, in this case, to determine the height of the letters and their relative proportions one to another. To rule the diagonal lines (No. 5), set off *ex* along the topmost line *ee*, equal to thirteen-sixteenths of an inch, and draw a straight line through the points *bx*. This will serve as your guide line for regulating the remainder of the sloping lines, and all that remains to complete them is to set off spaces along the lines *ee*, *bb*, equal to *xy* or *bz*, and rule straight lines passing through every succeeding pair of points, commencing from the first pair *x b*, through which the guide line for regulating the inclined lines was drawn.

LESSONS IN GERMAN.—III.

SECTION V.—THE NOUN. OLD DECLENSION.

THERE are in German four cases, namely: the Nominative, answering to the English *nominative*; the Genitive, answering to the English *possessive*; the Dative, which has no corresponding case in English; and the Accusative, which answers to the English *objective*.

Of the four cases, the dative, without a *preposition*, generally corresponds to our objective governed by *to* or *for*, as:—

Sch gebe dem Manne das Glas. I give (to) the man the glass.
Er macht dem Manne einen Hut. He makes (for) the man a hat.

Often, however, the dative in German is construed with a *preposition*, where, as above, the *objective* is of course employed in English, as:—

Das Kind ist in dem Hause. The child is in the house.
Der Hund ist unter dem Baume. The dog is under the tree.
Der Jäger geht nach dem Walde. The hunter goes to the forest.
Der Mann ist auf dem Schiffe. The man is on the ship.
Der Koch ist an dem Tische. The cook is at the table.

DECLENSION OF THE DEFINITE ARTICLE MASCULINE AND NEUTER IN THE SINGULAR.

Masculine. Neuter.

Nominativ. Der, the; das, the;
Genitiv. Des, of the; des, of the;
Dativ. Dem, to or for the; dem, to or for the;
Accusativ. Den, the; das, the.

German nouns have two forms of declension, called the Old and the New. In the old declension, the genitive, like the corresponding case in English, is formed by affixing *s* to the nominative, as:—

Nom. Der Vater, the father. Gen. Des Vaters, the father's.

Nouns ending in *s*, *ß*, *z*, or two consonants, generally add *es* in the genitive, thus, like our words which end with the sound of *s*, *x*, *z*, soft *c* or *s*, forming an additional syllable.

Nom. Das Ross, the horse. Gen. Des Rosses, the horse's.

RULES FOR FORMING THE CASES OF NOUNS ACCORDING TO THE OLD DECLENSION.

- RULE I. The genitive adds *s* or *es* to the nominative.
- RULE II. The dative drops the *s* of the genitive (§ 13. Note).
- RULE III. The accusative is like the nominative.

DECLENSION OF NOUNS ADDING *s* IN THE GENITIVE.

Masculine. Neuter.

9. Der Vater, the father; das Mädchen, the girl;
10. Des Vaters, the father's; des Mädchens, the girl's;
11. Dem Vater, to, for the father; dem Mädchen, to, for the girl;
12. Den Vater, the father; das Mädchen, the girl.

DECLENSION OF NOUNS ADDING *es* IN THE GENITIVE.

Masculine. Neuter.

13. Der Mann, the man; das Kind, the child.
14. Des Mannes, the man's; des Kindes, the child's;
15. Dem Manne, to, for the man; dem Kinde, to, for the child;
16. Den Mann, the man; das Kind, the child.

CONJUGATION OF THE PRESENT SINGULAR OF Sein and Leben.

Ich bin, I am; ich lebe, I praise;
Sie sind, you are; Sie leben, you praise;
Er ist, he is; er lebt, he praises.

EXAMPLES OF THE SEVERAL CASES.

Nominative.

Das Kamel ist stark. The camel is strong.
Der Hund ist treu und watchsam. The dog is faithful and watchful.
Das Pferd ist schön und nützlich. The horse is beautiful and useful.

Nominative and Genitive.

Das Wasser des Meeres ist salzig. The water of the sea is salt.
Der Baum des Waldes ist groß. The tree of the forest is large.
Des Kindes Ball ist weich. The child's ball is soft.

Whether in cases of this kind, where the genitive is used to denote possession, we should say, Der Ball des Kindes (the ball of the child), or, Des Kindes Ball (the child's ball), is a point regulated by no certain rule. The former mode is the more common in German.

Nominative and Dative.

Der Brief ist von dem Vater. The letter is from the father.
Der Bauer ist in dem Felde. The peasant is in the field.
Er schickt es dem Freunde. He sends it to the friend.

Nominative and Accusative.

Der Hund beißt den Dieb. The dog bites the thief.
Der Schmied hämmert das Eisen. The smith hammers the iron.
Das Kind liebt und lobt den Vater. The child loves and praises the father.

Nominative, Dative, Genitive, and Accusative.

Der Vater des Kindes giebt dem Bruder den Vogel. The father of the child gives (to) the brother the bird.
Der Herrscher des Staates schickt dem Krieger das Schwert. The ruler of the state sends (to) the warrior the sword.

VOCABULARY.

An, at.	In, in.	Sohn, m. son.
Auf, on.	Korb, m. basket.	Stall, m. stable.
Ball, m. ball.	Loben, to praise.	Stuhl, m. chair.
Bruder, m. brother.	Pferd, n. horse.	Tischler, m. joiner.
Durstig, thirsty.	Sack, m. bag.	Unter, under.
Freund, m. friend.	Schläfrig, sleepy.	Wo? where?
Hund, m. dog.	Schüler, m. scholar.	Zimmer, n. room.
Hut, m. hat.	Sein, to be.	Zimmermann, m. carpenter.

RÉSUMÉ OF EXAMPLES.

Der Wolf lebt in dem Walde. The wolf lives in the forest.
Das Kind liebt den Bruder. The child loves the brother.
Der Lehrer lobt des Schülers Fleiß. The teacher praises the scholar's industry.
Der Schnee liegt auf dem Berge. The snow lies on the mountain.
Das Mädchen hat des Vaters Hut. The girl has the father's hat.
Der Sohn des Bäckers hat Brod in dem Korbe; er giebt es dem Bettler. The son of the baker has bread in the basket; he gives it to the beggar.

EXERCISE 6.

1. Sind Sie der Freund des Bäckers? 2. Nein, ich bin der Freund des Tischlers.
3. Was hat der Freund des Fleischer's? 4. Er hat den Hund und das Pferd des Bauers.
5. Wo ist das Mehl? 6. Es ist in dem Sacke des Müllers.
7. Wo ist das Korn? 8. Es ist in dem Korbe des Bauers.
9. Wer liebt den Lehrer? 10. Der Schüler liebt den Lehrer.
11. Sind Sie schläfrig? 12. Nein, ich bin durstig.
13. Wo ist der Ball des Bruders? 14. Das Kind hat den Ball des Bruders in dem Hute des Vaters.
15. Wo ist das Pferd des Lehrers? 16. Es ist in dem Stalle.
17. Liebt der Tischler den Zimmermann? 18. Nein, der Sohn des Zimmermanns liebt den Sohn des Lehrers.
19. Wo ist der Stuhl des Tischlers? 20. Er (Seet. XVIII. 3) ist in dem Zimmer des Lehrers.
21. Liebt der Zimmermann den Lehrer? 22. Ja, er liebt und lobt den Lehrer.
23. Der Mann ist an dem Tische, das Buch ist auf dem Tische, und der Hund ist unter dem Tische.

SECTION VI.—DEMONSTRATIVE PRONOUNS.

„Dieser“ is declined, in the masculine, precisely like the definite article; while in the neuter, as will be seen in the following declension, all its endings, except the dative, are alike [§ 62.].*

* By the references in Roman numerals, thus (Seet. XVIII. 3), as above, the learner is directed to Sections in Part I. of these Lessons. References thus [§ 62 (2)] refer to the Sections in Part II.

DECLENSION OF *Dieser*: MASCULINE AND NEUTER SINGULAR COMPARED WITH THE DEFINITE ARTICLE.

<i>Masculine.</i>		<i>Neuter.</i>	
D. (t-cr) <i>tief-cr</i> , this;	(b-as) <i>tief-es</i> , this;		
G. (t-es) <i>tief-es</i> , of this;	(t-es) <i>tief-es</i> , of this;		
D. (t-em) <i>tief-em</i> , to, for this;	(t-em) <i>tief-em</i> , to, for this;		
A. (t-en) <i>tief-en</i> , this;	(t-as) <i>tief-es</i> , this.		

DECLENSION OF THE INTERROGATIVE *Wer* AND THE PERSONAL PRONOUN *er* AND *es* IN THE SINGULAR.

	<i>Masculine.</i>		<i>Neuter.</i>	
N. <i>Wer?</i> who?	<i>er</i> , he;	<i>es</i> , it;		
G. <i>wessen?</i> whose?	<i>seiner</i> , of him;	<i>seiner</i> , of it;		
D. <i>wem?</i> to, for whom?	<i>ihm</i> , to, or for him?	<i>ihm</i> , to, or for it;		
A. <i>wen?</i> whom?	<i>ihn</i> , him;	<i>es</i> , it.		

VOCABULARY.

<i>Apfel</i> , <i>m.</i> apple.	<i>Geld</i> , <i>n.</i> gold.	<i>Sattler</i> , <i>m.</i> saddler.
<i>Bürgermeister</i> , <i>m.</i> , bur- gomasster, mayor.	<i>Haus</i> , <i>n.</i> house.	<i>Schneider</i> , <i>m.</i> tailor.
<i>Dieser</i> , <i>tiefes</i> , <i>this</i> .	<i>Hut</i> 'macher, <i>m.</i> hatter.	<i>Schuh</i> 'macher, <i>m.</i> shoe- maker.
<i>Für</i> , for (§ 113).	<i>Kupfer</i> , <i>n.</i> copper.	<i>Silber</i> , <i>n.</i> silver.
<i>Garten</i> , <i>m.</i> garden.	<i>Leder</i> , <i>n.</i> leather.	<i>Von</i> , from, of.
<i>Geld</i> , <i>n.</i> money.	<i>Papier</i> , <i>n.</i> paper.	
	<i>Rock</i> , <i>m.</i> coat.	

RÉSUMÉ OF EXAMPLES.

<i>Dieser</i> Jüngling ist arm.	<i>Dieses</i> This youth is poor.	<i>This</i> child is sleepy.
<i>Dieses</i> Jünglings Hut ist neu.	<i>Dieses</i> This youth's hat is new.	<i>This</i> girl's ribbon is beautiful.
<i>Weshen</i> Sie diesem Bettler und diesem Kinde Geld?	Do you give this beggar and this child money?	
Lieben Sie diesen Irifländer? Loben Sie dieses Mädchen?	Do you love this Irishman? Do you praise this girl?	
Wessen Feteermesser hat dieses Kind? Des Lehrers.	Whose penknife has this child? The teacher's.	

EXERCISE 7.

1. *Wer* hat das *Papier* dieses Mädchen? 2. *Dieses* Kind hat es. 3. *Wessen* Buch hat *dieser* Schüler? 4. *Er* hat das Buch des Lehrers. 5. *Von* wem haben Sie dieses *Leder*? 6. *Ich* habe es von dem *Schuh*-macher. 7. *Für* wen ist *dieser* *Apfel*? 8. (*Sect. XVIII. 3*) ist für das Kind des *Sattlers*. 9. *Wessen* *Rock* hat der Sohn des *Schneiders*? 10. *Er* hat den *Rock* dieses *Freuntens*. 11. *Von* wem hat der Sohn dieses *Hutmachers* *Geld*? 12. *Er* hat *Geld* von dem *Vater*. 13. *Wo* ist der *Wagen* des *Bauers*? 14. Der *Freund* des *Lehrers* hat ihn. 15. *Wessen* *Haus* und *Garten* hat der *Lehrer*? 16. *Er* hat das *Haus* und den *Garten* des *Bürgermeisters*. 17. *Von* wem haben Sie *diesen* *Hut*? 18. *Ich* habe ihn (*Sect. XVIII. 3*) von dem *Hutmacher*. 19. *Für* wen ist er? 20. *Er* ist für den Sohn des *Schneiders*. 21. *Haben* Sie *Geld*, *Silber*, oder *Kupfer* für den *Lehrer*? 22. *Ich* habe *Silber* für ihn. 23. *Wen* *liebt* das *Kind*? 24. *Es* *liebt* den *Bruder* des *Lehrers*.

SECTION VII.

CONJUGATION OF THE PRESENT SINGULAR, *gehen* AND *geben*.

<i>Ich</i> <i>gehe</i> , I go.	<i>Ich</i> <i>gebe</i> , I give.
<i>Sie</i> <i>gehen</i> , you go.	<i>Sie</i> <i>geben</i> , you give.
<i>Er</i> <i>geht</i> , he goes.	<i>Er</i> <i>gibt</i> (<i>Sect. XIX. 1</i>), he gives.

The learner should mark the irregularity in the conjugation of *gehen*.

VOCABULARY.

<i>Alt</i> , old.	<i>Hay</i> , <i>n.</i> hay.	<i>Schiff</i> , <i>n.</i> ship.
<i>Arm</i> , poor.	<i>Hungrig</i> , hungry.	<i>Sehr</i> (with verb), very much.
<i>Bei</i> , with.	<i>Jäger</i> , <i>m.</i> hunter,	<i>Sehr</i> (with adj. or adv.), very.
<i>Captain</i> ' <i>m.</i> captain.	ranger.	<i>Steuer</i> mann, <i>m.</i> mate.
<i>Deutsch</i> land, <i>n.</i> Ger- many.	<i>Knecht</i> , <i>m.</i> servant.	<i>Wald</i> , <i>m.</i> forest.
<i>Edel</i> mann, <i>n.</i> noble- man.	<i>Krank</i> , sick.	<i>Wie</i> , how, as.
<i>Freud</i> lich, merry.	<i>Matros</i> ' <i>m.</i> sailor.	<i>Zell</i> haus, <i>n.</i> custom- house.
<i>Geben</i> , to give.	<i>Nach</i> , to (§ 112. 8, 9).	<i>Zu</i> , to (§ 112. 13).
<i>Gehen</i> , to go.	<i>Nicht</i> , not.	
	<i>Noch</i> , still, yet.	
	<i>Reich</i> , rich.	

RÉSUMÉ OF EXAMPLES.

Der Baum ist sehr groß.	The tree is very large.
Er <i>liebt</i> ihn sehr.	He loves him very much.
Was sagt <i>dieser</i> Mann dem <i>Lehrer</i> ?	What says this man to the teacher?

<i>Er</i> sagt ihm nichts.	He says nothing to him.
Was geben Sie dem <i>Captain</i> ?	What do you give the captain?
Wer lobt den <i>Knecht</i> ?	Who praises the servant?
Wen lobt der <i>Knecht</i> ?	Whom does the servant praise?

EXERCISE 8.

1. *Wo* ist der *Bruder* des *Steuer*manns? 2. *Er* ist bei dem *Captain* in dem *Schiffe*. 3. *Ist* der *Sohn* des *Edel*manns auch bei ihm? 4. *Nein*, er ist in *Deutsch*land. 5. *Wo* ist der *Vater*? 6. *Er* ist bei dem *Captain* in dem *Zoll*haus. 7. *Liebt* der *Captain* den *Sohn* des *Edel*manns? 8. *Ja*, und er *lobt* auch den *Vater*. 9. *Liebt* der *Edel*mann den *Captain*? 10. *Ja*, er *liebt* und *lobt* ihn sehr. 11. *Ist* *dieser* *Mann* der *Sohn* des *Captains*? 12. *Nein*, er ist der *Sohn* des *Steuer*manns. 13. *Ist* *dieser* *Matros*e reich? 14. *Nein*, er ist arm und *fröh*lich. 15. *Wie* alt ist *dieser* *Mann*? 16. *Er* ist nicht sehr alt. 17. *Ist* er *krank*? 18. *Nein*, er ist *hungrig*. 19. *Was* gibt *dieses* *Mädchen* dem *Kind*? 20. *Es* (§ 134. 2) gibt ihm nur *Zucker*. 21. *Was* geben Sie dem *Knechte*? 22. *Ich* gebe ihm *Geld*. 23. *Was* gibt der *Knecht* dem *Herr*e? 24. *Er* gibt ihm *Heu*. 25. *Liebt* *dieses* *Kind* den *Lehrer*? 26. *Ja*, und der *Lehrer* *lobt* das *Kind*. 27. *Ist* der *Jäger* noch in dem *Walde*? 28. *Ja*, und der *Sohn* des *Edel*manns ist bei ihm. 29. Der *Jäger* *geht* nach dem *Walde* zu dem *Vater*, und *ich* *gehe* zu dem *Bruder*.

MECHANICS.—II.

THE UNIT OF FORCE.—FORCES APPLIED TO A POINT.

HAVING in our first lesson explained the meaning of the word "force," and shown how a force is applied and measured, we shall next consider the simplest kind of mechanical problem, that of several applied to a single point. Before I proceed, however, it is advisable to fix clearly your notions of the "unit of force." I have already laid down the rule, that a force may be measured by the number of feet it would cause the unit ivory ball, equal in weight to a cubic inch of pure water, to move over in one second, when applied to it suddenly by a blow. If the ball move over seven feet, the number 7 should be written for the force; if over a furlong, the number is 660, the feet in a furlong. But suppose it moves over exactly one foot, then it is clear that the numeral 1 should be written; and that particular force is the "one" of forces. And the conclusion to which we thus are led is that—

THE UNIT OF FORCE is the force which would, if applied instantaneously to the unit of mass, make it move over one foot in one second.

But you can clearly see that the force which could produce no greater velocity than this in the ball—which, instead of being ivory, we may take to be a ball of frozen water, a cubic inch in volume—cannot be a very strong force. In fact, it is equal to a little less than eight grains of weight, that is, this unit of force could be balanced by that with which an eight-grain weight pulls downwards. How this is ascertained I cannot here explain to you, as you would require some little knowledge of dynamics to understand the proof. For the present, therefore, you must take my statement on credit.

But this unit is evidently too small for practical purposes. The strains in the mechanical powers, the lever, the wheel and axle, the pulley, etc., and in roofs and bridges, cannot be calculated in grains, on account of the large numbers we should have to operate on. A larger unit is therefore necessary, and the pound weight exactly answers the purpose. We can calculate and measure forces in pounds; or, if the figures in that case be too large, we can calculate them in hundred-weights, or even in tons. All that is necessary is to keep clearly in mind what your unit is in your calculation, and to know how to pass from one unit to another. If, in the same calculation, you were to use different units in different places—a pound for instance, in one, and a hundred-weight in another—without reducing the one to the other, the result could be nothing but confusion and error.

But how are you to pass from one unit to another? This is a nice point in practice, as we shall see in due time; but this much is clear, that, if your unit be a hundred-weight, you should multiply all the numbers which represent your forces by 112 (the number of pounds in a hundred-weight), and then these forces will be expressed in pounds. If they are already expressed in pounds, then divide by 112, and you will have them in hundreds and fractions of a hundred-weight. And so, from hundred-weights you can pass to tons by dividing by 20, and

reverse the operation by multiplying by that number. Thus, we see that "ton," "hundred-weight," and "pound," are only so many different expressions for the same unit—namely, the pound—either singly or collectively, and that, therefore, for practical purposes, we may say that a pound weight is the "unit of force."

But we cannot leave this subject without determining the relation between this unit and the very small one of which I first made mention. I have asked you to take it on credit that the latter is nearly eight grains. The more correct value involves decimals, and is 7.85 grains nearly, that is, seven grains and eighty-five parts out of a hundred of one grain. Hence, since there are 7,000 grains in an avoirdupois pound, if we divide this number by 7.85, we shall have the number of these small units (which henceforth we shall call the *dynamical unit*), to which one pound weight is equal. The division gives 892 nearly for the quotient; and thus we learn how we may pass from dynamical units to pounds, or from pounds to these units. The result may be summed up in the following table:—

7.85 Grains make nearly one Dynamical Unit.
892 Dynamical Units make nearly one Pound.
112 Pounds make one Hundred-weight.
20 Hundreds make one Ton.

Forces applied to a Point.—When a single force is applied to any point of a body, if the latter be free, motion will ensue, and the question belongs to *Dynamics*. If it be not free, but fastened in any way to fixed objects, the force will be communicated through its substance to the points of support or connection, which will resist, and by resisting cause the body to sustain strain. For example, suppose a beam of wood is fixed at one point, round which, as on a pivot, it can turn in any direction, and that a force is applied to it at some other point. It is clear that this force will pull the beam round towards itself so far as it can go, that is, until the line of direction of the force passes through the fixed point. Then this point will resist, and equilibrium will be produced. The case thus becomes one of two forces—namely, that applied and the resistance produced; and we see thus that a single force can never in *Statics* be the subject of study, without involving the consideration of other forces which it calls into existence. A statical problem must be concerned about at least *two* forces.

If two forces be applied to a point in the same direction, we assume in *Mechanics*, as a self-evident truth, the result of experience, that their joint effect is the same as that which would be produced by a single force equal to their sum. If two men of unequal strength pull on a rope against another man stronger than either, who succeeds in balancing their united strength, we say, without hesitation, that his force is equal to the sum of those put forth by the two. When two forces thus act separately at a point, the single force to which their joint power is equal is called the "resultant" of these forces. We therefore say, if two forces act on a point in the same direction, their resultant is the *sum* of these forces. If three act on it, since two of them are equivalent to one equal to their sum, this one with the third must be equivalent to a single force equal to the sum of the three. And so on, as to more than three, we may lay it down as a general rule that—

The resultant of any number of forces acting on a point in the same direction, is a single force equal to the *sum* of the separate forces.

When two forces act in *opposite* directions on a point, for the same reason as in the former case, we assume that the resultant is the difference of the two. And this leads us to the most general case that can occur of such forces—namely, that in which any number of them are applied to a body *along the same line*, some in one direction and others in the opposite direction. To determine the resultant of all, it is evident that it is sufficient to take the separate resultants of the opposing sets, then take the difference of these resultants, and that this difference will be the required resultant of *all*, and its direction that of the greater of the two separate resultants. Hence the following rule:—

If any number of forces be applied to a body along the *same line*, their resultant is the *difference* between the sums of those which act in the opposite direction, and its direction is the same as that of the greater sum.

For example, if fifteen men pull on a rope against eleven, and drag them along a road, the resultant of the twenty-six

forces applied to the rope along its length is the difference between the united powers of the fifteen and of the eleven, whatever be the particular strength of each man, and its direction is that in which the fifteen pull.

But suppose now that *two* forces only are employed, and that they are *equal* and in *opposite* directions; what will be the result? They will balance, or be in equilibrium. Now it is sometimes said that the body to which two such forces are applied at one of its points is in the same condition as if *no* force had been applied to it. This is not true, strictly. It is in the same condition *so far as equilibrium is concerned*, but not otherwise. It is not in the same condition as to pressure or strain. The rope, which at one moment is lying stretched on the ground, is not in the same condition it was in a few minutes before, when two strong men were pulling at opposite ends of it with balanced strength. In the latter case it is strained along its whole length—every thread on the stretch, ready to snap. Its condition is very different on the two occasions—different in every circumstance, except that of there being no motion. So, also, if two equal and opposite pressures are applied to a round ball, it will be an equilibrium, but the condition of its *substance* will be changed. Its particles will be pressed towards one another inwards; and, if it be made of soft or elastic material, its form will be altered by the flattening effect of the opposing forces. And this is true, whatever be the magnitude of the ball. It may be as small as we please, even so small as an atom, or what is called a "material particle," and yet there will be this internal compression or straining. Thus we see that even the "material particle," acted on by two equal and opposite forces, cannot be said to be in the same condition before and after their application.

The case of equal and opposite forces presents some other points of interest, which may well occupy your attention in this lesson. Suppose, for example, two men pull against each other with equal strength at the opposite ends of a rope. What will be the strain on the rope? What will be its amount, considering that both are pulling? Most persons at first incline to say that it is strained by the united strength of both, or by double the strength of either man. Such is not the case; the strain is only equal to the strength of one of the men. What is the reason of this? A moment's reflection makes it evident. Suppose one man only to pull; the rope follows him, and there is no strain on it. But the instant the other seizes his end and pulls, strain begins, caused by his resistance. If he gives a strong pull, it is great; if a weak, it is slight. But, to put this in another way, suppose the first man leads, pulling with all his might, while the other, holding on with less strength, is dragged after. The rope is strained in this case also. By how much? By the *less* of the two forces. The stronger pull becomes divided into two parts, one putting both the rope and the second man in motion, and the other balancing the latter's pull. It is this second portion which strains the rope, and must be equal to the strength of the hinder man, while the other, which causes motion, is the difference of the two pulls or forces. Suppose, lastly, that the two pulls become equal, their difference becomes nothing, motion ceases, and the men come to a standstill. But the strain remains, as before, equal to the hinder force, which, being equal to that of the leading man, we can say it is equal to either of the forces.

Let us next suppose that for one of the men an iron ring, fastened on a wall, is substituted, to which one end of the rope is attached. So long as the rope hangs loosely from the ring there is no strain on it. Let the other man now pull at the far end, the rope at once is strained, evidently not by the wall, but by the man's pull. The wall puts forth no more effort to strain it than it did before; but simply resists the force communicated to it through the rope. It is, in fact, a case of a force applied to the wall through the rope, every point of which may be considered a point of its application.

Again, take two equal weights attached to the ends of a cord which passes over a pulley. The strain on the cord which hangs down at either side is evidently equal to the weight on that side; and, since the weights are equal, the strains on both sides, and therefore all through the cord, are equal to that weight.

If two bullocks raise water from a pond in a large bucket by a rope which passes over a pulley, as the bucket ascends two forces are acting at the ends of the rope. The stronger pull of

the bullocks overcomes the weight of the water and bucket, and an amount of motion results, due to the difference of the two forces. The rope, however, is strained only by the weaker force, evidently so in the part which descends from the pulley to the bucket, and therefore also in the remainder, since the strain must be uniform along its whole length.

In all these cases the forces were of the nature of a pull, causing a stretching strain. But the conclusions hold equally good of pushing forces. If two such, equal to each other, be applied to a ball at opposite sides in opposite directions, the compressing strain within the ball will be equal to only one of the forces. Or if the ball be pushed against a wall by only one of them, though the wall resists, the strain will still be the same—equal to the single force. The resistance counts for nothing. Also, when the two forces are unequal, and motion ensues, there is a compressing strain equal to the smaller force, while the motion produced is due to the difference of the forces. When a man ascends a ladder with a hod of mortar, there are two such compressing forces acting on his shoulder at the spot on which the hod rests—namely, his own muscular power pushing his shoulder upwards, and the weight of the hod and mortar pushing it down. His ascent is effected by the difference of these forces, the muscular being the greater; while the compressing strain is evidently the weight of the loaded hod. These examples will make clear to you the principle I have been explaining; and you will find no difficulty in multiplying them by thinking of others yourselves.

We now pass to the case of three forces, whose directions are all different, applied to a point, and producing equilibrium. Now it is evident, first of all, that the three must pull or push in the same plane or flat, such as, for instance, the flat surface of a table; for if two of them pulled along that surface, while the third pulled in a slanting direction upwards, this latter force should lift the body off the table. Try the experiment with three strings attached to a ring which lies flat on a table, two of which are pulled horizontally along the table, and the third in any direction upwards. The ring will be lifted, and soon the three strings will come into one plane. I am not here taking into account the weight of the ring and strings, which are a fourth force applied to the body. For the sake of simplification, to enable you to understand the principle, I suppose these to be so small in comparison to the others as to count for nothing.

Secondly, when three forces applied to a point are in equilibrium, the resultant of any two of them is equal and opposite to the third force. This is also evident; for, if it were not, the resultant of the two and the third force, to which the three are equivalent, would not be two forces equal, and opposite to each

other, and therefore could not make equilibrium. In the case of the ring on the table, to which the three strings are attached, if the direction of the effect of the pulls on two of the strings were not opposite to that of the third pull, the three would make the ring move to the side of the table, towards which these two directions incline. And, furthermore, even if the directions were opposite, the ring would move, if the effect of the two, or their resultant, were not equal to the third force. These two principles may be definitely stated as follows:—

1. When three forces applied to a point are in equilibrium, they are in the same plane.
2. The resultant of any two of three forces in equilibrium at a point is equal and opposite to the third force.

From these principles it is evident that in order to ascertain when three forces applied to a point are in equilibrium, it is necessary first to discover what the resultant of any two of them is. If you find that the resultant is opposite to and equal to the third force, then you are certain of equilibrium. The question then is, how may the resultant of two forces be found? This we shall defer to the next lesson, closing this with the single instance in which, without looking for a resultant, we can say that three forces are in equilibrium; that is, when three forces are all equal, and make equal angles with each other, the first with the second, the second with the third, the third with the first, in order all round.

Take, for instance, three equal weights, attached to three strings, two of them much longer than the third, which are tied together in a knot at their other ends. If the two longer strings with their attached weights are now thrown over two pulleys in the same plane, one of the pulleys being even higher up than the other, and the third string and weight is allowed

to hang down in the middle, we shall have a case of three equal forces applied to a point. There are the two outside weights acting over the pulley, and drawing the knot obliquely to either side, and the middle weight pulling it downwards. What position will the strings settle themselves into? Evidently so that the angles all round between the strings may be equal; for no reason in the world can be given why they should be unequal. Whatever reason could be assigned for supposing one of these angles greater than the other, since the forces are equal all round and all the other circumstances the same, that same reason should make that other angle greater than the first. The angles, therefore, must be equal. Let any one of you make the experiment, and measure the angles, and he will find the result to be as I have stated. But you will find this same conclusion arrived at in the next lesson in another and more satisfactory manner, by the Parallelogram of Forces.

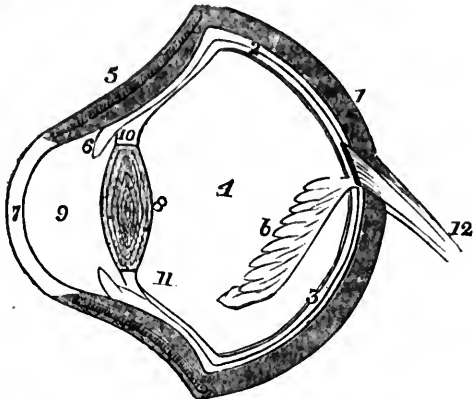


HODMAN ASCENDING LADDER.

ANIMAL PHYSIOLOGY.—II.

THE EYE (Continued).

THROUGHOUT these classes of animals which are called vertebrate, because they have an internal skeleton, the main central portion of which consists of a back-bone of pieces jointed to one another in a long row stretching from one end of the body to the other, the eye is essentially of the same structure as in man. It is true there are differences in the proportion and shape of the parts, and in some cases additional parts are found, while in others the eye is so reduced and degraded as to be of little



VERTICAL SECTION OF THE EYE OF A SOARING BIRD.

1, Sclerotic; 2, Choroid; 3, Retina; 4, Vitreous humour; 5, Bony support of sclerotic or hard coat; 6, Iris; 7, Cornea; 8, Lens; 9, Aqueous humour; 10, Lens ligament; 11, Ciliary processes; 12, Optic nerve.

or no use; but in the majority of cases in brutes, reptiles, and fishes, and in all birds, the eye is well developed, and even where it can be of no use, still indications of it are found.

Our English mole is an instance of an animal with a degraded condition of eye. It is in this animal smaller than a pin's head, and has to be looked for carefully in the midst of the velvet fur. Of course, to an animal which lives underground, burrowing continually in soft earth, an eye would be useless, and even inconvenient; yet the rudiment of an eye is found.

Besides man, only apes (and some lizards, such as the chameleon, and perhaps some fish) have the yellow spot of distinct vision. Vision in some apes must be very powerful, for it is said a gentleman who owned a baboon used to ride away across the plain until he could only just see his dog-ape with the naked eye; then using his telescope, he made a number of gestures, which were immediately mimicked with precision by the animal.

In looking into the open eye the white is part of the opaque sclerotic. The coloured part is the iris seen through the transparent cornea and vitreous humour, while the pupil is the hole through the middle of this, which seems black because of the dark non-reflecting choroid at the back of the eye.

The iris gives the colour to the eye. When there is only a layer of pigment on the back part of this, the eye is blue; but when, in addition, specks or sheets of pigment are distributed through the substance of the iris, eyes of various colours are produced. Thus, fair people have usually blue eyes, and black eyes accompany an olive complexion and dark hair. In other words, people that have a surplus of internal paint elsewhere have it in the iris too.

Again, the lack of pigment is sometimes so great that even the choroid has none, and then the pupil looks red because the blood-vessels of the choroid can be seen through its front layer. Albinos, as individuals with the last peculiarity are called, are found among rabbits, mice, cats, and many other species, and are especially prone to occur under domestication. These creatures present an appearance which is very ethereal and fairy-like, so that artists have often introduced them into their fanciful pictures, as in Landseer's "Bottom and Titania." But however they may grace the ideal creation of the painter, they are less suited to this working-day world than their coarser brothers.

On the other hand, in some species a further deposit takes

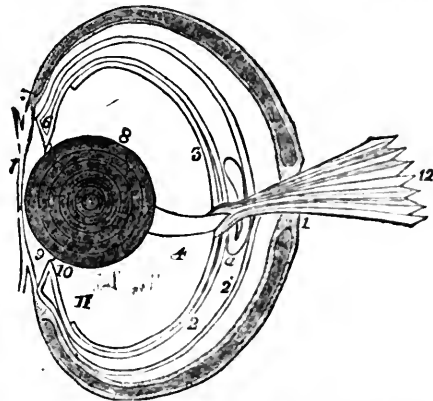
place in the choroid of pigment of metallic brilliancy. This may be well seen at the bottom of the eye of the ox inside; in others, the sclerotic is coloured, as any visitor at the Zoological Gardens may see to be the case in the eye of the chimpanzee.

These diversities, with many others, such as the contraction of the iris of the cat, so as to leave a slit instead of a circular opening, are interesting, but by no means so functionally important as others to be mentioned hereafter, when we describe eyes suited to conditions altogether different, such, for instance, as the fish's eye, which is constructed to see in water.

Birds, some of which are almost exclusively denizens of the air, and most of which have the power of betaking themselves to flight occasionally to escape pursuit, to hunt active prey, to search for new feeding-grounds, or to select a more genial climate at the change of the seasons, must have eyes suited to distant vision. Hence the lens is of a very flattened form, and does not increase in density from the outside to the inside as it does in mammalia, and more strikingly in fish. The distance from the lens to the back part of the eye is small, and to the cornea large relatively; in other words, they have a larger amount of aqueous and a smaller amount of vitreous humour than brutes have. The back part of the eye too is flatter, and is a portion of a larger sphere in relation to the rest of the eye than in animals. The shape will be best seen by the aid of the diagram of the vertical section of the eye of a soaring bird.

When the eye is spherical and distended with fluid, as in man, there is no tendency of the pressure within to alter the shape of the ball; but when, as in the case of birds, it has any other form, the internal pressure would strain the elastic capsule of the eye in some parts more than in others. This strain can only be prevented by rendering those parts of the capsule which are exposed to the extra pressure more solid. In the case of the bird, this is effected by means of a series of bony plates which encircle the sclerotic, bedded in its substance, and stretching from the rim of the cornea to the circumference of the large segment of the eye, on the inside of which the retina is spread out.

The structures described above, conducive to long sight in a thin medium, are more especially to be remarked in soaring, raptorial birds, like the eagles, vultures, and hawks. These, as they wheel round at a great height, survey a large extent of



VERTICAL SECTION OF THE EYE OF A FISH.

1, Sclerotic; 2, Choroid; 3, Inner layer of Choroid; 4, Retina; 5, Choroid gland; 6, Iris; 7, Cornea; 8, Lens; 9, Aqueous humour; 10, Lens ligament; 11, Ciliary processes; 12, Optic nerve.

country; yet their sight is so keen at that elevation that no young unprotected animal, or maimed and disabled prey, escapes their sight. So keen is the sight of the condor of the Andes, that if a carcass be exposed where the naked eye can detect none of these creatures in the horizon, yet in a few minutes they are seen streaming in from all directions straight towards their hoped-for meal.

But though birds be long-sighted, it is also highly necessary that they should see minute objects at a short distance. No entomologist will deny that an insectivorous bird must have keen eyes for short distances, if it is to get its living with ease. A microscopic sight is scarcely less requisite for a grain-

feeding bird. The swallow, which plunges with such reckless impulse through the air, will nevertheless seize a small insect as it dashes along with almost unerring certainty. Usually the prey is so small, that the wonderful powers of the bird displayed in the chase cannot be observed; but sometimes, when the insect has large wings, this dexterity may be seen.

The writer has seen a swallow seize, while in headlong flight, the beautiful, scarce swallow-tail butterfly, and shear out its rapid body from between the wide wings, and let them float severally down; and then, not satisfied with a feast so little proportioned to the splendour in which it was dished up, glance round and seize again the several pieces before they had time to reach the ground. How, then, is a long sight and a keen short sight to be obtained from the same eye? This is done mainly by the aid of the bony plates already described. These are so disposed that the edge of one is capable of sliding over the edge of its next neighbour, so that when the fibres of the muscle which unites them contract they compress the eye all round and make it more tubular, while the humours of the eye, thus subjected to pressure, cause the cornea to protrude more, and also the retina to be removed further from the lens. These motions are, in addition to the adjustment for distance, found in mammals.

Intimately connected with this pressure upon and alteration of the dimensions of the humours of the eye, is another peculiarity in the eye of a bird. This is a puckered, purse-like membrane, which is attached to the optic nerve, which in this class enters into the eye by a slit-like opening. This membrane is sometimes called a marsupium, from its resemblance to a purse, and sometimes a pecten, from its supposed likeness to a comb. It stretches to the interior of the eye to a different extent in different birds, and is composed of a tangled mass of blood-vessels, mixed with pigment granules. Whether this is simply an erectile organ, which can rapidly contract and enlarge suddenly as it is deprived of or injected with blood, or is capable of feeding the vitreous humour with liquid strained by it from the blood, and draining it off again as circumstances require, is not known.

The eyes of reptiles are so different from one another, ranging in structure between the eye of the bird and that of the fish, that it is better at once to pass on to a description of an eye adapted to sight in water.

A fish, living as it does in an atmosphere which is many hundred times denser than air, and by no means so transparent, must have an eye suited to look at near objects. It must therefore be able to concentrate the rays of light rapidly; yet it is under this disadvantage, that as it is only when passing from a rare into a dense transparent convex substance that diverging rays are bent towards one another, and the original rays pass through a dense medium, the cornea and aqueous humours can play no part in the bending of the rays towards one another, for they are of about the same density as water. The whole duty of refraction must thus be done by the lens. This is very dense, and of the sheets of which it is made up the inside are denser than the outside, while it is so convex both before and behind as to become a perfect globe.

Both the consistence and shape of the round lens may be seen by squeezing it out of the eye of a cooked fish, even by those whose taste for comparative anatomy is only stimulated at the dinner-table.

In connection with this kind of lens we have a shallow eye. In other words, if the cornea, through which light enters, be turned upwards, the back of the eye on which the retina is spread resembles a saucer, and not a cup as it does in animals and birds.

This is so much the case, that even though the hard capsule is shallower than in brutes, there is still left a large space between this and the choroid, and even this latter has between two of its layers a horse-shoe shaped "gland" composed of blood-vessels, something like the pecten of a bird, though in a different place, and with exactly a converse function.

The hard outer coat is strengthened and held to its form by a cup-shaped bone or cartilage, which occupies the parts which are left unoccupied by the bird's eye-bones; because while the latter are used to elongate the eye this maintains a shortened axis.

The cornea, or window, and the watery fluid behind it being useless to collect the rays are left, the one flat and the other

in small quantity, and the result of this is that the fish can see distant objects as well through the air as through the water; and this is important, because almost all fish are surface fish; many feed on flies, and most have to be on their guard against aerial foes. The reader, then, need not be surprised when the sun-loving shoals of carp or chub all plunge headlong into the depths when he appears on the river bank.

As a singular instance of the adaptation of means to ends, it is found that all animals, whether reptiles, birds, or brutes, which are amphibious, or which spend much time in the water, have eyes which, though they differ from those of fish, in some things have the same relation of the cornea and lens. Thus the whale and the dolphin (which are but brutes which have taken to the sea), the cormorant and diver, the frog and the crocodile, have all spherical lenses and flat cornea.

Fish and frogs have on the outer layer of the choroid a layer of silvery or golden crystals, and this layer, which is continued round till it occupies the front layer of the iris, gives to the toad so metallic and bright an eye as to countenance the legend that it has a jewel in its head. So Shakespeare—

"The toad, ugly and venomous,
Wears yet a precious jewel in its head."

LESSONS IN GERMAN.—IV.

SECTION VIII.—INDEFINITE ARTICLE.

THE *indefinite* article is less varied than the *definite*, having for the *masculine* and *neuter* nominative but one form, as—

Masculine: ein Mann, a man. *Neuter*: ein Glas, a glass.

DECLENSION OF THE INDEFINITE ARTICLE MASCULINE AND NEUTER WITH NOUNS.

<i>Masculine.</i>	<i>Neuter.</i>
N. Ein Mann, a man;	ein Kind, a child;
G. Einem Manne, of a man;	eines Kindes, of a child;
D. Einem Manne, to, for a man;	einem Kinde, to, for a child;
A. Einen Mann, a man;	ein Kind, a child.

OF THE COMPOUNDING OF NOUNS IN GERMAN.

1. NOUNS are more frequently compounded in German than in English; and accordingly *one* word in German often requires for its full translation several in English, as:—

Wirthungsfreis, sphere of action (action sphere);
Schwimmvogel, web-footed bird (swimming fowl);
Lastthier, beast of burden (burden animal);
Zugthier, draught animal (§ 2. 7);
Hausthier, domestic animal (house animal).

VOCABULARY.

Band, <i>n.</i> ribbon.	Kaufmann, <i>m.</i> merchant.	Schmied, <i>m.</i> blacksmith.
Ein, <i>a.</i> an.	Lastthier, <i>n.</i> beast of burden.	Schwert, <i>n.</i> sword.
Eisen, <i>n.</i> iron.	Oberhofrichter, <i>m.</i> judge of the superior court.	Stock, <i>m.</i> stick, cane.
Empfehlungsbrief, <i>m.</i> letter of recommendation.	Papierhändler, <i>m.</i> paper-dealer.	Tuch, <i>n.</i> cloth.
Feind, <i>m.</i> enemy.	Pflug, <i>m.</i> plough.	Tuchhändler, <i>m.</i> draper.
Gefäßbuch, <i>n.</i> law-book.	Ramel', <i>n.</i> camel.	Wagner, <i>m.</i> carriage-maker.
Gewehr, <i>n.</i> gun.		Zugthier, <i>n.</i> draught animal.

RÉSUMÉ OF EXAMPLES.

Der Wolf ist ein Raubthier.	The wolf is a beast of prey.
Der Zimmermann ist ein Handwerker.	The carpenter is a mechanic.
Der Hammer ist ein Werkzeug.	The hammer is a tool (an instrument).
Das Bindewort ist ein Redetheil.	The conjunction is a part of speech.
Der Name eines Dinges ist ein Dingwort.	The name of a thing (substance) is a substantive.
Das Kind liebt den Großvater.	The child loves the grandfather.

EXERCISE 9.

1. Hat ein Mann, oder ein Kind den Stof dieses Treutes? 2. Dieser Mann hat ein Schwert eines Feindes, und dieses Kind hat den Stof eines Feindes. 3. Was hat der Säger? 4. Er hat einen Hund und ein

Gelehrte. 5. Wer hat den Pflug des Bauers? 6. Der Vater dieses Kindes hat den Pflug. 7. Hat dieser Schmied das Geld des Kaufmanns? 8. Nein, er hat nur Eisen von einem Kaufmann. 9. Haben Sie den Wagen des Vaters? 10. Nein, ich habe diesen Wagen von einem Wagner. 11. Haben Sie das Band dieses Mädchens? 12. Nein, ich habe Tuch von einem Tuchhändler. 13. Haben Sie den Rock dieses Freundes? 14. Nein, ich habe diesen Rock von einem Schneider. 15. Haben Sie das Papier des Lehrers? 16. Nein, ich habe dieses Papier von einem Papierhändler, und einem Empfehlungsbrief von dem Lehrer. 17. Ist das Pferd ein Jagdtier? 18. Ja, und es ist auch ein Lastthier? 19. Ist das Kamel auch ein Jagdtier? 20. Nein, es ist nur ein Lastthier? 21. Wessen Gesetzbuch hat der Sohn des Edelmanns? 22. Er hat das Gesetzbuch des Oberhofrichters.

SECTION IX.—DECLENSION OF ADJECTIVES.

The adjective has thus far been employed only predicatively, in which use it is unvaried in form, as

Eisn ist hart, steel is hard; Blei ist weich, lead is soft.

The terms *attributive* and *predicative* have, in grammar, a strictly conventional sense, and should be distinctly understood. If we say, 'The deep river is here (ter tiefe Fluß ist hier), the adjective *deep* is *attributive*: for the quality, depth, is there referred to as a known and recognised *attribute* of the river. If we say, 'The river is deep here (ter Fluß ist hier tief), the adjective is *predicative*, for we then merely affirm or *predicate* of the river that it has the quality, depth.

When used *attributively*, the adjective is varied by the addition of suffixes.

1. When not affected by a preceding word, the adjective is inflected according to

THE OLD DECLENSION.

Masculine.

Neuter.

- 1. Gut-er Stahl, good steel; gut-es Eisen, good iron;
- 2. Gut-es Stahls, of good steel; gut-es Eisens, of good iron,
- 3. Gut-em Stahle, to good steel; gut-em Eisen, to good iron;
- 4. Gut-en Stahl, good steel; gut-es Eisen, good iron.

The genitive of the old form is now seldom used; that of the new form being preferred. Thus, guten Stahls; guten Eisens, &c., instead of gutes Stahls; gutes Eisens, &c.

2. When preceded by any of the following words—

Masculine.	Neuter.	Masculine.	Neuter.
Der,	das (tho);	jeder,	jedes (every);
Dieser,	dieses (this);	jener,	jenes (that);
Aller,	alles (all);	mancher,	manches (many a);
Einiger,	einiges (some);	solcher,	solches (such);
Welcher,	welches (some);	welcher,	welches (which);

the adjective adds, in the nominative *masculine* and in the nominative and accusative *neuter*, the letter *e*, and in all the other cases *en*; and is inflected according to

THE NEW DECLENSION.

Masculine.

Neuter.

- 1. Der gut-e, the good; das gut-e, the good;
- 2. Des guten, of the good; des guten, of the good;
- 3. Dem guten, to, for the good; dem guten, to, for the good;
- 4. Den guten, the good; das gut-e, the good.

VOCABULARY.

Alles, all.	Jung, young.	Schön, beautiful, fine.
Engländer, m. Englishman.	Kein, small, little.	Schwach, weak, feeble.
Frack, m. dress-coat.	Messer, n. knife.	Schwarz, black.
Goldschmied, m. goldsmith.	Rateltischen, n. pin-cushion.	Stark, strong.
Groß, great, large.	Neu, new.	Uhrmacher, m. watchmaker.
Gut, good, well.	Dheim, m. uncle.	Weber, m. weaver.
	Scharf, sharp.	

3. RÉSUMÉ OF EXAMPLES, SHOWING THE ENDINGS OF ADJECTIVES IN THE NOMINATIVE, AFTER THE NEW DECLENSION.

Attributive.	Predicative.	
Aller hart-e Stahl ist nützlich.	Aller nützlich-e Eisen ist hart.	All hard steel is useful.
Der nützlich-e Stahl ist hart.		All useful iron is hard.
		The useful steel is hard.

Attributive. Predicative.

Das hart-e Eisen ist nützlich.	This beautiful bird is white.
Dieser schön-e Vogel ist weiß.	This white paper is beautiful.
Dieses weiß-e Papier ist schön.	Some (a little) red wine.
Einiger roth-e Wein.	Some (a little) red paper.
Einiges roth-e Papier.	Every contented man is happy.
Jeder zufriedene-e Mann ist glücklich.	Every happy child is contented.
Jedes glücklich-e Kind ist zufrieden.	Yonder (that) beautiful tree is large.
Jener schön-e Baum ist groß.	Yonder (that) large horse is beautiful.
Seine groß-e Pferd ist schön.	Many a good man is poor.
Mancher gut-e Mann ist arm.	Many a beautiful girl is vain.
Manches schön-e Mädchen ist eitelf.	Such fine steel is costly.
Goldes fein-e Stahl ist feilbar.	Such costly cloth is fine.
Solches feilbar-e Tuch ist fein.	Which old man is happy?
Welcher alt-e Mann ist glücklich?	Which little child is contented?
Welches klein-e Kind ist zufrieden?	

EXERCISE 10.

1. Ist dieser junge Mann der Sohn des Caritains? 2. Nein, er ist der Sohn des alten Webers. 3. Wer hat das Platensisen dieses kleinen Mädchens? 4. Dieses kleine Kind hat guten Freundes hat es. 5. Wer hat das schöne Pferd des guten Webers? 6. Der junge Goldschmied hat es. 7. Wer hat den großen schwarzen Hund des Vaters? 8. Der junge Bruder des Kaufmanns hat ihn. 9. Hat das kleine Kind das scharfe Messer des guten Bruders? 10. Nein, es hat den neuen Stamm des guten Mädchens. 11. Hat der junge Freund des alten Uhrmachers das schöne Pferd des alten Knächtes? 12. Nein, er hat das Pferd des reichen Engländers. 13. Haben Sie den Trank des guten Schneiders? 14. Nein, ich habe diesen neuen Trank von dem guten Schneider. 15. Haben Sie das Tuch in es armen Webers? 16. Nein, ich habe Tuch von dem Weber. 17. Ist aller alte Wein stark? 18. Nein, und nicht aller neue Wein ist schwarz. 19. Der neue Trank ist von schwarzem Luch.

SECTION X.—DECLENSION OF ADJECTIVES (continued).

When preceded by any one of the following words—

Masculine.	Neuter.	Masculine.	Neuter.
Ein,	ein (a or an);	unser,	unser (our);
Mein,	mein (my);	Ihr,	Ihr (your);
Dein,	dein (thy);	euer,	euer (your);
Sein,	sein (his, its);	ihr,	ihr (their);
Ihr,	ihr (her);	kein,	kein (no, or not any);

the adjective has, in the nominative *masculine* and in the nominative and accusative *neuter*, the terminations of the old declension, and, in all the other cases, those of the new, and is said to be of

THE MIXED DECLENSION.

Masculine.

Neuter.

- 1. Mein gut-er, my good; mein gut-es, my good;
- 2. Meines guten, of my good; meines guten, of my good;
- 3. Meinem guten, to, for my good; meinem guten, to, for my good;
- 4. Meinen guten, my good; mein gut-es, my good.

1. In the preceding list of words, ein, mein, dein, &c., it will be seen that their form for the *masculine* and *neuter* is the same; and hence that they do not (like the previous class, der, dieser, &c., and like adjectives of the old declension) indicate the *gender* of the nouns which they precede. The *adjective*, therefore, by taking the characteristic termination (er for the *masculine* and es for the *neuter*) assumes the office of pointing out the *gender* of its noun, as

Masculine:	Ein groß-er Stein, a great stone.
Neuter:	Ein groß-es Schiff, a great ship.

VOCABULARY.

Aber, but.	Lamm, n. lamb.	Stief, steep.
Dach, n. roof.	Nicht, not.	Stets, always.
faul, lazy, idle.	Schaf, n. sheep.	Thier, n. animal, beast.
fest, fast.	Schutz, m. protection,	Tief, deep.
Selbster, m. Dutchman.	defence.	True, true, faithful.
	Schwein, n. swine.	Zufrieden, contented.
Ihr, your.	Sein, his.	satisfied.
Keller, m. cellar.	Sofa, n. sofa.	Weiß, white.

2. RÉSUMÉ OF EXAMPLES, SHOWING THE ENDINGS OF ADJECTIVES IN THE NOMINATIVE AFTER THE MIXED DECLENSION.

Attributive. Predicative.
 Ein warm-er Mantel ist gut.
 Ein warm-es Kleid ist gut.
 Mein gut-er Hund ist alt.
 Mein alt-es Pferd ist gut.
 Dein schön-er Vogel ist weiß.
 Dein weiß-es Papier ist schön.
 Sein hart-er Stahl ist gut.
 Sein gut-es Eisen ist hart.
 Ihr gut-er Bruder ist klein.
 Ihr klein-es Kind ist gut.
 Unser groß-er Baum ist schön.
 Unser schön-es Haus ist groß.
 Euer alt-er Koffer ist schwarz.
 Euer schwarz-es Band ist alt.
 Ihr grün-er Garten ist groß.

A warm coat is good.
 A warm garment is good.
 My good dog is old.
 My old horse is good.
 Thy beautiful bird is white.
 Thy white paper is beautiful.
 His hard steel is good.
 His good iron is hard.
 Her good brother is small.
 Her little child is good.
 Our large tree is beautiful.
 Our beautiful house is large.
 Your old trunk is black.
 Your black ribbon is old.
 Their green garden is large.

Attributive. Predicative.
 Ihr groß-es Feld ist grün.
 Sein gut-er Stahl ist gelb.
 Sein gut-es Silber ist gelb.

Their large field is green.
 No good steel is yellow.
 No good silver is yellow. (Compare Sect. IX. 3.)

EXERCISE 11.

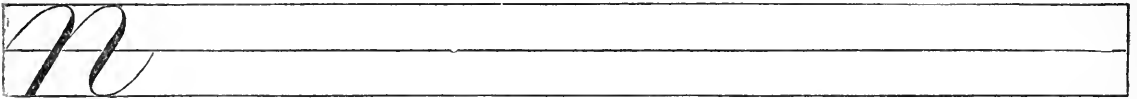
1. Ist Ihr guter Freund, der Capitain, noch ein junger Mann? 2. Ja, er ist noch jung, aber sein guter Freund, der Holländer, ist alt. 3. Haben Sie einen schönen, großen Hund? 4. Nein, ich habe ein schönes, großes Pferd. 5. Hat Ihr kleines Kind mein neues Messer? 6. Nein, aber Ihr guter Sohn hat Ihren neuen Stock. 7. Hat der Fleischer ein fettes Schaf? 8. Ja, und sein guter Sohn hat ein schönes, weißes Lamm. 9. Ist Ihr Freund, der junge Holländer, reich oder arm? 10. Er ist nicht reich, aber er ist zufrieden. 11. Ein zufriedener Mann ist auch reich. 12. Ein reicher Mann ist nicht stets ein zufriedener Mann. 13. Ihr großes Haus hat ein steiles Dach und einen tiefen Keller. 14. Von wem haben Sie Ihr neues Sopha? 15. Ich habe es von einem guten Freunde. 16. Das Schwein ist ein faules, fettes Thier. 17. Ein treuer Freund ist ein starker Schutz.



COPY-SLIP NO. 11.—THE "TOP TURN" OR "HANGER."



COPY-SLIP NO. 12.—THE "TOP AND BOTTOM TURN."



COPY-SLIP NO. 13.—THE LETTER **n**.



COPY-SLIP NO. 14.—THE LETTER **m**.

LESSONS IN PENMANSHIP.—V.

HITHERTO the attention of the learner has been confined to letters based on the elementary stroke called the "pot-hook" or "bottom-turn." He may now proceed to copy the next elementary stroke, called the "top-turn" or "hanger," as shown in Copy-slip No. 11.

This stroke will be found to enter into the composition of three letters only, and therefore plays by no means so important a part in the formation of the writing alphabet as the bottom-turn, which, as it has been already said, enters into the composition of no less than nine. It consists of a fine hair-stroke, commenced on the central line *c c*, and carried upwards in a direction bending gradually towards the right, as far as the upper line *a a*, where it is turned and changed into a broad down-stroke, which is brought downwards, with an equal pressure of the pen throughout, as far as the lower line *b b*.

The top-turn may be described as being precisely the reverse of the bottom-turn; or, in other words, the bottom-turn reversed, as may be seen by turning the page upside down, and examining the stroke in this position. It is only used in combination with other elementary strokes in forming letters, for unlike the bottom-turn, there is no letter of the writing alphabet which is formed of this stroke alone, or even by its repetition or any modification of it.

It is needful, therefore, for the learner to become acquainted with a third elementary stroke before he can proceed to the formation of any new letters, and this he will find in the top and bottom-turn shown in Copy-slip No. 12. This stroke enters into the composition of six letters of the writing alphabet, as the learner will find in future lessons. It consists of a fine hair-stroke, commenced at the central line *c c*, brought upwards towards the right in a gentle curve, and turned at the upper line *a a* into a broad down-stroke, which is again narrowed as it approaches the lower line *b b* into a fine hair-stroke that is turned and carried upwards towards the right. It may be described as being formed of the upper half of the top-turn and the lower half of the bottom-turn, joined together on the line *c c*. Examples of all these elementary strokes will be found in No. 1 of "Cassell's Penny Copy-Books." When the learner can make these strokes with ease, he will find that he is in a position to form two more letters of the writing alphabet without any difficulty whatever, while he has also advanced more than half-way towards the formation of the seven other letters that are partly made by the aid of these strokes. He may now proceed to copy the letters **n** and **m**, as shown in Copy-slips Nos. 13 and 14, observing that the letter **n** consists of a combination of these two strokes only, the top-turn being made first, and the top-and-bottom-turn added to it, while in the letter **m** the top-turn is repeated twice, and the letter is then completed by the addition of the top-and-bottom-turn.

LESSONS IN ARITHMETIC.—V.

DIVISION.

1. THE process of finding how many times one number is contained in another is called *Division*.

The number to be divided is called the *Dividend*.

The number by which we divide is called the *Divisor*.

The result—viz., the number of times which the Dividend contains the Divisor—is called the *Quotient* (Latin *quoties*, "how often").

The sign \div placed between two numbers means that the first is to be divided by the second. Thus, $19 \div 5$ means 19 divided by 5.

If the Dividend does not contain the Divisor an exact number of times, it will contain it a certain number of times (the Quotient) with a number left over, which will be less than the Divisor. The number left over in this case is called the *Remainder*.

Thus, when we say that 5 is contained in 19 3 times and 4 over, 19 is the dividend, 5 the divisor, 3 the quotient, and 4 the remainder.

This fact may be exhibited in the following form:—

$$19 = 3 \times 5 + 4$$

2. It will readily be perceived that division is, in reality, only a short method of performing a series of *subtractions*, in the same way as multiplication is a convenient method of performing a series of additions. For instance, to find how many times 5 is contained in 19, subtract 5 (the divisor) continually from 19 (the dividend), until the number is exhausted, or a number less than 5 is left; then, counting the number of these subtractions, we shall get the quotient. Thus, 5 from 19 leaves 14, 5 from 14 leaves 9, 5 from 9 leaves 4. Since 5 has been subtracted 3 times from 19, leaving 4 as a remainder, we see that 19 divided by 5 has 3 for its quotient, leaving 4 as a remainder.

N.B.—It is evident, from the nature of division, that the product of the quotient and divisor, added to the remainder, is equal to the dividend.

3. *Method of Division*.—The method we are about to explain depends upon the truth of the following principle:—

If the dividend be split up into any number of parts, of which the sum is equal to the dividend, then, if we divide each part separately by the divisor, the sum of all the quotients so obtained will be the quotient required.

For instance, 18 is equal to the sum of 9 and 6 and 3. The quotients of these, divided respectively by 3, are 3, 2, and 1, which, added together, make 6, the quotient of 18 divided by 3.

Similarly, 36 is 28 + 8, and therefore 36 divided by 4 is the sum of the separate quotients of 28 and 8 by 4, which are 7 and 2 respectively. Hence $7 + 2$, or 9, is the required quotient.

It must be observed that if, the quotient of a given dividend and divisor being known, the dividend be increased by annexing any number of ciphers to it, the new quotient is obtained by annexing the same number of ciphers to the quotient. Thus, 28 divided by 4 has the quotient 7; and 28000 divided by 7 is 4000.

4. To divide 5356 by 4.

$$5356 = 5 \text{ thousands} + 3 \text{ hundreds} + 5 \text{ tens} + 6 \text{ units.}$$

Now 5 contains 4 once, with remainder 1; therefore 5 thousands contain 4 one thousand times, with remainder 1 thousand.

Add this remaining 1 thousand to the 3 hundreds, thus making 13 hundreds.

Now 13 contains 4 three times, with remainder 1; therefore 13 hundreds contain 4 three hundred times, with remainder 1 hundred.

Add this remaining 1 hundred to the 5 tens, thus making 15 tens.

Now 15 contains 4 three times, with remainder 3; therefore 15 tens contain 4 thirty times, with remainder 3 tens, or 30.

Add this remaining 30 to the 6 units, thus making 36 units.

Now 36 units contains 4 nine times.

Therefore 1 thousand, 3 hundreds, three tens, and 9 units are the number of times the parts into which 5356 has been divided contain the divisor 4 respectively. Their sum, therefore, is the required quotient: this is

$$1 \text{ thousand} + 3 \text{ hundreds} + 3 \text{ tens} + 9 \text{ units, i.e. } 1339.$$

5. The above is the analysis of the following shorter process, and will be seen fully to explain it:—

Write down the dividend and divisor as in the margin; then say 4 in 5 is contained 1 time, with 1 over. Write the quotient 1 under the 5, and placing the remaining 1 before the next figure of the dividend 3, say, 4 in 13

$$\begin{array}{r} 4)5356 \\ \underline{4} \\ 13 \\ \underline{12} \\ 10 \\ \underline{8} \\ 20 \\ \underline{20} \\ 6 \\ \underline{4} \\ 2 \end{array}$$

is contained 3 times and 1 over. Write the quotient 2 under the second figure in the dividend, and prefixing the remaining 1 to the 5, say, 4 in 15 is contained 3 times and 3 over. Write the quotient 3 under the third figure in the dividend, and prefixing the remaining 3 to the 6, say, 4 in 36 is contained 9 times, with no remainder, and write down the 9 under the last or unit's figure of the dividend.

It will be seen that when, to get the first figure of the quotient, we say 4 in 5 is contained once, with remainder 1, we really indicate that 4 is contained in 5000 1000 times, with remainder 1000, which 1000 we carry on to add to the next three of the dividend, which really indicates 300, and so on; as will be seen by comparing the process with the analysis of the method in Article 4.

6. To divide 7499 by 9.

$$\begin{array}{r} 9)7499 \\ \underline{9} \\ 8 \\ \underline{8} \\ 9 \\ \underline{9} \\ 9 \\ \underline{9} \\ 0 \end{array}$$

$$833-2$$

Here, since 7, the first figure of the dividend, is less than the divisor, 9, we take two figures of the dividend, and say, 9 in 74 is contained 8 times, with a remainder 2, and put down the 8 under the second figure of the dividend (reckoning from the left hand). Then, proceeding as in the previous example, we say, 9 in 29 is contained 3 times and 2 over; and again, 9 in 29 is contained 3 times and 2 over. This last 2 is 2 units, and is therefore the remainder left after dividing 7499 by 9. It is generally written after the quotient, as above.

This method, which is only conveniently applicable when the divisor is a small number (generally one figure), is called *Short Division*.

EXERCISE 8.

- (1.) Divide 658 by 2; 537 by 3; and 7891011 by 6.
- (2.) Divide 4389127 by 8; 407792 by 11; and 5249279 by 9.
- (3.) Divide 41239789 by 12; and 54937862 by 5.
- (4.) Divide each of the numbers contained in the square in Ex. 4, page 23, successively by 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.
- (5.) Divide each of the numbers contained in the square in Ex. 4, page 23, successively by 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.
- (6.) Divide each of the numbers 1010421690, 7689768432134, 54932684736856, and 423571423571496, by all the numbers from 2 to 12 inclusive.

7. To divide 9298 by 35.

Arrange the figures as in the margin; then say, the largest number of times which 35 is contained in 92 is 2 times. Write the 2 on the right, to form the first figure of the quotient, and subtract 2×35 —i.e., 70—from 92, leaving 22. Annex to this remainder the next figure (9) in the dividend, thus making it 229.

$$\begin{array}{r} 35)9298(265 \\ \underline{70} \\ 229 \\ \underline{210} \\ 198 \\ \underline{175} \\ 23 \end{array}$$

Then say, the greatest number of times that 35 is contained in 229 is 6 (which must be found by trial). Put down the 6 to form the next figure in the quotient, and subtract 6 times 35—i.e., 210—from 229, leaving a remainder 19. To this annex the last figure (8) of the dividend, making it 198.

Then say, the greatest number of times which 35 is contained in 198 is 5. Write down the 5 to form the next figure in the quotient, and subtract 5 times 35—i.e., 175—from 198, leaving 23. 265 is the required quotient, and 23 is the remainder.

$$\text{Hence } 9298 = 265 \times 35 + 23.$$

8. A careful examination of the above process will show that what we have really done is equivalent to saying: 35 is contained in 92 hundreds two hundred times, with a remainder 22 hundred; then, subtracting 200 times 35—i.e., 7 thousand—from 9298, we have 2298 left.

Next we say: 35 is contained in 229 tens sixty times, with a remainder of 19 tens; then subtracting 60 times 35—i.e., 2100—from 2298, we have 198 left.

Next we say: 35 is contained five times in 198, with a remainder 23.

Hence we see that after taking away 35, first, 200 times from the dividend, again, 60 times from what is left, and again, 5 times from what is left, we have 23 units over, a number which is less than 35.

Hence we see that 35 is contained in 9298—

$$200 + 60 + 5 \text{—i.e., } 265 \text{ times—with a remainder } 23.$$

We might have written down the process thus:—

35)9298(200
 7000
 ———
 35)2298(60
 2100
 ———
 35) 198(5
 175
 ———
 23

The quotient is therefore 200 + 60 + 5, or 265, and the remainder 23.

9. The above explanations will sufficiently elucidate the following—

Rules for Division:—

(1.) When the divisor contains only one figure, write the divisor on the left of the dividend, with a curved line between them. Beginning at the left hand, divide successively each figure of the dividend by the divisor, and place each quotient figure directly under the figure divided. If there be a remainder after dividing any figure, prefix it to the next figure of the dividend, and divide the number so formed as before. If there occur any figure which does not contain the divisor, place a cipher in the quotient, and prefix this figure to the next one of the dividend, as if it were a remainder, and proceed in the same manner to the last figure.

(2.) When the divisor contains more than one figure, beginning on the left of the dividend, find how many times the divisor is contained in the first fewest figures of the dividend which will contain it, and place the quotient figure on the right hand of the dividend, with a curved line between them; then multiply the divisor by this figure, and subtract the product from the figures divided. To the right of the remainder bring down the next figure of the dividend, and divide the number so formed as before. If this number be less than the divisor, annex a cipher to the quotient, and bring down the next figure continuing this process until the number thus obtained be equal to or greater than the divisor. Proceed in this manner until all the figures of the dividend are exhausted.

10. Tests of Correctness of Division:—

(1.) Multiply the divisor by the quotient, and add the remainder to the product. This should, as already explained, give the dividend.

(2.) Subtract the remainder, if any, from the dividend, and divide the difference so obtained by the quotient. The result should be equal to the divisor, if the working be correct.

EXERCISE 9.

- (1.) Divide 47839 by 42; 75043 by 52; and 93840 by 63.
- (2.) Divide 325000 by 85; 421645 by 74; and 999999 by 47.
- (3.) Divide 145260 by 1345; and 1912500 by 425.
- (4.) Divide 8993810 by 37846; and 9302688 by 14356.
- (5.) Divide 9749320 by 365; 65358547823 by 2789; and 908670605040 by 654321.
- (6.) Divide 1000000000000000 by 111; 100000000000 by 333; and 10000000000000000 by 11111.
- (7.) Divide the product of 12345 multiplied by 67890 by 97, 213, 4351, 59, 847, and 6939.

LESSONS IN LATIN.—III.

PRELIMINARY INSTRUCTIONS IN THE VERBS OF THE FOUR CONJUGATIONS (continued).

SECOND CONJUGATION.

ACTIVE VOICE.		PASSIVE VOICE.	
PRESENT INDICATIVE.		PRESENT INDICATIVE.	
PERSON-ENDING.		PERSON-ENDING.	
Singular.	Plural.	Singular.	Plural.
-or,	I	-or,	I
-or,	thou	-eris,	thou
-et,	he	-etur,	they.
	-emus, we	-emur,	we
	-etis, ye	-emini,	ye
	-ent, they.	-entur,	they.

EXAMPLE.—Monēre. to remind: stem, mon.

PRESENT ACTIVE INDICATIVE.		PRESENT PASSIVE INDICATIVE.	
Singular.		Singular.	
1st per.	Monēo, I remind	1st per.	Monēor, I am reminded
2nd "	Monēs, thou remindest	2nd "	Monēris, thou art reminded
3rd "	Monēt, he reminds.	3rd "	Monētur, he is reminded.
Plural.		Plural.	
1st per.	Monēmus, we remind	1st per.	Monēmur, we are reminded
2nd "	Monētis, you remind	2nd "	Monēmini, you are reminded
3rd "	Monēt, they remind.	3rd "	Monēntur, they are reminded

VOCABULARY.

Debēo, 2 I owe.	Mordēo, 2 I bite.	Terrēo, 2 I frighten.
Docēo, 2 I teach.	Movēo, 2 I move.	Timēo, 2 I fear.
Exercēo, 2 I exercise.	Parēo, 2 I obey.	Et (conj.) and.
Florēo, 2 I flourish.	Tacēo, 2 I am silent.	Si (conj.) if.
Gaudēo, 2 I rejoice.	Tenēo, 2 I hold.	

EXERCISE 5.—LATIN-ENGLISH.

- 1. Debes. 2. Docet. 3. Exercetur. 4. Florēmus. 5. Gaudētis. 6. Mordentur. 7. Movēmus. 8. Movētis. 9. Movent. 10. Times. 11. Timet. 12. Terrētur. 13. Terrēmini. 14. Debeo parere. 15. Si parētis laudāmini. 16. Si tacemus laudāmur. 17. Docētis et educāris. 18. Tacet et laudātur. 19. Mordet et vūneror. 20. Si vūneras vituperāris. 21. Tenentur.

EXERCISE 6.—ENGLISH-LATIN.

- 1. Thou fearest and art frightened. 2. If I am silent I am blamed. 3. He rejoices. 4. We rejoice. 5. They rejoice. 6. He tries to bite. 7. We try to educate. 8. Thou obeyest and art praised. 9. We bite. 10. If we bite we are blamed. 11. They exercise. 12. You are moved. 13. He dances. 14. They are delighted. 15. You are adorned.

N.B.—In this exercise, and in those which follow, words and forms previously given are repeated for the sake of practice.

THIRD CONJUGATION.

ACTIVE VOICE.		PASSIVE VOICE.	
PRESENT INDICATIVE.		PRESENT INDICATIVE.	
PERSON-ENDING.		PERSON-ENDING.	
Singular.	Plural.	Singular.	Plural.
-o,	I	-or,	I
-is,	thou	-eris,	thou
-it,	he	-itur,	he
	-imus, we	-imur,	we
	-itis, ye	-imini,	ye
	-unt, they.	-untur,	they.

EXAMPLE.—Rēgōre, to rule or guide: stem, reg.

PRESENT ACTIVE INDICATIVE.		PRESENT PASSIVE INDICATIVE.	
Singular.		Singular.	
1st per.	Rego, I rule	1st per.	Regor, I am ruled
2nd "	Regis, thou rulest	2nd "	Regēris, thou art ruled
3rd "	Regit, he rules.	3rd "	Regitur, he is ruled.
Plural.		Plural.	
1st per.	Regimus, we rule	1st per.	Regimur, we are ruled
2nd "	Regitis, you rule	2nd "	Regimini, you are ruled
3rd "	Regunt, they rule.	3rd "	Reguntur, they are ruled.

VOCABULARY.

Cedo, 3 I yield.	Lego, 3 I read.	Scribo, 3 I write.
Defendo, 3 I defend.	Occido, 3 I slay.	Vinco, 3 I conquer.
Diligo, 3 I love.	Decido, 3 I fall.	Bene (adv.) Well.
Fallo, 3 I deceive.	Pingo, 3 I paint.	Male (adv.) Ill.
Lædo, 3 I injure.	Pungo, 3 I prick.	Valde (adv.) Much.

EXERCISE 7.—LATIN-ENGLISH.

- 1. Fallis. 2. Fallitur. 3. Fallimur. 4. Fallo et vituperor. 5. Cedit. 6. Legis. 7. Scribit. 8. Bene legit. 9. Valde fallis. 10. Si diligenter gaudet. 11. Pungimur. 12. Vincis. 13. Vincimur. 14. Vincuntur. 15. Decidit. 16. Occidis. 17. Si occidis vituperāris. 18. Bene monet. 19. Male educāris. 20. Movēmur valde. 21. Sultāmus et gaudēmus. 22. Læditur. 23. Lædimini. 24. Defenditis. 25. Defenduntur. 26. Diligor.

EXERCISE 8.—ENGLISH-LATIN.

- 1. I obey. 2. If I obey I am loved. 3. He is loved much. 4. He writes well. 5. They paint ill. 6. They dance well. 7. I rejoice if he reads much. 8. Thou paintest. 9. They obey and are praised. 10. If you rule well you are loved. 11. They defend. 12. You are defended. 13. He is deceived. 14. They are pricked.

FOURTH CONJUGATION.

ACTIVE VOICE.		PASSIVE VOICE.	
PRESENT INDICATIVE.		PRESENT INDICATIVE.	
PERSON-ENDING.		PERSON-ENDING.	
Singular.	Plural.	Singular.	Plural.
-o,	I	-or,	I
-is,	thou	-eris,	thou
-it,	he	-itur,	he
	-imus, we	-imur,	we
	-itis, ye	-imini,	ye
	-iunt, they.	-untur,	they.

EXAMPLE.—Audire. to hear: stem, aud.

PRESENT ACTIVE INDICATIVE.		PRESENT PASSIVE INDICATIVE.	
Singular.		Singular.	
1st per. Audio, I hear	2nd " Audis, thou hearest	1st per. Auditor, I am heard	2nd " Audiris, thou art heard
3rd " Audit, he hears.		3rd " Auditor, he is heard.	
Plural.		Plural.	
1st per. Audimus, we hear	2nd " Auditis, you hear	1st per. Audimur, we are heard	2nd " Audimini, you are heard
3rd " Audiunt, they hear.		3rd " Audiuntur, they are heard.	

VOCABULARY.

Custodio, 4 I guard.	Fuleo, 4 I support.	Venio, 4 I come.
Dormio, 4 I sleep.	Nutrio, 4 I nourish.	Vestio, 4 I clothe.
Erudio, 4 I instruct.	Punio, 4 I punish.	Vincio, 4 I bind.
Ferio, 4 I strike.	Reporio, 4 I find.	Cur, Why?

EXERCISE 9.—LATIN-ENGLISH.

1. Custodis. 2. Fulcitur. 3. Venit. 4. Cur dormis? 5. Bene dormit. 6. Eruditur. 7. Pungis. 8. Oecidit. 9. Valde fallis. 10. Auditor. 11. Si valde dormis puniris. 12. Repertit. 13. Si bene erudis laudaris. 14. Vincitur. 15. Cur taces? 16. Tacet et punitur. 17. Reperiuntur. 18. Vestiris. 19. Bene vestiuntur. 20. Si bene vestimini delectamini. 21. Male eruditur. 22. Si vinceris vinciris.

EXERCISE 10.—ENGLISH-LATIN.

1. Why do you slay? 2. He is guarded. 3. They guard. 4. If you are guarded you are conquered. 5. He blames and punishes. 6. He hears and is instructed. 7. You are well educated. 8. Thou sleepest much. 9. They read. 10. If you dance you are delighted. 11. He is supported. 12. Why are they punished? 13. They are heard. 14. I am clothed ill. 15. They are struck and reminded.

RECAPITULATION—TERMINATIONS OR PERSON-ENDINGS OF THE FOUR CONJUGATIONS.

INDICATIVE MOOD, PRESENT TENSE.			
ACTIVE VOICE.		PASSIVE VOICE.	
Singular.		Singular.	
1. 2. 3. 4.	1. 2. 3. 4.	1. 2. 3. 4.	1. 2. 3. 4.
1st per. -o -eo -o -io	1st per. -or -eor -or -ior	1st per. -or -eor -or -ior	1st per. -or -eor -or -ior
2nd " -as -es -is -is	2nd " -aris -eris -ris -iris	2nd " -aris -eris -ris -iris	2nd " -aris -eris -ris -iris
3rd " -at -et -it -it.	3rd " -atur -itur -itur -itur.	3rd " -atur -itur -itur -itur.	3rd " -atur -itur -itur -itur.
Plural.		Plural.	
1st per. -imus -imus -imus -imus	1st per. -imur -imur -imur -imur	1st per. -imur -imur -imur -imur	1st per. -imur -imur -imur -imur
2nd " -atis -atis -atis -atis	2nd " -amini -amini -amini -amini	2nd " -amini -amini -amini -amini	2nd " -amini -amini -amini -amini
3rd " -ant -ant -ant -ant	3rd " -antur -antur -antur -antur	3rd " -antur -antur -antur -antur	3rd " -antur -antur -antur -antur

EXERCISE 11.—LATIN-ENGLISH.

1. Cedo. 2. Legis. 3. Movemus. 4. Exerceris. 5. Mordent. 6. Florent et gaudent. 7. Legere tentat. 8. Cur male legis? 9. Dormit male. 10. Valde diligeris. 11. Vincimini. 12. Bene scribunt. 13. Si bene pingitis haurimini. 14. Defendimur. 15. Ferimus. 16. Cur punitis? 17. Vestimur. 18. Vincimus. 19. Vincimur. 20. Vincimur. 21. Vincitis. 22. Custodiris. 23. Ornatur. 24. Laudantur. 25. Timemur. 26. Valde times. 27. Mordemini. 28. Educamus. 29. Male saltant.

EXERCISE 12.—ENGLISH-LATIN.

1. They yield. 2. If you yield you are conquered. 3. If you are conquered you are bound. 4. I am supported. 5. They sleep. 6. Why do they punish? 7. Why are they punished? 8. You are clothed ill. 9. Thou conquerest. 10. Thou art conquered. 11. Thou bindest. 12. Thou art bound. 13. They prick. 14. They are pricked. 15. Why dost thou move?

As in the exercises which are immediately to follow, we shall have occasion for parts of the verb, *esse, to be*, I shall here lay before you so much of that verb as may be necessary for my purpose.

THE VERB ESSE, to be.

INDICATIVE MOOD, PRESENT TENSE.

Singular.		Plural.	
1st per. Sum, I am	2nd " Es, thou art	1st per. Sumus, we are	2nd " Estis, you are
3rd " Est, he is.		3rd " Sunt, they are.	

VOCABULARY.

Bonus, Good.	Doctus, Learned.	Cæcus, Blind.
Malus, Bad.	Indoctus, Unlearned.	Non, Not.
Salvus, Safe.		

REMARK 1.—Those adjectives which in the singular end in *us*, form the plural in *i*: thus, "I am good" is *bonus sum*; but "we are good" is *boni sumus*. In order to form the plural, cut off the termination *us*, you thus get the stem; to the stem add *i*.

REMARK 2.—In Latin the order of the words is not so rigidly fixed as it is in English. In English we say *I am good*, and

do not commonly say *good am I*. But in Latin we may say either *sum bonus, I am good*: or *bonus sum, good am I*. This change in the relative position of the words of a sentence, is called inversion. The Latin language has great capability of inversion. The inversions which it employs are neither unnatural nor arbitrary. The inversions depend on the sense. If we wish to throw emphasis on the epithet *good*, then we must place *bonus* first. For example, suppose you wish to say that I am *good* but not *safe*, you do so by putting *bonus* before *sum*. But if you wish to say *I am good*, in opposition to some one who says you are not *good*, then, you say, *sum bonus*, and not *bonus sum*. As then these inversions were a means by which the Romans gave expression to their own feelings and opinions, they were with them perfectly natural; and if they have the appearance of being unnatural to us, it is merely because we express emphasis differently; that is, we express by certain tones of the voice the emphasis which they expressed by the position of words. In saying this, however, I do not mean to assert that the Romans never gave emphasis by intonation. The beginning of a sentence is the place of chief emphasis; next to this stands the end; an intermediate position has least emphasis.

EXERCISE 13.—LATIN-ENGLISH.

1. Boni sumus. 2. Bonus est. 3. Bonus es. 4. Non sum bonus. 5. Cæcus est. 6. Non est cæcus. 7. Valde docti sunt. 8. Salvi estis. 9. Non estis salvi. 10. Indoctus sum. 11. Indocti estis. 12. Non est indoctus. 13. Valde doctus es. 14. Cur malus es? 15. Non sum malus. 16. Sumus boni. 17. Est indoctus. 18. Cur es indoctus? 19. Non sum indoctus. 20. Sumus salvi. 21. Salvi sumus. 22. Doctus et salvus es.

EXERCISE 14.—ENGLISH-LATIN.

1. I am learned. 2. I am not learned. 3. He is learned. 4. They are learned. 5. You are bad. 6. You are not bad. 7. Thou art good. 8. They are good. 9. They are not good. 10. Why are they not good? 11. He is blind. 12. He is not blind. 13. Why is he blind? 14. Thou art not unlearned. 15. Thou art blind and not safe. 16. They are blind. 17. You are good and safe. 18. He is very unlearned.

KEY TO EXERCISES IN LESSONS IN LATIN. II.

EXERCISE 3.—LATIN-ENGLISH.

1. I praise. 2. Thou blamest. 3. He adorns. 4. We educate. 5. You grieve. 6. They wound. 7. He tries. 8. He tries to dance. 9. Thou art wounded. 10. He is grieved. 11. We are praised. 12. Thou adornest. 13. They are educated. 14. Thou art grieved. 15. You are wounded. 16. I delight. 17. Thou delightest. 18. He delights. 19. We delight. 20. You delight. 21. They delight. 22. I am delighted. 23. Thou art delighted. 24. He is delighted. 25. We are delighted. 26. You are delighted. 27. They are delighted.

EXERCISE 4.—ENGLISH-LATIN.

1. Laudo. 2. Laudas. 3. Laudat. 4. Laudamus. 5. Laudatis. 6. Laudant. 7. Laudor. 8. Laudaris. 9. Laudatur. 10. Laudamur. 11. Laudamini. 12. Laudantur. 13. Delectant. 14. Ornas. 15. Vexamini. 16. Educantur. 17. Saltat. 18. Vituperamini. 19. Tentamus. 20. Tentamini. 21. Vulneratur. 22. Educor.

LESSONS IN DRAWING.—III.

BEFORE commencing our remarks upon the methods of drawing solid objects, we must lay before the pupil some very important rules with regard to retiring lines and retiring planes; these rules belong to Perspective. As we are now getting into deeper water, we must ask for the patient attention of the pupil in a branch of the subject which would be much easier to explain in his presence, with the help of a piece of chalk and the black-board, than to express in writing. First, then, retiring lines are lines which go away from us. For instance, suppose we are standing at the end of a street and looking down its length; the lines of the eaves, and spouts, tops and bottoms of windows, and doors, etc., are retiring lines. And secondly, the fronts of the houses are retiring planes, or surfaces. Again, sit at the end of a table; the lines or edges on the right side and on the left are retiring lines, and the surface or top of the table is a retiring plane; so that retiring planes, like retiring lines, may be horizontal (parallel with the earth), perpendicular (up-right), or inclined. We also direct the attention of the pupil to Figs. 28, 29, etc. In Fig. 28, *f, b, g, d, h, e*, and *i, c* are horizontal retiring lines, and the whole surface of the pavement is a retiring horizontal plane. In Fig. 29 the wall to the left is a retiring perpendicular plane. In Fig. 30 the fronts of the steps are

parallel perpendicular retiring planes. The tops of the steps are horizontal retiring planes. In Fig. 31 the lid of the box from its position is an inclined retiring plane.

We advise the pupil now to make himself familiar with the following fixed principles relating to retiring lines and planes:—

1. The Line of Sight, or, as it is sometimes called, the horizontal line, represents the height of the eye in the picture, which, when we come to the explanation of these terms, we will mark in the illustrations *HL* (see Figs. 28 and 29).
2. The Point of Sight, marked *PS*, is the point opposite the eye in the picture, and is consequently upon the line of sight.
3. The Station Point is the place where the spectator is supposed to stand when viewing the object represented; marked *SP*.
4. A Ground Plan is the horizontal extent of the object when drawn upon the ground.
5. The Vanishing Point is that point in the plane or surface of the picture, where retiring lines if produced or continued, would meet or terminate; marked *V P*.
6. All retiring lines have vanishing points.
7. All horizontal retiring lines have their vanishing points upon the line of sight.
8. All parallel retiring lines have the same vanishing point.

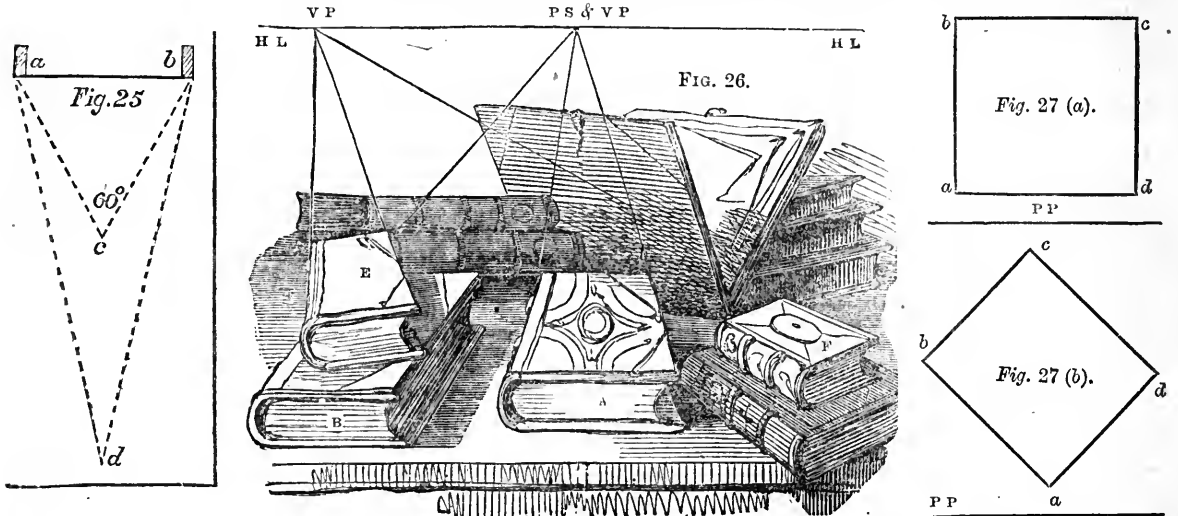
each way within a greater angle, he would have to turn his head, and consequently he would require two or more points of sight; this is only allowable in panoramas (viz., long pictures generally placed upon upright rollers, and so drawn out as a ribbon would be from a reel), when the view of a country for any number of miles in extent is exhibited; the proper or more convenient distance from the object is, when it is placed within an angle of from 20° to 25° .

Let *a b*, Fig. 25, be two objects to be drawn in the same picture; the distance from them at *c* would be the nearest approach we could make; then the angle *a c b* would be an angle of 60° . If we removed our position to *d*, then the angle would be much less, and more suitable for our picture.

We beg it may be understood that hereafter when we say drawing from Nature, we allude to all objects, trees, buildings, etc. Although buildings are not natural objects, yet they are included under this expression.

4th. Ground Plan. The best illustration of a ground plan is a map; it has nothing to do with heights or depths. Suppose the walls of a house were removed, and only the foundations left, we should then see the plan of the house.

5th. Vanishing Point (*V P*). If a line be drawn from the eye parallel to any original straight line of the object the point



9. All horizontal lines which are parallel with the picture plane, are drawn parallel with each other, and the line of sight.

10. All horizontal retiring lines forming right angles with the picture plane, or with our position, have the point of sight for their vanishing point.

11. All lines inclined with the horizon, and with the picture plane, have their vanishing points above or below the line of sight, according to the angle they form with the horizon, their vanishing points being always on a line perpendicular to the vanishing point upon the line of sight, to which they would have retired had they been horizontal.

Before going any further we will endeavour to explain the above fixed principles or definitions, taking them in their order.

1st. The Line of Sight, *HL* (horizontal line), is drawn parallel with the base of the picture, according to the height of the eye from the ground. If we are drawing a house from a higher point of view than when standing or seated on the ground, the line of sight will be higher in the former than in the latter case.

2nd. The Point of Sight (*PS*) is subject to the same conditions as to its height from the ground as the line of sight.

3rd. The Station Point (*SP*) may be at almost any distance from the object that is most convenient; but observe, if too near, we get a distorted view of the object when drawing from Nature. Let the reader for a moment place himself in an upright position, keep his head perfectly still, and turn his eyes to the right and to the left; all that he can possibly see whilst so doing is included in an angle of 60° (sixty degrees), considerably too near the objects he is looking at to make a pleasing picture, though it would not be wrong. But if he included more objects

where that line cuts the picture plane (or surface of the picture) is the vanishing point of that original line. When the pupil has read this, let him rise from his chair, and stand about eight or nine feet from the window, and look out upon the objects beyond. Suppose that a house is in sight, having one of its corners towards him. If he stood without moving from the position he has chosen, and took a long stick having a piece of charcoal, or something that will make a mark on glass, fastened to the end, he might trace the form of the house upon the glass in the same way as tracing a drawing through a piece of thin paper; he would then have made a true perspective drawing of that house upon the glass. This glass is the *picture plane*; the place where he stands when making the tracing is the *station point*. Now, supposing the retiring side of the building he is tracing is on the left as he looks at it, let him raise his left arm and hold it parallel to that retiring face or plane of the building, he will then be pointing to the vanishing point of the retiring face or plane, and all horizontal lines upon that plane would be retiring also, and consequently meet at the same vanishing point.

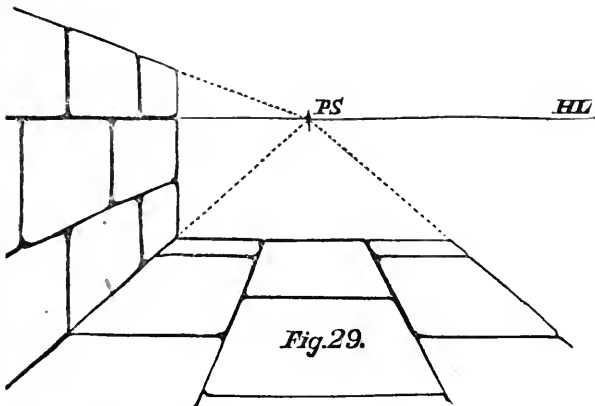
He might, for the sake of experiment, actually make a tracing on the window of one or more of the parallel retiring lines of the building, and at the same time make a mark upon the wall for the vanishing point. Then if he continue the traced lines on the glass he would eventually find that they will meet the mark upon the wall, that mark being the vanishing point; and he would also find that the mark upon the wall is on a level with his eye, on the line of sight. He would find also that if there were any other lines *parallel with the window*, those lines when traced would be parallel with the line of sight, and be drawn

horizontally on the glass. This explains all that is meant in the definitions numbered 5, 6, 7, 8, 9. If there be any other lines of walls or buildings to be seen through the window which are at right angles with it, these lines have the point of sight for their vanishing point; just as the retiring lines of the covers of the books at A and B in Fig. 26, which are at right angles to the edge of the table on which they are lying have their vanishing point in the point of sight, while those that are not at right angles to the edge of the table, as at E and F, have their vanishing points to the right and left of the point of sight. This observation will explain Definition 10.

Definition 11 will come under our notice hereafter, when we will go more into the consideration of the above fixed principles with the help of diagrams.

An object can be placed in two positions, to which the rules of perspective are applicable—parallel and angular.

Parallel perspective is a



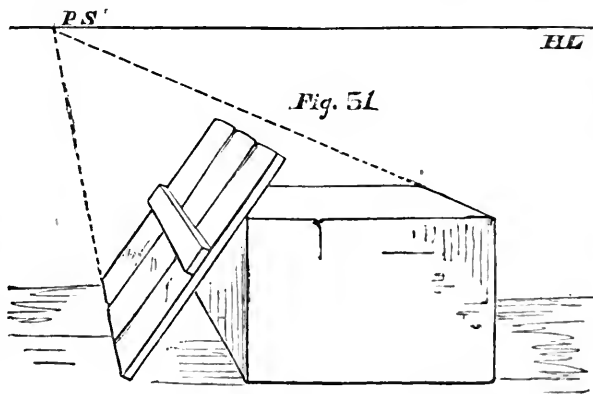
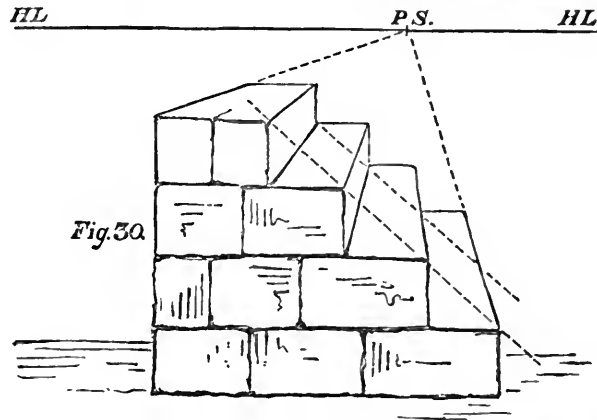
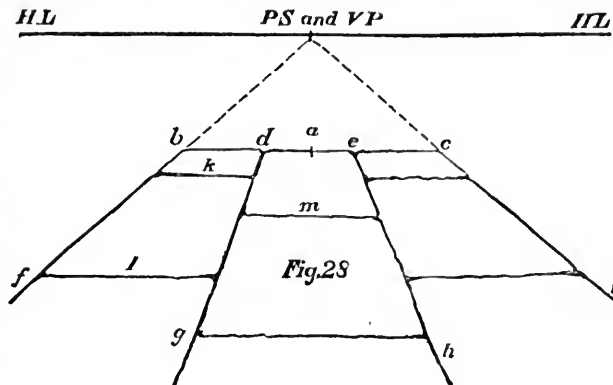
term used in reference to objects of a rectangular form, such as the interior of a room, a cube, etc., when these objects are so placed that their retiring sides are at a right angle with the picture plane, P P, and the remaining sides are parallel to the same, as in Fig. 27 (a).

Angular perspective alludes to objects of the same form so placed that all the sides retire, as in Fig. 27 (b), which is the plan of a room in angular perspective, having one of its angles towards the picture plane P P, and its four sides retiring.

Parallel perspective is the more simple of the two, and easier to be understood, we therefore commence with that. The first example is a pavement (Fig. 28).

Draw the horizontal line, H L, and place upon it a point marked P S and V P (point of sight and vanishing point). The reason that it is both the point of sight and the vanishing point has been explained in Definition 10. Then mark the distance of a from P S, through a draw the line b c, and divide it in the points d and e; place the pencil on P S, and draw it over the paper through b to f, mark f, join b f, proceed precisely in the

same way with the other lines d g e h and e i. Now observe, if all these lines were produced towards the line of sight, H I, they would meet at the P S. The other parallel lines, k, l, m, etc., must be carefully arranged according to the principles we have already laid down in our introductory lessons. The pupil may naturally inquire if there are not some perspective rules for regulating the retiring horizontal distances of objects, as well as their heights. We answer, there are. We do not intend to avoid this question, but put it off for the present, lest the pupil should become too early involved in technicalities that belong especially to geometrical perspective—a branch of drawing to be considered hereafter. With reference to the retiring lines of the pavement (Fig. 28), we have a fitting illustration in a railroad; probably the pupil has observed when standing on a railway bridge and looking down the line, that the rails as they retired seemingly converged to a point in the distance; that point would be the vanishing



point; therefore, in drawing lines so placed, our having a vanishing point renders the task much easier, and insures that which is so very desirable, a truthful result. Let Fig. 28 be practised over and over again, until the various lines which compose it can be drawn with ease and readiness. Fig. 29 is the same, with the addition of a wall on the left. After the last example the manner of drawing it will be self-evident. Fig. 30, a flight of steps; the retiring edges of the steps are all drawn towards the P S. The other examples require no further explanation. Should

the pupil in going along with us through these lessons have made some failures, and found some difficulties, there is no doubt that most of them may be attributed to one great neglect which all beginners so readily fall into, that is, the not "marking in the distances" before they attempt to draw the lines. It is the common failing with the majority of beginners, that they attempt to draw the lines without first arranging their positions. We have said quite enough of the practical way of proceeding with the arrangement of lines, but once more, let the attention of the pupil be ever directed to the "whereabouts" of the lines of his drawing.

LESSONS IN ENGLISH.—III.

SIMPLE PROPOSITIONS.—THE PARTS OF SPEECH.

As, in English nouns, there are at the most only two cases, so are we without an objective or accusative case. Yet sentences in English, as in Latin, have their object. That object must be recognised. Let it be called the object of the proposition, for so it is; in any given instance let it be termed the object of the verb, for it is the object of the verb.

Here you must carefully distinguish between a case and a relation. A case denotes a change in a noun corresponding to the change in its relation. This you will see in these two propositions:—

- | | |
|--|---|
| (1) <i>Deus fecit mundum</i>
<i>God made the world.</i> | (2) <i>Mundus factus est a Deo</i>
<i>The world was made by God.</i> |
|--|---|

Now, without knowing Latin you may clearly understand what case means, and learn that in English we have no objective case. The *Deus* of number 1 becomes *Deo* in number 2; but in both, the English word *God* remains the same, though in the former, is in what is commonly called the nominative, and in the latter in what is commonly called the ablative case. Look also at *mundus* and *mundum*; you see that the nominative *mundus* is, in the objective or accusative case, changed into *mundum*. Here you clearly have two cases, but the English word *world* represents both. Consequently, if *world* is in the nominative it is not also in the objective case, for there is no alteration of form whatever. Yet in the latter case there is a change of relation; for while in number 1 *world* is the *object*, in number 2 it is the *subject* of the proposition. The English, then, does not conform to the Latin custom of expressing diversity of relations in nouns by diversity of form, or does so only in a limited degree. In fact, the tendency of the English language has long been to drop the terminations and inflexions which it borrowed from its Anglo-Saxon parent. The tendency has for ages continued to become more and more strong. It is a tendency which deserves encouragement, for in proportion as it is effectual, it gives freedom and power to the language, and makes the acquisition of it easy, and the diffusion of it rapid.

I have intimated that propositions have each an *object* as well as a *subject*. Such is generally the case, and such is the case more widely than may at first appear. In our standard phrase *Alfred reads*, no object is expressed. And the statement may be made without any clear reference to an *object*. Verbs in which there is no reference, or no clear and obvious reference to an object, are called *intransitive verbs*—that is, verbs the action of which does not (intransitive—in, *not*; trans, *across*; *co*, *I go*) pass over to an object. *Alfred sleeps*, *Alfred runs*, *Alfred rides*, supply other instances of intransitive verbs; because in each case the action remains with the *subject*. But these and most other intransitive verbs may become *transitive* by having an *object* placed after them; e.g.—

INTRANSITIVE.	Alfred sleeps.	Alfred runs.
TRANSITIVE.	Alfred sleeps a deep sleep.	Alfred runs a long way.
INTRANSITIVE.	Alfred rides	Alfred sings.
TRANSITIVE.	Alfred rides a fine horse.	Alfred sings a fine song.

If, however, propositions in general have an *object*, then we must add an object to our grammatical formula; thus:—

SUBJECT.		PREDICATE.
Alfred	reads	writing.

The grammatical formula is thus made complete. The verb *reads* is, as we have seen, equivalent in grammar (or logic) to the form *is good*; where the former is the copula, and the latter the attribute; so that an attribute with its copula is equivalent to the verb and its object, in forming the predicate of a proposition.

The proposition which, as it stands, has all the essential parts of a proposition, may receive additions in order to express modifications of the meaning. Introduce *and*, then it runs,

Alfred reads writing and manuscript.

This particle *and* is termed a conjunction. Conjunctions (Latin, *cum*, *with*, and *junco*, *I join*) join together words and sentences. *And*, in this case, unites *manuscript* with *writing*. Before *writing* insert *a*; then the proposition stands thus:—

Alfred reads a writing.

A is called an article (properly in Latin *a little joint*). *A* is

called the *indefinite article*, inasmuch as it leaves it indefinite what object is meant, merely intimating that it is not many objects but only *one* object that is intended. *A*, indeed, is only a variety of our word *one, one*. Being so, its original form was *an*. The *n* is now dropped before a consonant for the sake of *euphony* (Greek, *eu*, *well*, and *phoné*, *a sound*; meaning *agreeable sound*).

Contrasted with the indefinite article *a*, is another form, which bears the name of the *definite article*; that is, *the*. *The* is a reduced form of *these*. Consequently the refers to an object previously mentioned or known; as—

Alfred reads *THE* writing;

he reads, that is, some writing known to the speaker.

We have already found a form of speech which qualifies nouns—namely, the adjective. We may therefore insert a suitable adjective in this lengthening form; thus:—

SUBJECT.	PREDICATE.
Alfred	reads the obscure writing and manuscript.

We have hitherto modified the *predicate*. Still more may it be modified. The verb *reads* may undergo a modification of import. Introduce the word *soon*:—

SUBJECT.	PREDICATE.
Alfred	soon reads the obscure writing and manuscript.

Two other parts of speech may be introduced by inserting the words *to me*, as—

SUBJECT.	PREDICATE.
Alfred	soon reads <i>TO ME</i> the obscure writing and manuscript.

Me is a pronoun, as we found *he* to be. *Me*, you see, holds the place of a noun. *Me* is the objective case corresponding to the nominative case *I*. Our pronouns, as you here see, have some diversities of case, for in them you find *varying forms* corresponding to varieties of meaning. The other word just added—namely, *to*, is called a preposition. The word *preposition* signifies, according to its Latin element, *that which is put before*; a preposition, then, is a word *put before a noun*; and it is put before a noun in order to modify its signification, or mark the relation in which the noun stands to another word, or to other words; e.g.—

He gave the book <i>to me</i> .	He took the book <i>from me</i> .
He read the book <i>with me</i> .	He bought the book <i>of me</i> .

where *to*, *from*, *with*, and *of* are prepositions.

In the ordinary list of the parts of speech stands the *participle*. This word, of Latin origin, denotes the *partaker* (from *pars*, *a part*, and *capio*, *I take*). The participle is so denominated because it partakes of the qualities of the verb and the adjective. Thus *shining* is a participle from the verb *to shine*. It may also be employed as an *adjective*. Thus,

PARTICIPLE.	The sun <i>shining</i> disperses the clouds.
ADJECTIVE.	The <i>shining</i> sun dazzles the eyes.

The right of the *participle* to be accounted a separate part of speech has been contested not without reason. Perhaps less valid is the claim of the *interjection*. An interjection (*inter*, *between*, and *jacio*, *I cast*) is a sound of surprise, or sorrow, thrown out under the impulse of strong and sudden emotion, as *O! Oh! Ah!* and is with little propriety placed among the forms of articulate speech. Let us introduce a *participle* into our model—

SUBJECT.	PREDICATE.
(1) Alfred studying	(2) soon reads (3) to me (4) the obscure writing and manuscript.

1. Noun. 2. Participle. 3. Adverb. 4. Verb. 5. Preposition. 6. Pronoun. 7. Article. 8. Adjective. 9. Conjunction.

The form is thus seen to comprise nine parts of speech. If the *interjection*, or *exclamation*, is to be reckoned a part of speech, it may be prefixed in the shape of *Yes!* Here, then, we find a condensed view of all the parts of speech, and in the remarks by which the view has been prefaced and prepared, lies the kernel of the entire English Grammar. If you have gone with me understandingly thus far, you will have no difficulty in following me to the end, for having developed these general facts and principles, I have now only to take up each part of speech in

succession, and, in connection with it, enter into such particulars as may appear desirable with a view to my object.

Before I close the chapter, however, I will add a few general remarks respecting the actual classification, which bears the name of the *nine* (or *ten*) parts of speech. The aim of the classification is to arrange under separate heads all the words of the English (or any other) language. Now a good classification has two qualities: first, it is *exhaustive*; secondly, it is *distinctive*. It is *exhaustive*—that is, it comprises and places under some suitable head all the facts. It is *distinctive*—that is, it makes such clear and sharp distinctions as to place the several facts each under its own head, without confounding similar facts together, or putting under one head facts which may as properly stand under another head.

The classification under review is neither exhaustive nor distinctive. It is not exhaustive, for it leaves out the *infinitive mood*, which has as good a right to be called a part of speech as the *participle*. It is not distinctive, for the term *adjective* makes no distinction where a distinction exists, and the term *participle* makes a distinction where no distinction is required. Indeed, the classification is wholly unscientific, being based not on a principle, but on vague and general views. Something less objectionable may be offered in the following words.

Speech corresponds to the realities which it represents. Those realities are thoughts and things. Now, thoughts and things may be reduced to three classes:—1, *Objects*; 2, *qualities of objects*; 3, *actions*. Consequently, the essential parts of speech are the *noun*, the *adjective*, and the *verb*. But objects and their qualities are the same things differently viewed. We may therefore strike out *qualities*. Thus we have two classes left—namely, the *noun* and the *verb*. Verbs, however, are the names of action, as nouns are the names of being. Hence language resolves itself into *names*. We may, then, declare that speech is made up of *names*. These names may be expanded and divided into 1, *names of being, or nouns*; 2, *names of action, or verbs*; and 3, *names of qualities, or adjectives*. Under the last head, or names of qualities, may stand other parts of speech, for the *adverb* names the *quality of the action of the verb*, and the article names the *extent in which the noun is to be taken*. The term *particles* has not inappropriately been applied to *adverbs and conjunctions*, for, to a considerable degree they appear to be parts (particles—that is, *little parts*) or fragments of once existing nouns and verbs. If, however, our analysis of language into *names of being and names of action is correct*, then the sentence which, as given above, contains all the nine parts of speech, may be reduced to two; as,

SUBJECT.	PREDICATE.
Alfred	reads.
Name of being.	Name of action.

and thus we are brought back to the very form with which we commenced our former lesson on "Simple Propositions." Clearly, as compared with these two parts, the other words in the sentence are incidental, and of small moment.

It may be desirable to give another germ or two expanded into the full forms.

SUBJECT.	PREDICATE.
Nelson	fought
Brave Nelson	fought
Brave Nelson	fought
Brave Nelson	often fought
Brave Nelson	often fought
Brave Nelson, defying danger,	often fought
Brave Nelson, defying danger and death,	often fought
(1) (2) (3) (4) (5) (6) (7) (8) (9)	
Brave Nelson, defying danger and death,	often fought the enemy of his country.

1. Adjective. 2. Noun. 3. Participle. 4. Conjunction. 5. Adverb. 6. Verb. 7. Article. 8. Preposition. 9. Pronoun.

Other explanatory words or phrases might be added. Thus, to the subject might be appended the words *sailing from England*, as

Brave Nelson, *sailing from England*, and defying danger, fought.

Or, you might qualify *fought* by the adverb *successfully*. You might also make the sentence compound by inserting after *fought* the words, *and conquered*; thus:—

Brave Nelson fought and conquered the enemy, etc.

SUBJECT.	PREDICATE.
	OBJECT.
(1) (2) (3) (4) (5) (6) (7) (8) (9)	
	And lo! Stanley rising quickly caused great wrath in the king.

1. Conjunction. 2. Interjection. 3. Noun. 4. Participle. 5. A verb. 6. Verb. 7. Adjective. 8. Preposition. 9. Article.

In the last example, one part of speech is omitted to exercise the mind of the student, who is also expected to effect the reduction of the proposition to the name of being and the name of action.

Let the reader carefully study and analyse the following sentences:—

1. *Propositions without an object.*

Birds sing. Cows graze. Rabbits burrow. Dogs fight. Children play.

2. *Propositions with an object.*

The sun lights the earth. The trees produce fruit. The rain waters the meadows. Storms purify the air. The universe proclaims its Author. Qualifying words may be added at will, as—

3. *Propositions with a subject and object qualified.*

My young brother teased the little animals. Avaricious tradesmen overcharge all their goods. A diligent scholar learns all his lessons.

I subjoin some fragments to be made into complete sentences:—

1. *Propositions lacking subjects.*

— leads a blind man. — aids his sick mother. — neglect their duty. — avoids bad company. — promises a rich harvest. — cost much money.

2. *Propositions lacking objects.*

Disobedient children deserve — The proud despise — Thick clouds cover — A bad child grieves — An honest debtor pays — Wise men rebuke —

3. *Propositions lacking verbs.*

The eldest sister — the younger ones. The father — his incorrigible son. Noisy boys — the neighbourhood. The police — public order. A grateful daughter — tender mother. The divine Saviour — our human infirmities.

It may here be necessary, by anticipation, to inform the totally uneducated student that, when the verb is singular it has *s* at the end, when plural it is without *s*. The verb must be in the *singular number* when the noun or pronoun connected with it denotes *only one person or thing*; and the verb must be in the *plural number* when the noun or pronoun connected with it denotes *more than one person or thing*; e.g.—

SINGULAR: A boy loves; the house stands; the duck swims.
PLURAL: Boys love; houses stand; ducks swim.

The rule might be put in another form, as, when the noun has an *s* (or is in the *plural*) the verb is without; and when the verb has an *s* the noun is without.

LESSONS IN GEOGRAPHY.—III.

NOTIONS OF THE GREEKS AND ROMANS.

THE desire for nautical expeditions, which, under the excitement of commercial enterprise, had begun to spread among the nations, was restrained by the conquests of the Romans. These conquests, however, if they did not extend the boundaries of the known world, at least enriched the domain of geographical knowledge with new facts, and more exact than those which had been collected and taken for granted by the writers of former ages. The three Punic (Carthaginian) wars, the Illyrian war, the contests with the Gauls, the expeditions against Spain, and those of Ætius Gallus into Arabia and Ethiopia, all contributed, in their turn, to give to this science a more positive character and more varied details. Polybius, about 150 years before the age of Hipparchus, gave a description of the world which, notwithstanding his numerous errors, evinced remarkable progress in the knowledge of the globe. The new acquisitions of the Romans, and of Mithridates Eupator, the campaigns of Julius Cæsar in Gaul and in Britain, rendered accessible the knowledge of countries hitherto but partially explored, or altogether unknown. Posidonius, a Syrian, resident at Rhodes, endeavoured to correct the measurement of the earth's circumference formerly made by Eratosthenes. He observed that when the star Canopus, in the constellation Argo, became visible in the horizon of Rhodes, it was elevated seven degrees and a half above the horizon of Alexandria. He supposed these places to

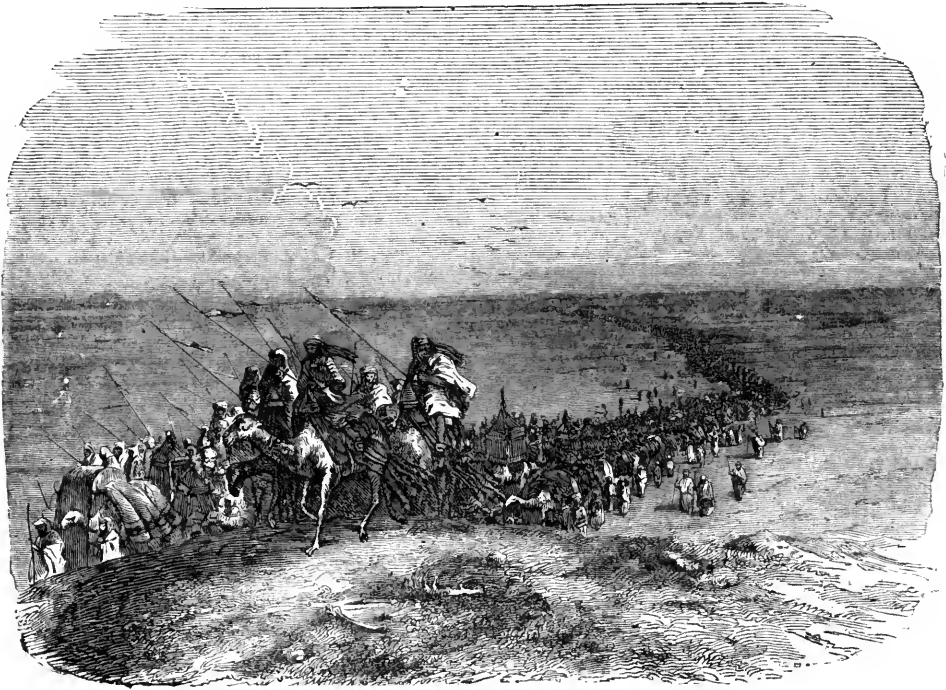
be under the same meridian, and, from the reckoning of navigators, he found the distance between them to be 5,000 stadia. Now, seven degrees and a half being the forty-eighth part of a great circle of the sphere, this gives the circumference of the earth equal to 240,000 stadia. This was a nearer approximation to the truth than that of Eratosthenes, but it was founded on erroneous data; for the arc of the great circle between the two places above mentioned was only about $5^{\circ} 15'$, and the difference between their two meridians was rather more than 2° .

Strabo, who flourished under the reign of Augustus Cæsar, corrected many errors of the geographers who preceded him, and made some of his own. The limits of his knowledge of the world were, on the north, Ierne or Ireland, and the mouth of the Elbe. He denied the existence of *Thule*, and asserted that the earth was not habitable at the distance of 4,000 stadia north of Britain. On the east, he considered Ceylon, or Taprobane and Thinae, the borders of the world, and it is doubtful whether his knowledge of it extended as far as the mouths of the Ganges. He knew the western coast of Africa

minds of men for a period of no less than twelve centuries of the history of the world.

When we consider the advanced state of the arts and sciences in the age of Augustus Cæsar, at least compared with those which preceded it, we cannot but wonder at the imperfect state of geographical knowledge which existed in the Roman world at this period. Horace considered Great Britain and the Thames as the confines of the earth; and Virgil, as we have already remarked, placed the source of the Nile in India. The geographical productions of Dionysius Periegetes and of Pomponius Mela, written within a period of fifty years after the Christian era, contain nothing worthy of notice, being mere compilations of what was then known, and by no means improved.

When the legions of the Emperor Claudius Cæsar, A.D. 40, marched to the conquest of Britain, this country was a new world to the Romans. The fleet of Agricola, thirty-five years afterwards, circumnavigated Scotland, explored the surrounding seas, and re-discovered the famous *Thule*. But even at this epoch Great Britain was still a mysterious country; Tacitus



ANCIENT EASTERN TRADING CARAVAN ON THE MARCH.

as far as Cape Nuri. But he partook of the error of those who represented the Caspian Sea as united to the Northern Ocean; and he rejected the positive information of Herodotus on this point. He acknowledged little regard for the authority of this ancient historian, and his doubt on the subject of the voyages of Pytheas, Hanno, and Eudoxus, showed his ignorance of many important geographical questions.

Strabo adopted the division of the earth into climates recognised by Greek and Roman authors previous to his time. Long before him, indeed, as well as after him, the globe was divided into five zones, namely, two *frigid* or *frozen* zones near the poles, one *torrid* or central zone scorched by the sun and extending along the equatorial line on each side of it, and two others called the *temperate* zones, occupying the rest of the world. The last-named were considered to be the only habitable portions of the globe; and as to the torrid zone, it was supposed to be condemned, on account of its fiery climate, not only to eternal solitude, but to present an invincible obstacle to the exploration of the countries situated beyond the equator. It will afford an illustration of the force of those ideas which prevailed on the subject of the zones of the globe, and on the relative position of the great divisions of the earth, when we reflect on the fact that they maintained their ground in the

says it was bounded on the east by Germany, on the south by Gaul, and on the west by Spain. As to Ireland, he places it midway between Spain and Great Britain. The interior of Germany became known to the Romans in consequence of their active commerce with certain northern parts of Europe, which arose from the passion of the Roman ladies for succinum or yellow amber. In the east, a discovery of very great importance advanced the progress of navigation and geography. Hippalus, about the middle of the first century, established the fact of the periodicity of the *monsoons*, or trade-winds, in the Indian Ocean, which from that period has regulated the motions of the western navigators to India and the Asiatic Archipelago.

On the south, the expedition of the Consul Suetonius Paulinus into the country of Sejelmissa, on the borders of the Sahara, or Great Desert of Africa, disclosed those parts of the modern Morocco and Algeria which extend southwards, from the southern side of Mount Atlas to the confines of the sun-scorched desert. The campaign of Cornelius Balbus in a neighbouring and parallel region, was accompanied with still more interesting results. The Roman army set out for Tripoli, traversed the desert, penetrated into Fezzan, and advanced even into the country visited by Messrs. Denham and Clapperton in 1822, that is, to the vicinity of Bornou. Of the scientific information gained by

these enterprises, the celebrated Caius Secundus Pliny availed himself, in his Natural History. He also knew how to dip with considerable discernment into the writings of the Greeks; but he appears not to have considered it necessary to consult the work of Strabo. From the information he had obtained in this way, he assigned to the different quarters of the world then known the following magnitudes:—To Europe, one-third; to Asia, one-fourth; and to Africa one-fifth of the whole.

Marinus of Tyre, who preceded Ptolemy, was distinguished for his geographical knowledge. He took advantage of all ancient and contemporary writers to compose a complete treatise on the subject of geography and maps; and he even prepared new editions of his books, corrected and improved in proportion as he obtained more exact information; but it is to be regretted that these have not reached us. At last appeared, about the middle of the second century, the famous Ptolemy, who lived at Alexandria in Egypt, and taught astronomy there. His system of astronomy and geography, which stood unimpeached for about twelve centuries, and received the name of the Ptolemaic system from its author, was not superseded till Copernicus appeared; and notwithstanding his errors, due more to the ignorance of mankind than to himself, his name is still revered as a geographer and astronomical observer. His work entitled the "Megale Syntaxis, or Great Construction," is a monument of his labour and his learning. He examined the ratio of the length of the gnomon or style of the sun-dial to its shadow at the equinoxes and the solstices; he calculated eclipses; he investigated the calculations founded on the difference of climate, and carefully consulted the reports of travellers and navigators. He reduced his information and observations into a regular system, and expressed the positions of places by longitude and latitude, after the manner of Hipparchus. His great work consists nearly of an elementary picture of the earth, in which its figure and size, and the positions of places on its surface, are determined. It contains only a very short outline of the division of countries, with scarcely any historical notice. It is supposed that a detailed account was added to this outline, but it has not reached us. His geography is contained in eight books, and is certainly more scientific than any previous work on the subject. He taught how to determine the longitude by lunar eclipses, and by this method ascertained that of many places with tolerable accuracy.

According to Ptolemy, the limits of the world were Thule on the north, and the Prassum Promontorium on the south, the former being, most probably, some part of Norway, and the latter some unknown point south-west of Madagascar. Its limits on the west were the Fortunate Isles, now the Canaries; and on the east, Thine in Sine or China. He rejected the theory of all preceding geographers, who represented the world as surrounded by an impassable ocean on all sides; and he replaced it by an indefinite expanse of unknown land. He rejected the true reports of circumnavigation of Africa, and extended its limits southward beyond all reasonable bounds.

With Europe, Ptolemy was tolerably well acquainted; and he described Germany and Sarmatia with some degree of accuracy. He knew the Ems, the Weser, the Elbe, the Oder, and the Vistula. He calls Jutland the Cimbric Chersonese or Peninsula, and the Baltic, the Sarmatic Ocean; but he failed in his account of this inland sea. He was better acquainted with the south of Russia in Europe, with the Tanaïs, the Borysthenes, and the Euxine, or Black Sea. In his description of the Mediterranean there are many errors; but his account is more accurate with them all than that of any previous geographer. In regard to Asia, his knowledge was obscure and unsatisfactory, though some features can be still identified with fact. Here he described the "Golden Chersonese," and the *Magnus Sinus*, or Great Bay of India. These appear to have been the Indo-Chinese countries of Ava, Pegu, and Malacca, with their adjacent gulfs or bays; and Thina, which he places at this remote corner, is supposed to be Siam, rather than any place in China.

The Serica of Ptolemy in the north of Asia is supposed, with good reason, to be China, which was reached by great trading caravans, which proceeded from Byzantium (or Constantinople), across Asia Minor, crossing the Euphrates at Hierapolis, and passing through Media, by way of Ecobatana to Hecatompylos, the capital of Parthia. Their next route was through Hyrcania, Aria, Margiana, and Bactria, whence they ascended the table-land of the interior of Asia, passed over the *Montes Comedorum*, or

Bolor Mountains, and reached the celebrated *Lithinos Pyrgos*, or "Stone Tower," a station whose site is still a doubtful question among geographers. From this station to the frontier of Serica was a seven months' hard and perilous journey. The description which Ptolemy gives of Serica corresponds more exactly to China than any other country; and his account of the manners and customs of the inhabitants identifies it still more. Moreover, the staple commodity of this overland trade was silk, for which China has been celebrated from time immemorial. Ptolemy appears to have had a considerable knowledge of Hindostan or India, both within and beyond the Ganges; a knowledge said to be superior to that of the moderns till within the limits of the present century. With regard to Africa, this statement may just be reversed. But, on the whole, his work must be considered a singular monument of industry, and a valuable book of reference in all matters relating to the ancient geography of the world.

LESSONS IN FRENCH.—V.

SECTION I. FRENCH PRONUNCIATION (continued).

III. NAME AND SOUND OF THE VOWELS.

38. **Ê, ê, ACUTE.**—Name, *ay*; sound, like the letters *ay* in the English word *pray*.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Arrivé	Ar-cev-ay	Arrived.	Obligé	O-ble-zhay	Obliged.
Élevé	Ayl-vay	Raised.	Précéder	Pray-say-day	To proceed
Été	Ay-tay	Summer.	Prémédité	Pray - may - Prem-adi	tated.
Flagorné	Flah-gorn-ay	Wheddled.	Trouvè	Troov-vay	Found.
Forgé	For-zhay	Forged.	Vérité	Vay-ree-tay	Truth.
Joué	Zhoo-ay	Sported.			
Mérite	May-reet	Worth.			

39. **Ë, è, GRAVE.**—Name, *ai*; sound, like the letters *ai* in the English word *stair*.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Chère	Shair	Chær.	Madère	Mad-air	Madaira.
Colère	Ko-lair	Passionate.	Manière	Man-yair	Manner.
Élève	Ay-laiv	Pupil.	Mère	Mair	Mother.
Fièvre	Feai-vr'	Fever.	Modèle	Mo-dail	Pattern.
Jardinière	Zhahr-deen-yair	Gardener.	Père	Pair	Father.
			Ratière	Rat-yair	Rat-trap.

40. **Ê, ê, CIRCUMFLEX.**—Name, *ai*; sound, like the letters *ai* in the English word *stair*.

Ê has a longer and broader sound than è. The mouth must be opened wider in pronouncing the former than the latter. In ordinary reading and common conversation, the difference between ê and è is hardly perceptible. Still there is a difference; just the difference between pronouncing *e* like the letters *ai* in the English word *stair* with the mouth half opened, and pronouncing the same letters in the same word with the mouth well opened, and also prolonging the sound. Practice will demonstrate this.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Ête	Bait	A beast.	Forêt	For-rai	Forest.
Crème	Kraim	Cream.	Même	Main	The same.
Crêpe	Kraip	Crape.	Prêcher	Prai-shay	To preach.
Dépêche	Day-paish	Dispatch.	Prêt	Prai	Ready.
Être	Aitr'	To be.	Rêve	Raiv	Dream.
Extrême	Eks-traim	Extreme.	Tête	Tait	Head.

SECTION X.—PLURALS OF PRONOUNS, ETC.

1. The plural form of the pronouns *le, him* or *it*; *la, her* or *it*, is *les, them*, for both genders. Its place is also before the verb.

Vous les avez. Les avez-vous? You have them. Have you them?
Nous ne les avons pas, We have them not.

2. The plural of the article, preceded by the preposition *de, of* or *from*, is *des* for both genders.

Des livres, des plumes, Of or from the books, of the pens.
Des frères, des sœurs, Of or from the brothers, of the sisters.

3. The same form of the article is placed before plural nouns used in a partitive sense [Sect. IV. 1].

J'ai des habits, I have clothes.
Vous avez des maisons, You have houses.

4. Sect. IV. 5, and Sect. VI. 4, apply also to plural nouns used partitively.

Nous n'avons pas de livres, *We have no books.*
Vous avez de bons crayons, *You have good pencils.*

5. The plural form of the possessive adjectives mon, ton, son, notre, votre, leur, is mes, *my*; tes, *thy*; ses, *his, her*; nos, *our*; vos, *your*; leurs, *their*, for both genders.

Mes frères, mes sœurs, *My brothers, my sisters.*
Nos livres, nos plumes, *Our books, our pens.*

6. The possessive pronouns, le mien, la mienne, etc. [Sect. VII. 6], form their plural as follows:—

<i>Masc.</i>	<i>Fem.</i>	<i>Masc.</i>	<i>Fem.</i>
Les miens, les miennes, <i>mine.</i>		Les tiens, les tiennes, <i>thine.</i>	
Les siens, les siennes, <i>his or hers.</i>		Les nôtres, les nôtres, <i>ours.</i>	
Les vôtres, les vôtres, <i>yours.</i>		Les leurs, les leurs, <i>theirs.</i>	
Vos maisons et les miennes,		Your houses and mine.	
Vos champs et les siens,		Your fields and his.	
Les siens, les vôtres, et les nôtres,		His, yours, and ours.	

7. The demonstrative adjectives, ce, cet, cette, have ces for their plural.

Ces hommes, ces femmes, *These men, these women.*

8. The demonstrative pronoun celui, m., *this* or *that*, makes ceux in the plural. The feminine form, celle, merely takes the s in the plural.

Mes chandeliers (m.) et ceux de vos frères, *My candlesticks and those of your brothers.*
Vos chandeliers (f.) et celles de nos voisins, *Your candles and those of our neighbours.*

RÉSUMÉ OF EXAMPLES.

Votre frère a-t-il mes chevaux?	<i>Has your brother my horses?</i>
Il n'a ni les vôtres ni les siens.	<i>He has neither yours nor his.</i>
A-t-il ceux de nos voisins?	<i>Has he those of our neighbours?</i>
Il ne les a pas.	<i>He has them not.</i>
Ma sœur a-t-elle vos plumes ou celles de ma cousine?	<i>Has my sister your pens or my cousin's? f. (or those of my cousin).</i>
Elle n'a ni les miennes ni celles de ma cousine, elle a les siennes.	<i>She has neither mine nor my cousin's, she has her own.</i>
Avez-vous des marteaux?	<i>Have you hammers?</i>
Vous n'avez pas de marteaux.	<i>You have no hammers.</i>
Vous avez de jolis crayons.	<i>You have pretty pencils.</i>
Avez-vous les habits des enfants?	<i>Have you the children's clothes?</i>
Je n'ai pas les habits des enfants.	<i>I have not the children's clothes.</i>
Avez-vous les chapeaux des dames.	<i>You have the ladies' hats.</i>
Avez-vous ceux-ci ou ceux-là?	<i>Have you these or those?</i>

VOCABULARY.

Acajou, m., <i>mahogany.</i>	Chandelle, f., <i>candle.</i>	Fusil, m., <i>gun.</i>
Aubergiste, m., <i>inn-keeper.</i>	Cousine, f., <i>cousin.</i>	Laine, f., <i>wool.</i>
Blanc, m., <i>blanche, f., white.</i>	Crin, m., <i>horse-hair.</i>	Marbre, m., <i>marble.</i>
Chaise, f., <i>chair.</i>	Ébéniste, m., <i>cabinet-maker.</i>	Matelas, m., <i>mattress.</i>
Chandelier, m., <i>candle-stick.</i>	Ferblanc, m., <i>tin.</i>	Meilleure, adj. f., <i>better.</i>
	Ferblantier, m., <i>tin-man.</i>	Ouvrier, m., <i>workman.</i>
		Voyageur, m., <i>traveller.</i>

EXERCISE 17.

1. Avez-vous les marteaux des maréchaux? 2. Oui, Monsieur, je les ai. 3. Ne les avez-vous pas? 4. Non, Monsieur, nous ne les avons pas. 5. L'ouvrier les a. 6. L'aubergiste a-t-il vos chevaux? 7. L'aubergiste n'a ni mes chevaux ni les vôtres, il a les siens. 8. Le médecin a-t-il des livres? 9. Oui, Monsieur, il a de bons livres. 10. N'avez-vous pas mes meilleures plumes? 11. Oui, Monsieur, j'ai vos meilleures plumes, les miennes, et celles de votre cousine. 12. Le voyageur a-t-il de bons fusils? 13. Il n'a pas de bons fusils, il a des fusils de fer. 14. Le matelot n'a-t-il pas mes matelas de crin? 15. Il ne les a pas. 16. Qu'a-t-il? 17. Il a les matelas de laine de l'ébéniste. 18. L'ébéniste a-t-il des tables d'acajou? 19. Oui, Madame, il a des tables d'acajou et des tables de marbre blanc. 20. Avez-vous mes chaises ou les vôtres? 21. Je n'ai ni les vôtres ni les miennes, j'ai celles de l'ébéniste. 22. N'avez-vous pas sommeil? 23. Non, Monsieur, je n'ai ni sommeil ni faim. 24. Le ferblantier a-t-il vos chandeliers de fer? 25. Non, Monsieur, il a ceux du maréchal.

EXERCISE 18.

1. Have you my tables or yours? 2. I have neither yours nor mine, I have the innkeeper's. 3. Have you them? 4. No, Sir, I have them not. 5. Has your sister my horses? 6. Yes, Sir, she has your two horses and your brother's. 7. Are you

right or wrong? 8. I am right, I am not wrong. 9. Has the tinman my silver candlesticks or yours? 10. He has neither your silver candlesticks nor mine. 11. What has he? 12. He has the cabinet-maker's wooden tables. 13. Has he your mahogany chairs? 14. No, Sir, he has my white marble tables. 15. Have you these tables or those? 16. I have neither these nor those, I have the cabinet-maker's. 17. Have you good pencil-cases? 18. No, Sir, but I have good pencils. 19. Has the traveller iron guns? 20. Yes, Sir, he has mine, yours, and his. 21. Has he not your brother's? 22. He has not my brother's. 23. Has the workman my iron hammers? 24. Yes, Sir, he has them. 25. Has my brother your pens or my cousin's? 26. He has mine and yours. 27. Have you the children's clothes? 28. Yes, Madam, I have them. 29. Have you your sister's hat? 30. I have my cousin's, f. 31. Is anything the matter with your brother? 32. He is cold and hungry. 33. Have you horses? 34. Yes, Sir, I have two horses. 35. I have two horse-hair mattresses and one wool mattress.

SECTION XI.

AGREEMENT OF ADJECTIVES—FEMININE OF ADJECTIVES.

1. The adjective in French, whatever may be its place,* agrees in gender and number with the noun which it qualifies [§ 15 (1) (2)].

2. Adjectives ending with *e* mute, *i.e.*, not accented, retain that termination for the feminine.

Un garçon aimable,	<i>An amiable boy.</i>
Une fille aimable,	<i>An amiable girl.</i>

3. Adjectives not ending in *e* mute take *e* for the feminine.

Un garçon diligent,	<i>A diligent boy.</i>
Une fille diligente,	<i>A diligent girl.</i>

4. EXCEPTIONS.—Adjectives ending in *el, cil, en, et, on, as,* and *es*, double the last consonant and take *e* for the feminine.

<i>Masc.</i>	<i>Fem.</i>	<i>essential.</i>	<i>Masc.</i>	<i>Fem.</i>	<i>subject.</i>
Essentiel,	essentielle,		Sujet,	subjecte,	
Vermeil,	vermeille,	vermillion.	Bon,	bonne,	good.
Ancien,	ancienne,	ancien.	Bas,	basse,	low.

5. Adjectives ending in *f* change the *f* into *ve*; those ending in *s* change that letter into *se* for the feminine.

Un habit neuf,	<i>A new coat.</i>
Une robe neuve,	<i>A new dress.</i>
Un homme heureux,	<i>A happy man.</i>
Une femme heureuse,	<i>A happy woman.</i>

6. The adjectives beau, handsome; fou, foolish; mou, soft; nouveau, new; vieux, old; become, bel, fol, mol, nouvel, and vieil, before a noun masculine commencing with a vowel or an *h* mute; the last consonant of the latter form is doubled, and *e* added, for the feminine. Ex.: Belle, folle, nouvelle, vieille.

7. Additional rules and exceptions will be found in § 15 of Part II.

8. CONJUGATION OF THE PRESENT OF THE INDICATIVE OF ETRE, TO BE.

<i>Affirmatively.</i>		<i>Interrogatively.</i>	
Je suis,	<i>I am.</i>	Suis-je?	<i>Am I?</i>
Tu es,	<i>Thou art.</i>	Es-tu?	<i>Art thou?</i>
Il est,	<i>He is.</i>	Est-il?	<i>Is he?</i>
Elle est,	<i>She is.</i>	Est-elle?	<i>Is she?</i>
Nous sommes,	<i>We are.</i>	Sommes-nous?	<i>Are we?</i>
Vous êtes,	<i>You are.</i>	Etes-vous?	<i>Are you?</i>
Ils sont, m.,	<i>They are.</i>	Sont-ils?	<i>Are they?</i>
Elles sont, f.,	<i>They are.</i>	Sont-elles?	<i>Are they?</i>

RÉSUMÉ OF EXAMPLES.

Avez-vous un garçon diligent et une fille diligente?	<i>Have you a diligent boy and a diligent girl?</i>
Mon garçon est diligent, mais ma fille est paresseuse. (R. 5.)	<i>My boy is diligent, but my daughter is idle.</i>
Cette coutume est-elle ancienne?	<i>Is this custom ancient?</i>
Cette coutume n'est pas ancienne, elle est nouvelle. (R. 6.)	<i>This custom is not ancient, it is new.</i>
Votre plume, f., est-elle bonne ou mauvaise?	<i>Is your pen good or bad?</i>
Ma sœur est très-vive. (R. 5.)	<i>My sister is very lively.</i>
Votre maison est-elle meilleure que la mienne?	<i>Is your house better than mine?</i>
La maison de ma sœur n'est pas si bonne que la vôtre.	<i>My sister's house is not so good as yours.</i>

* For the place of adjectives see Sect. XIII, and Sect. VI. 5.

VOCABULARY.

Beau, bel, belle, handsome.	Fille, <i>f.</i> , daughter.	Parasol, <i>m.</i> , parasol.
Bon, <i>m.</i> , good.	Habit, <i>m.</i> , coat.	Petit, <i>-e</i> , small.
Content, <i>-e</i> , pleased.	Heureux, <i>-se</i> , happy.	Paresseux, <i>-se</i> , idle.
Cravate, <i>f.</i> , cravat.	Ici, <i>here</i> .	Porcelaine, <i>f.</i> , china.
Dame, <i>f.</i> , lady.	Meilleur, <i>-e</i> , better.	Que, <i>than</i> .
Encrier, <i>m.</i> , inkstand.	Neuf, <i>-ve</i> , new.	Vieux, <i>vieille</i> , old.
Excellent, <i>-e</i> , excellent.	Parapluie, <i>m.</i> , umbrella.	Vif, <i>vive</i> , quick, lively.

EXERCISE 19.

1. Cette dame est-elle contente? 2. Non, Monsieur, cette dame n'est pas contente. 3. Votre fille est-elle vive? 4. Mon fils est très vif et ma fille est paresseuse. 5. N'a-t-elle pas tort? 6. Elle n'a pas raison. 7. Votre cousine est-elle heureuse? 8. Oui, Madame, elle est bonne, belle, et heureuse. 9. A-t-elle des amis. 10. Oui, Monsieur, elle a des parents et des amis. 11. A-t-elle une robe neuve et de vieux souliers? 12. Elle a de vieux souliers et une vieille robe. 13. Votre frère n'a-t-il pas un bel habit? (R. C.) 14. Il a un bel habit et une bonne cravate. 15. Avez-vous de bonne viande, Monsieur? 16. J'ai de la viande excellente. 17. Cette viande-ci est-elle meilleure que celle-là? 18. Celle-ci est meilleure que celle-là. 19. Votre ami a-t-il le bel encrier de porcelaine? 20. Son encrier est beau, mais il n'est pas de porcelaine. 21. Quelqu'un a-t-il faim? 22. Personne n'a faim. 23. Les gâteaux sont-ils ici? 24. Les gâteaux et les macédoles sont ici. 25. J'ai vos parasols et vos parapluies, et ceux de vos enfants.

EXERCISE 20.

1. Is your little sister pleased? 2. Yes, Madam, she is pleased. 3. Is that little girl handsome? 4. That little girl is not handsome, but she is good. 5. Have you good cloth and good silk? 6. My cloth and silk are here. 7. Is your sister happy? 8. My sister is good and happy. 9. Has that physician's sister friends? 10. No, Madam, she has no friends. 11. Is your meat good? 12. My meat is good, but my cheese is better. 13. Has the bookseller a handsome china inkstand? 14. He has a fine silver inkstand and a pair of leather shoes. 15. Have you my silk parasols? 16. I have your cotton umbrellas. 17. Is your brother's coat handsome? 18. My brother has a handsome coat and an old silk cravat. 19. Have you relations and friends? 20. I have no relations, but I have friends. 21. Is that handsome lady wrong? 22. That handsome lady is not wrong. 23. Have you handsome china? 24. Our china is handsome and good. 25. It is better than yours. 26. Is not that little girl hungry? 27. That handsome little girl is neither hungry nor thirsty. 28. What is the matter with her? 29. She has neither relations nor friends. 30. Is this gold watch good? 31. This one is good, but that one is better. 32. Have you it? 33. I have it, but I have not your sister's. 34. I have neither yours nor mine, I have your mother's.

OUR HOLIDAY.

GYMNASTIC EXERCISES.—II.

RETURNING to exercises which may be practised without the aid of a companion, we have next to mention a class of light gymnastics known as the

WAND EXERCISES.

These are especially beneficial in inducing flexibility of the shoulder-joint, and form a useful preparation for more arduous movements at a later stage of the learner's progress.

The wand is a smooth stick, one inch in diameter and four feet long, with the ends rounded. For very young persons a length of three feet is sufficient. The following are among the exercises to be practised with this instrument.

1. Grasp the wand with the hands at either end, as seen in Fig. 5; the attitude being perfectly erect, and the chest thrown forward. Now, *without bending the elbows*, bring the wand down behind you as far as you can, then raise it again to the original position above the head, and repeat these movements twenty times in succession.

2. Start from the same position, and, after each backward movement, bring the wand over the head and down in front to the knees.

3. Hold the wand over the head as before; then bring it down on each side alternately, by lowering one hand and raising the other, until the wand is in a perpendicular position. Remember still that the elbows must not be bent.

4. Now hold the wand in an upright position in front of you, the hands near the middle, and about six inches apart; the arms extended forward as nearly straight as possible. Keeping the legs and arms still, move the wand from side to side as far as you can reach, the upper part of the body partly turning at each movement.

5. Standing erect, with the right hand put the wand out at a right angle in front of you, one end resting on the floor; the body and the wand being both perpendicular, and the right arm in the horizontal position, the left hand resting on the hip. Now, from this position, step out with the right leg as far as you can reach, the foot passing behind the wand. The elbow must not be bent, and the wand must remain unmoved. Return to the erect position, the wand still held forward, and repeat these movements ten times in succession. This is called "charging," and is good exercise for the legs and the lower part of the body.

6. Go through the same movements as in the last exercise, with the exception that the wand is held forward with the left hand, the charge being made with the left leg.

7. Stand erect and hold the wand out straight before you at arm's length, in a perpendicular position, the left hand resting on the hip. Now step out with the right foot to the wand, and back to the other foot, five times in succession, without bending the knee. Take the wand in the left hand, and advance the left foot in the same manner.

8. Holding the wand as before, step backward as far as you can with the right foot, in this case bending the left knee; then return to the erect position, and repeat the movement ten times. The same afterwards with the left foot.

9. Carry the right foot forward to the wand, and then backward as far as you can reach, without stopping. Do this ten times in succession, and then the same with the left foot.

10. Holding the upper end of the wand in both hands, one above the other, the arms straight out, step the right foot forward to the wand and the left backward as far as possible. Now change the position of the feet at a single jump, and do this ten successive times.

These examples of the Wand exercises will be sufficient. They may be greatly varied, and two persons, each with a wand, may go through exercises similar in character to the Ring movements described in the previous paper.

THE DUMB BELLS.

We now come to Dumb Bell exercises, which are a well-known and very ancient means of physical culture. The best modern gymnasts, however, have introduced an important change in the practice with dumb bells. Formerly it was the custom to employ the heaviest bells that could be used by the learner, and to put him only through a small variety of motions with them. Now the most approved system is founded on the use of a light dumb bell, with which the pupil is taught to perform a great variety of active and graceful movements, calculated to advance the flexibility as well as the strength of all the muscles of the body. Some gymnasts maintain that the dumb bell should range only between two pounds and five pounds in weight, according to the strength of the learner; but Dr. Dio Lewis, who takes the lead as a recent authority in gymnastics, and who has had a very long and wide experience, is of opinion that bells weighing two pounds are heavy enough for any man, provided he wishes to attain to something more than the strength required for lifting heavy weights. He recommends that, as the dumb bells should be of considerable size, they should be made of wood; and wooden dumb bells only are used in his own gymnasium at Boston, U.S. The handle should be at least half an inch longer than the width of the hand, and of such a size as can be easily grasped, with a slight swell in the middle.

Before describing the light dumb-bell exercises, we will, however, say a few words as to the use of the heavier metal bells, with which some of our readers may be already provided. The object of their use is chiefly to strengthen the muscles of the

* The article, the possessive and demonstrative adjective, are repeated before every noun. Mon frère et ma sœur, my brother and sister.

wrists and arms, and among the most suitable exercises for this purpose are the following:—

1. The dumb bells are held close before the chest, the arms from the shoulder to the elbow resting by the side. The body must be erect, the heels touching, and the feet at right angles. Now raise the dumb bells slowly, first with one hand and then with the other, as high above the head as you can reach; bringing them back to the position in front of you. Then exercise both arms together in the same way.

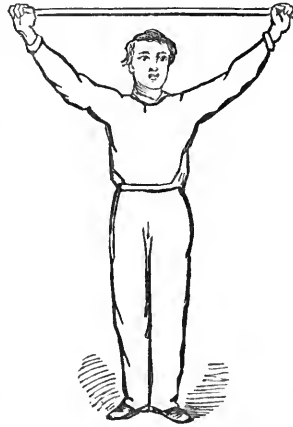


Fig. 5

2. Hold the bells down by the sides, and raise the arms until they are extended at full length in a horizontal position from the shoulders; raise and depress each arm alternately, then lower them both down to the sides, and repeat the former movement.

3. From the original position stretch the arms out before you, then bring them gradually back as far as you can without bending the elbows, and keeping the dumb bells grasped in the hands with the thumbs uppermost. Move the arms forward again, making the dumb bells meet in front, and then backward, trying to cause them to touch behind, which you will be able to accomplish with practice. As the learner gains strength, the speed with which these movements are made may be increased.

Some of the other exercises usually practised without apparatus, which we have described in our first paper on Gymnastics, may also be performed with the heavier dumb bells.

1. The light dumb-bell exercises are commenced by holding the

arms straight down, with the bells in an exactly horizontal position from the hips, the thumbs outward. Now turn the thumb ends of the bells to the hips, and back again, ten times. Be careful at each turn to keep the bells perfectly straight, so that a line run through one dumb bell would also pass through the other.

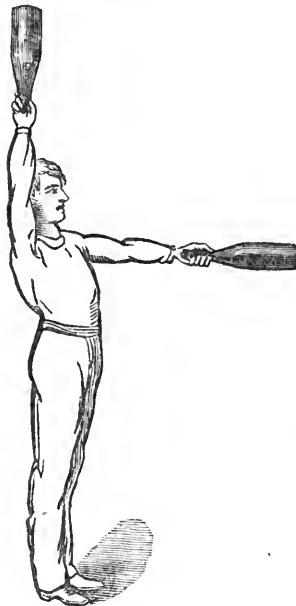


Fig. 7.

2. Now, with the arm from the shoulder to the elbow close by the side, hold the bells before you with the thumbs outward. Then turn the bells until their ends are reversed, as before, making them come in line at each movement, and repeat this ten times in succession. These exercises will do much to strengthen the wrists.

3. Hold the bells straight in front, the arms being extended, and the knuckles pointing downward; then twist the arms until the position of the dumb bells is reversed, the knuckles being upward.

4. Thrust the bells downward, upward, forward, and sideways, bringing them back to the chest after each movement, and repeating the series five times. Take great care that at each movement the arms and the bells be exactly parallel to each other.

5. Swing the bells energetically backward and forward, making them meet both in front of the chest and behind the back.

6. Go through the "charging" exercises already described among the wand movements, each dumb bell in turn serving

the purpose of an imaginary wand for the guidance of the gymnast in the position.

7. Hold one dumb bell high above the head with the right hand, the arm being quite straight; let the other bell rest on the neck—the arm, of course, being bent; change the position of each arm alternately. Now, with the bells still in these positions, stretch the left leg backward as far as possible, and, when it has reached its limit, sink the body towards the ground. Rise to the perpendicular again, and then stretch back the other leg in the same way. Repeat these movements five times.

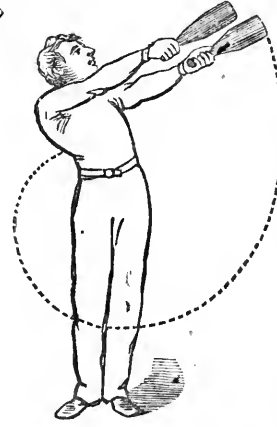


Fig. 6.

8. Standing erect, arms down, carry them to the horizontal position in front; then above the head as seen in Fig. 8. Now down to the horizontal again, and then to the floor, as seen in the dotted lines in the figure. Repeat these movements ten times, and without bending the knees or the elbows.

Here we must leave the dumb bells; but, as in the case of the other exercises, the examples which we have now given will be sufficient to suggest numerous variations and additions to the learner.

We pass on now to another kind of exercise, which will give the learner more severe work than any of those to which we have yet alluded.

INDIAN CLUBS.

The clubs are made of wood; they should be about eighteen inches long, somewhat tapering in form, from three to four inches

in diameter at the thickest end, and the other forming a convenient handle for the grasp. The weight of the clubs should be just such as will allow the learner to use them with tolerable freedom; for anything like a violent or undue strain upon the muscles is to be avoided in our gymnastic training.

We need not give a detailed list of Indian club exercises. Many of those performed with the dumb bells, etc., can be practised to equal advantage with the clubs, and the learner who has studied the rules and movements we have already given, will know how to proceed with these implements. It will assist him, however, to have before him the two illustrations given on this page. Fig. 7 indicates the proper position of the body from which all the exercises should be commenced, the clubs being used either in perpendicular or horizontal positions, or sometimes in both simultaneously, as in the cut.

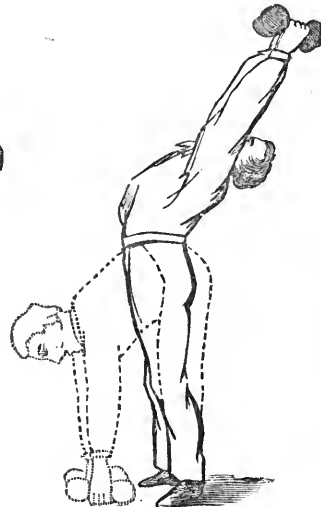


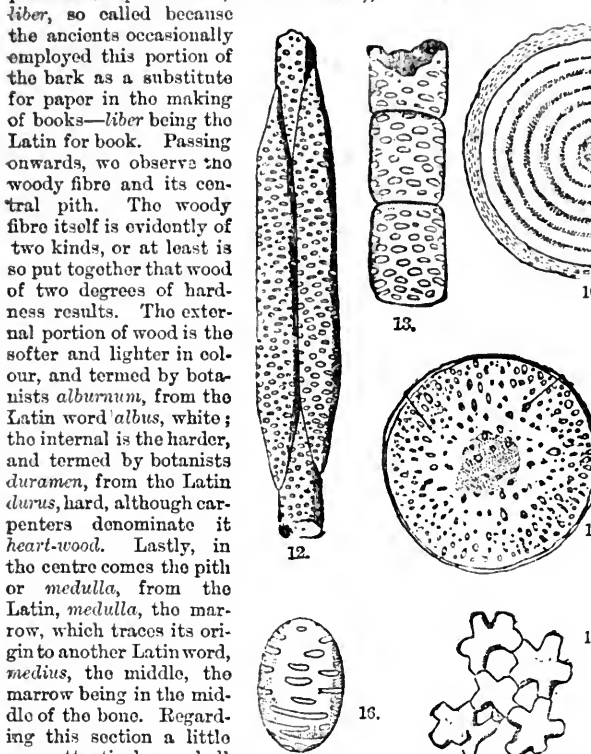
Fig. 8.

Fig. 6 shows the kind of movement which may be practised in order to obtain entire freedom with the clubs, the dotted lines describing their direction. Having reached the back, bring the arms to the side, with the clubs hanging downward; then sweep them the reverse way to that shown in the illustration, holding them above the head, and arching the body as much as possible. Remember in the club exercises, as in all others, the invariable rule, never to bend the knees or the elbows unless the character of the movement contemplated renders it absolutely necessary to do so.

LESSONS IN BOTANY.—III.

SECTION IV.—STRUCTURE OF THE STEM OF VEGETABLES.

This is a very important point, and helps to furnish us with a means of dividing plants, at least flowering plants, into two primary groups or divisions. Let us consider that which takes place during the growth of an oak from the acorn. The acorn, on being planted in the ground, sends down its root, and sends up its stem. At first this stem is a tiny thing of very inconsiderable diameter; year by year, however, it grows, until a gigantic tree results. If we now cut this tree across and examine the structure of its section, we shall recognise the following appearances. In the first place, commencing our examination from without, we shall find the bark, or *cortex* (Latin, *cortex*, bark), separable into two distinct layers, the outer of which is termed the *cuticle* (Latin, *cutis*, skin), or *epidermis*, (Greek *ἐπίδερμις*, pronounced *ep-i-der'-mis*, the outer skin), and the inner one the *liber*, so called because the ancients occasionally employed this portion of the bark as a substitute for paper in the making of books—*liber* being the Latin for book. Passing onwards, we observe the woody fibre and its central pith. The woody fibre itself is evidently of two kinds, or at least is so put together that wood of two degrees of hardness results. The external portion of wood is the softer and lighter in colour, and termed by botanists *alburnum*, from the Latin word *albus*, white; the internal is the harder, and termed by botanists *duramen*, from the Latin *durus*, hard, although carpenters denominate it *heart-wood*. Lastly, in the centre comes the pith or *medulla*, from the Latin, *medulla*, the marrow, which traces its origin to another Latin word, *medius*, the middle, the marrow being in the middle of the bone. Regarding this section a little more attentively, we shall observe passing from the pith to the bark, and establishing a connexion between the two, a series of white rays, termed by the botanist *medullary rays*, and by the carpenter *silver grain*. We shall also observe that the section displays a series of ring-like forms concentric one within the other. These are a very important characteristic. They not only prove that the trunk in question was generated by continued depositions of woody matter around a central line, or, in other words, by an outside deposition, but they enable us in many cases actually to read off the age of any particular tree—the thickness corresponding with one ring being indicative of one year's growth. Inasmuch as the formation of an oak tree is thus demonstrated to be the consequence of a deposition of successive layers of woody fibres externally or without—it is said to be like all others subjected to the same kind of growth, an *exogenous* plant—from two Greek words, *ἔξω* (*ex'-o*), *without*, and *γεννάω* (*gen-ná-o*, *g hard*, as in *gun*), *I generate*.



10. HORIZONTAL SECTION OF AN EXOGEN. 11. HORIZONTAL SECTION OF AN ENDOGEN. 12. DOTTED VESSELS OF THE CLEMATIS. 13. DOTTED VESSELS OF THE MELON. 14. SPIRAL VESSELS OF THE MELONS. 15. LACTIFEROUS VESSELS OF THE CELANDINE. 16. OVOID CELL. 17. STELLIFORM CELLS. 18. ANGULAR CELLS.

Fig. 10 represents the internal structure of an exogenous stem. It is true that the peculiar disposition of rings thus spoken of cannot always be recognised. For example, as a rule, trees which grow in hot climates are checked so little in their pro-

gress, the winter to which they are exposed being so short, that their course of growth is scarcely interfered with by any impediment. Under these circumstances, there is scarcely any winter pause sufficient to create a line of demarcation between ring and ring; the progress of deposition goes on continuously. However, the manner of deposition is not the less external because we cannot see the rings.

Very different from this method of increase is that by which another grand division of plants augments in size. For an example we must no longer have recourse to a section of a plant of our temperate zone, but must appeal to the larger tropical productions of this kind. If we cut a piece of bamboo, or cane (with which most of us are familiar), horizontally, we shall find a very different kind of structure to that which we recognised in the oak. There will be no longer seen any real bark, nor any pith, and the concentric rays will be also absent, but the tissue of which the stem is made up may be compared to long strings

of woody fibre tightly packed together. These concentric rings, in point of fact, could not have existed; inasmuch as a cane does not grow by deposition of woody matter externally, but internally, or, more properly speaking, upwards. A young cane is just as big round as an old cane, the only difference between them consisting in the matters of hardness and of length. Hence, bamboos, and all vegetables which grow by this kind of increment, are termed *endogenous*, from two Greek words *ἐνδον* (*en'-don*), *within*, and *γεννάω* (*gen-ná-o*), *I generate*. The largest specimen of endogenous growth is furnished by palm trees—those magnificent denizens of tropical forests to which we are so much indebted for dates, cocoa-nuts, palm-oil, vegetable wax, and numerous other useful products. Fig. 11 is a representation of the section of a palm tree, in which the peculiarities of endogenous structure are very well developed.

All the endogenous productions of temperate climes are small, though very important. In proof of the latter assertion it may suffice to mention the grasses; not only those dwarf species which carpet our lawns and our fields with verdure, but wheat, barley, oats, rice, maize, all of which are grasses, botanically considered, notwithstanding their dimensions. Indeed, size has little to do with the definition of a grass; for if we proceed to tropical climes, we shall there find grasses of still more gigantic dimensions. Thus the sugar cane, which grows to the elevation of fifteen or sixteen feet, is a grass, as in like manner is the still taller cane, out of the stem of which, when split, we make chair-bottoms, baskets, window-blinds, etc., and which, when simply cut into convenient lengths, is also useful for other purposes; one of which will, perhaps, occur to some of our younger readers.

The reader will not fail to remember that we, a few pages back, divided vegetables into phanogamous and cryptogamio (we are sure we need not repeat the meaning of these terms). We may now carry our natural classification still further, and say that phanogamous plants admit of division into exogenous and endogenous ones. This division is quite natural, even if we

have regard merely to the structure of the stem; but the agreement is much wider than this, and recognisable by other analogies, as we shall see presently, when we come to consider the nature and peculiarities of leaves and seeds.

SECTION V.—CONCERNING LEAVES AND THEIR USES.

THERE are two methods of teaching the nature of a thing; one is by definition, the other by example. Of these the latter is usually the more easy, but the former is the more precise. Accordingly, then, we shall commence by stating that in botanical language a leaf admits of definition as "a thin flattened expansion of epidermis, containing between its two layers vascular and cellular tissue, nerves, and veins, and performing the functions of exhalation and respiration." Such is the botanical definition of a leaf. Probably the learner may not understand this definition just yet, but a little contemplation will enable him to do so. With the object of enabling him to understand the definition, suppose we go through its clauses one by one. Firstly, then, a *thin flattened expansion of epidermis*, we assume to be a self-evident expression. The epidermis means, as we have already stated, the outside bark—at least, this is its botanical acceptance. Literally, the Greek word *ἐπίδερμις* means *skin*, as we have said above, and is also applied to indicate that portion of the animal skin which readily peels off, which rises under the action of a blister, and which, when thickened and hardened, constitutes those troublesome pests on the feet which we call *corns*. As regards the epidermis of vegetables, it may readily be seen in the birch tree, from which it peels off in long strips. Well, a leaf, then, consists of two layers of this epidermis, one above and the other below, *enclosing vascular and cellular tissue*, the meaning of which terms we have now to explain to the reader. The word *vascular* means "consisting of, or containing vessels," and is derived from the Latin *vasculum*, a little vessel, while *cellular*, which is derived from the Latin *cella*, a hollow place or cavity, means, "consisting of cells." By vascular tissue is meant those little pipes or tubes which run through vegetables, just like arteries and veins through animal bodies, and which serve the purpose of conveying juices from one part of a plant to another. In plants, these pipes or tubes are so exceedingly small that their tubular character is only recognisable by the aid of a microscope or powerful lens, but their presence may be recognised by the naked eye. Thus, for example, we have little doubt that most readers of this work have noticed that, on breaking across a portion of succulent vegetable stem, such, for instance, as a piece of the long stalk of the *rhubarb* leaf, which is used for making pies and puddings, that the two portions do not always break clean off, but one part remains attached to the other by certain little fibrils. Now, these fibrils are vascular, that is to say, they are tubes, and tubes of various kinds, admitting of distinction amongst themselves. These distinctions we shall not enter upon here further than stating in general terms that, while some of the tubes are straight, others are twisted or spiral, like the perforator of a corkscrew; whence arises the term *spiral vessels*, which botanists have applied to them. Figs. 12, 13, 14, and 15, are magnified representations of the most remarkable kinds of vessels contained in vegetables; the spiral vessels of which we have been treating will easily be recognised by their peculiar appearance.

Cellular tissue is, as its name indicates, an assemblage of little cells, the natural form of which is spheroidal or oval (fig. 16), but more frequently this form is modified from various causes, usually the mutual pressure of cells against each other. Thus the pith of trees, a portion of which is made up of cellular tissue, if examined under the microscope, will be found to be composed of cells having the form of honeycomb cells, that is to say, hexagonal (fig. 18).

This last drawing represents the appearance of a thin segment of elder pith when submitted to microscopic examination. Occasionally the cells of cellular tissue assume a star-like or stellate (Latin *stella*, a star) form, as, for example, is the case in a common bean, of which our diagram (fig. 17) represents a section as seen when examined under the field of a microscope. Usually these vegetable cells are so very small that a microscope, or, at least, a powerful lens, is necessary for observing them. In certain vegetables, however, they assume such dimensions as to admit of being readily seen by the naked eye. For

an example the reader may refer to an orange, especially an orange somewhat late in the season. If the fruit be cut, or, still better, pulled asunder, the cells will be readily apparent. Still more readily do they admit of being observed in that large species of the orange tribe to which the name shaddock, or forbidden fruit, is ordinarily given.

We must now inform the reader that not only do the cells of this cellular tissue admit of being altered in form, but occasionally they give rise to parts in the vegetable organisation which would not be suspected to consist of cells. The cuticle of which we have spoken is nothing more than a layer of cells firmly adherent; and the medullary rays, or silver grain, of exogenous stems, the appearance of which has been already described, is nothing more nor less than closely compressed cellular tissue.

We commenced by describing a leaf, but observations have been so often directed to matters collateral to the subject that the description appears somewhat rambling. Nevertheless, it cannot be helped. In Botany, above all other sciences, there occur many curious names. They must be learnt, and the best way to teach them is to describe them as they occur.

A leaf, then, we repeat, is an extension of two flat surfaces of cuticle enclosing nerves and veins, vascular and cellular tissue. All these terms have been pretty well explained. We may add, however, that when cellular tissue exists confusedly thrown together, as it does in the substance of a leaf, or as it appears in the orange, then such cellular tissue is denominated *parenchyma*, from the Greek word *παρέγχυμα* (pronounced *par-en-ku'-ma*) "anything poured out."

Before we quite finish with our remarks relative to the substances which enter into leaves, it is necessary to observe that the green colouring matter of leaves is termed by botanists and by chemists *chlorophyl*, from the two Greek words *χλωρός* (pronounced *klō-ros*), yellowish green, and *φύλλον* (pronounced *ful'-lon*), a leaf. This chlorophyl is subject to become siennared in autumn, as we all know, but the cause of this alteration has not yet been explained.

READING AND ELOCUTION.—III.

PUNCTUATION (continued).

IV. THE COMMA.

22. THE mark used for a comma is a round dot with a small curve appended to it, turning from right to left.

23. When you come to a comma in reading, you must, in general, make a short pause or stop, so long as would enable you to count one.

24. The last word before a comma is most frequently read with the falling inflection of the voice.

25. In reading, when you come to a comma, you must keep your voice suspended as if some one had stopped you before you had read all that you intended to read.

26. In the following examples keep your breath suspended when you come to the comma; but let the short pause or stop which you make, be a total cessation of the voice.

Examples.

Diligence, industry, and proper improvement of time, are material duties of the young.

He is religious, generous, just, charitable and humane.

By wisdom, by art, by the united strength of a civil community, men have been enabled to subdue the whole race of lions, bears, and serpents.

The genuine glory, the proper distinction of the rational species, arises from the perfection of the mental powers.

Courage is apt to be fierce, and strength is often exerted in acts of oppression.

Wisdom is the associate of justice. It assists her to form equal laws, to pursue right measures, to correct power, to protect weakness, and to unite individuals in a common interest and general welfare.

Heroes may kill tyrants, but it is wisdom and laws that prevent tyranny and oppression.

27. When a note of interrogation occurs at the end of a sentence, the parts, and even the words, of the sentence separated by commas, should each be read like a question.

Examples.

Did you read as correctly, speak as properly, or behave as well as James?

Art thou the Thracian robber, of whose exploits I have heard so much?

Who shall separate us from the love of Christ? shall tribulation, or distress, or persecution, or famine, or peril, or sword?

How are the dead raised up, and with what body do they come?

For what is our hope, our joy, or crown of rejoicing?

Have you not misemployed your time, wasted your talents, and passed your life in idleness and vice?

Have you been taught anything of the nature, structure, and laws of the body which you inhabit?

Were you ever made to understand the operation of diet, air, exercise, and modes of dress, upon the human frame?

28. Sometimes the word preceding a comma is to be read like that preceding a period, with the falling inflection of the voice.

Examples.

It is said by unbelievers that religion is dull, unsociable, uncharitable, enthusiastic, a damper of human joy, a morose intruder upon human pleasure.

Nothing is more erroneous, unjust, or untrue, than the statement in the preceding sentence.

Perhaps you have mistaken sobriety for dullness, equanimity for moroseness, disinclination to bad company for aversion to society, abhorrence of vice for uncharitableness, and piety for enthusiasm.

Henry was careless, thoughtless, heedless, and inattentive.

This is partial, unjust, uncharitable, and iniquitous.

The history of religion is ransacked by its enemies, for instances of persecution, of austerities, and of enthusiastic irregularities.

Religion is often supposed to be something which must be practised apart from everything else, a distinct profession, a peculiar occupation.

29. Sometimes the word preceding a comma is to be read like that preceding an exclamation.

Examples.

How can you destroy those beautiful things which your father procured for you! that beautiful top, those polished marbles, that excellent ball, and that beautifully painted kite, oh how can you destroy them, and expect that he will buy you new ones!

How canst thou renounce the boundless store of charms that Nature to her votary yields! the warbling woodland, the resounding shore, the pomp of groves, the garniture of fields, all that the genial ray of morning gilds, and all that echoes to the song of even, all that the mountain's sheltering bosom shields, and all the dread magnificence of heaven, how canst thou renounce them and hope to be forgiven!

O Winter! ruler of the inverted year! thy scattered hair with sleet-like ashes filled, thy breath congealed upon thy lips, thy cheeks fringed with a beard made white with other snows than those of age, thy forehead wrapped in clouds, a leafless branch thy sceptre, and thy throne a sliding car, indebted to no wheels, but urged by storms along its slippery way, I love thee, all unlovely as thou seemest, and dreaded as thou art!

How art thou, O Peace! and lovely are thy children, and lovely are the prints of thy footsteps in the green valleys.

30. Sometimes the word preceding a comma and other marks, is to be read without any pause or inflection of the voice.

Examples.

You see, my son, this wide and large firmament over our heads, where the sun and moon, and all the stars appear in their turns.

Therefore, my child, fear and worship, and love God.

He that can read as well as you can, James, need not be ashamed to read aloud.

I consider it my duty, at this time, to tell you that you have done something of which you ought to be ashamed.

The Spaniards, while thus employed, were surrounded by many of the natives, who gazed, in silent admiration, upon actions which they could not comprehend, and of which they did not foresee the consequences. The dress of the Spaniards, the whiteness of their skins, their beards, their arms, appeared strange and surprising.

Yet, fair as thou art, thou shinnest to glide, beautiful stream! by the village shade, but windest away from the haunts of men, to silent valley and shaded glen.

But it is not for man, either solely or principally, that night is made.

We imagine, that, in a world of our own creation, there would always be a blessing in the air, and flowers and fruits on the earth.

Share with you! said his father—so the industrious must lose his labour to feed the idle.

31. Sometimes the pause of a comma must be made where

there is no pause in the book. Spaces are left in the following sentences where the pause is proper to be made.

Examples.

The Europeans were hardly less amazed at the scene now set before them.

Their black hair long and curled floated upon their shoulders or was bound in tresses around their head.

Persons of reflection and sensibility contemplate with interest the scenes of nature.

The succession and contrasts of the seasons give scope to care and foresight diligence and industry which are essential to the dignity and enjoyment of human beings.

The eye is sweetly rested on every object to which it turns. It is grateful to perceive how widely yet chastely Nature hath mixed her colours and painted her robe.

Winter compensates for the want of attractions abroad by fire-side delights and homefelt joys. In all this interchange and variety we find reason to acknowledge the wise and benevolent care of the God of seasons.

32. The pupil may read the following sentences; but before reading them, he should point out after what word the pause should be made. The pause is not printed in the sentences, but it must be made when reading them. And here it may be observed, that the comma is more frequently used to point out the grammatical divisions of a sentence, than to indicate a rest or cessation of the voice. Good reading depends much upon skill and judgment in making those pauses which the meaning of the sentence dictates, but which are not noted in the book; and the sooner the pupil is taught to make them, with proper discrimination, the surer and more rapid will be his progress in the art of reading.

Examples.

The golden head that was wont to rise at that part of the table was now wanting.

For even though absent from school I shall prepare the lesson.

For even though dead I will control the trophies of the capitol.

It is now two hundred years since attempts have been made to civilise the North American savage.

Doing well has something more in it than the fulfilling of a duty.

You will expect me to say something of the lonely records of the former races that inhabited this country.

There is no virtue without a characteristic beauty to make it particularly loved by the good, and to make the bad ashamed of their neglect of it.

A sacrifice was never yet offered to a principle, that was not made up to us by self-approval, and the consideration of what our degradation would have been had we done otherwise.

The succession and contrast of the seasons give scope to that care and foresight, vigilance and industry, which are essential to the dignity and enjoyment of human beings, whose happiness is connected with the exertion of their faculties.

A lion of the largest size measures from eight to nine feet from the muzzle to the origin of the tail, which last is of itself about four feet long. The height of the larger specimens is four or five feet.

A benison upon thee, gentle huntsman! Whose towers are these that overlook the wood?

The incidents of the last few days have been such as will probably never again be witnessed by the people of America, and such as were never before witnessed by any nation under heaven.

To the memory of André his country has erected the most magnificent monument, and bestowed on his family the highest honours and most liberal rewards. To the memory of Hale not a stone has been erected, and the traveller asks in vain for the place of his long sleep.

MECHANICS.—III.

FORCES APPLIED TO A SINGLE POINT—PARALLELOGRAM OF FORCES, ETC.

In this lesson we have to consider how the resultant of two, and thence of any number of forces, applied to a single point may be found. You will keep in mind that by a "single point," I mean a point "in a body;" and that will save me always adding the latter words when I use the former. Of course, forces applied to "a material point" are included in the description, and these you will find, in due time, to be of very great importance.

As the joint effect of two or more forces so applied is termed their "resultant," so we name the separate forces of which it is the effect its components. There are thus two operations, the Composition of Forces, and the Resolution of Forces, with which we may be concerned in Mechanics; by the former of which we

denote the putting together, compounding, or finding the resultant of any number of forces, and by the latter the separating, or resolving, of any given force into the two or more to which it may be considered equivalent. The composition we first consider; but this requires a short digression on

THE PARALLELOGRAM.

The resultant of two forces is found by the aid of the "parallelogram of forces;" and, as some of you may not know what a parallelogram precisely is, I shall explain the term, and tell you a few things about it which, in Mechanics, it is desirable you should know.

A parallelogram is a four-sided figure whose pairs of opposite sides and opposite angles are equal.

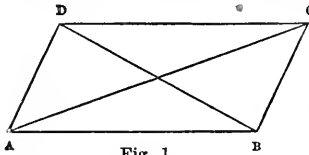


Fig. 1.

In the adjoining figure, ABCD is a parallelogram, if the side AB is equal to DC, and also BC to AD. The two cross lines, AC and BD, are called the "diagonals of the parallelogram." Now, if you examine the two triangles, ABC, A DC, which are

on opposite sides of the diagonal, AC, you will see reason for believing that they must be equal to each other. They are, in fact, the same triangle on opposite sides of that line; for they have AC for a common side, and the two other pairs of sides are equal, namely, AB equal to DC, and AD to BC; and you cannot out of three straight lines make two different triangles. This you can satisfy yourselves of by experiment, by putting three rods of different lengths together so as to form a closed figure.

Now, the point to which I am trying to lead you, and which you will soon find of importance, is that, since these triangles are equal—in fact, one and the same triangle in two positions—their angles must be equal to each other. Hence we arrive at the following important properties of a parallelogram:—

1. That the opposite angles, ABC and ADC, are equal, also the opposite angles, BAD and BCD.
2. That either diagonal makes equal angles with the pairs of opposite sides, ABD equal to CDB, and ADB equal to CBD.

It is on account of this latter property the figure is called "parallelogram." The opposite sides are not only equal, but parallel, on account of their making equal angles with either diagonal. However, keep in mind that these angles are equal, for this knowledge is necessary to your properly understanding what we next come to, namely—

THE PARALLELOGRAM OF FORCES.

The forces in our cuts and diagrams being represented, as agreed on, by lines, and their directions by arrow-heads attached to their remote ends, this principle may be stated as follows:—

If two forces applied to a point are represented in magnitude and direction by two straight lines, their resultant is represented in magnitude and direction by the diagonal passing through that point of the parallelogram of which these lines are two adjoining sides.

In Fig. 2 let OP, OQ be the two forces, and draw from P and Q the two dotted lines parallel to them which meet in R, then the dotted diagonal, OR, of the parallelogram thus formed is the resultant, both in magnitude and direction, of OP and OQ.

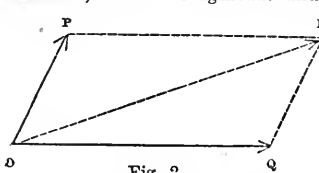


Fig. 2.

Now, I shall not here give you the strict mathematical proof of this proposition; it is too complicated, and involves so much close reasoning, that to force it on a student in the beginning of a treatise on mechanics would be to throw an unnecessary difficulty in his way.

The best course is to defer it until you have become more accustomed to mechanical reasoning, and then return to it. In the meantime you can satisfy yourselves that it is true by a reference to the two following experiments, one derived from equilibrium, the other from motion.

First Experiment.—Let three weights, UVW, be attached to three cords, as in Fig. 3, which are knotted together at o; and let two of the cords, longer than the third, with their at-

tached weights, be thrown over two pulleys, PQ, which move freely in the same plane round axles fastened into a wall or upright board. Arrange, then, the weights and cords until equilibrium is produced. It is evident, from the principle stated at the close of the last lesson, that the force, w, must be equal and opposite to the resultant of U and v, acting over the pulleys at o.

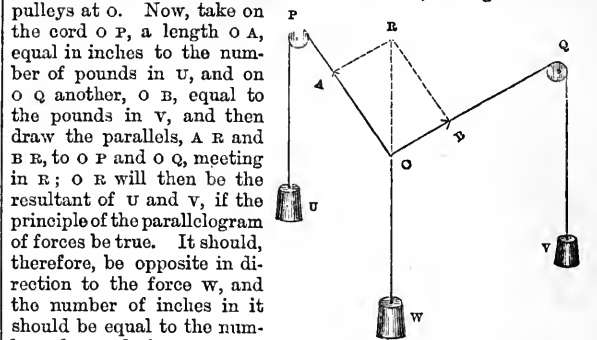


Fig. 3.

is opposite to w, that is to say, that it points vertically upwards in the plumb-line; and it is also found that the number of inches in its length is that of the pounds in w.

Second Experiment.—Let us suppose that a parallelogram OARB is described anyhow on a perfectly smooth horizontal table, and that at the point o, two springs are fitted so that one of them, on being let go, would make the unit ivory ball move over oA in the same time that the other would make it move over oB. It is evident that the lines oA and oB would then represent these forces. Furthermore, it should follow, if the principle of the parallelogram of forces be true, that, when both springs are let go together so as together to strike the ball, it should move

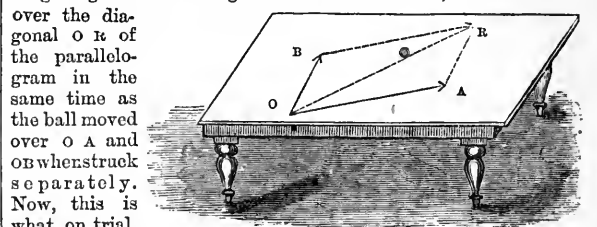


Fig. 4.

over the diagonal oR of the parallelogram in the same time as the ball moved over oA and oB when struck separately. Now, this is what, on trial, exactly happens. The ball does move over the diagonal, and moves over it in the same time that it previously moved over the sides. This it could not do if the resultant of two forces was not represented in magnitude and direction by the diagonal. Instruments are fitted up for lecture-rooms by which the experiment can be made, and the result always is as I have stated.

Taking the principle, then, as established, let us observe its consequences. You are given two forces, acting at a point, and you want their resultant. Make, you will immediately say, a parallelogram of the two forces, and the diagonal is the required line. Not so fast; you need not describe the whole of that figure, a part will suffice. Now, if from the end A of oA, you draw AR parallel and equal to oB, it is clear you do not want to draw BR at all. AR gives you the far end of the resultant, and all you have to do then is to join R with o, and your object is gained. Thus your parallelogram of forces suddenly becomes a triangle of forces; and you may lay this down as your rule in future for compounding two forces.

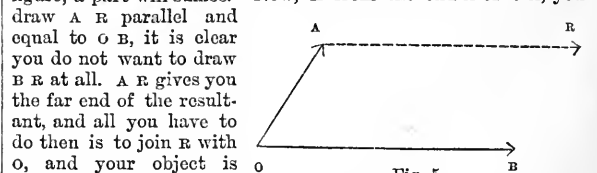


Fig. 5.

Draw from the extremity of one of the forces a line equal, and parallel to, the other force; and the third side of the triangle so formed by joining the end of this line with the point of application is the resultant.

There is great advantage in this substitution of the triangle for the parallelogram, for it saves the drawing of unnecessary

lines, which, as you will see, when many forces have to be compounded, would cause much confusion in your figures.

Let us apply this principle now to compound any number of forces acting on a point. Let there be five, and that will illustrate the rule as well as a thousand could.

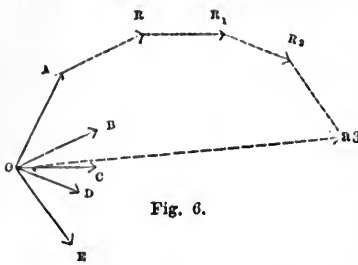


Fig. 6.

Suppose forces, $O A$, $O B$, $O C$, $O D$, $O E$, applied to the point, O . By the triangular rule, if I draw $A R$ equal and parallel to $O B$, the line joining O with R is the resultant of the first two forces. I shall not actually draw this line, $O R$; let us suppose it drawn. Now, if I compound this resultant with $O C$, I have the resultant of three of the forces. But that, by the same rule, is got by drawing from R a line $R_1 R_2$ equal and parallel to $O C$. The line $O R$ is this resultant of three. Again we shall not draw it. The resultant of this and $O D$, for the same reason, would be $O R_2$, got by drawing $R_1 R_2$ parallel and equal to $O D$, and, lastly, the resultant of this and $O E$ would be $O R_3$, the line, $R_2 R_3$, being equal and parallel to $O E$. We have thus exhausted all the forces, and evidently $O R_3$ is the resultant of the whole five. There was here no confusing ourselves with parallelograms; all we had to do was to draw line after line, one attached to the other, carefully observing to keep their magnitudes and directions aright. A kind of unfinished polygon was thus formed, and the line $O R_3$, which closes up the polygon, joining the last point R_3 , with the point of application, is the resultant in magnitude and in direction. Thus you have made another step in advance, and arrived at the Polygon of Forces. You have learned how, by the mere careful drawing of lines, to determine the resultant of any number of forces. All you require is paper and pencil, a rule, compasses, a scale, and a pair of parallel rulers.

Now, there is one point about this polygon I wish you carefully to note. You will observe that the arrows on its sides, representing the directions of the forces you have compounded, all point from left to right, as you go round the figure, turning it with you so as to bring each side in succession to the top. The resultant, however, points in the opposite direction, from right to left, when that side is uppermost. This is as it should be; the direction of the resultant, as you go round the figure, must be opposite to those of the components. The use of this you will see in the next lesson.

Now, let us suppose that, in determining the resultant after this method, as we come to the end of the operation, the end, R_3 , of the last line, $R_2 R_3$, chanced to coincide with, or fall upon the point of application, O . The polygon would close of itself without any joining line; what is the meaning of this? It means that there is no resultant; the line, $O R_3$, is nothing, and therefore the resultant is nothing, and the forces produce equilibrium. What a valuable result we have arrived at! A method by which we can, by rule and compass, tell at once whether any number of forces make equilibrium at a point or not. All we have to do is to describe the polygon of forces, and if it closes up of itself, there is equilibrium; if it does not, there cannot be equilibrium, and the resultant is in magnitude the side which is necessary to close the figure.

Deferring the further expansion of this subject to the next lesson, I shall now turn back and apply these principles to a few elementary examples.

First Example.—Three equal forces act at a point in different directions—what condition should they fulfil in order to be in equilibrium? Get your ruler and compass, and commence constructing the figure by which their resultant may be found. From the end of one of the forces you are to draw a line equal and parallel to the second equal force, and from the end of that another line, equal and parallel to the third. You will thus have three lines strung together, all equal to each other. But if the forces are in equilibrium, the end of the last line must fall on the point of application, that is to say, the polygon of forces must close up, and form a triangle. Your construction will then give you a triangle of three equal sides, commonly called an equilateral triangle. But such a triangle must have

all its angles equal; also the angles between the sides of the triangle, or of the polygon of forces, are the angles between the forces themselves, since they are parallel to these forces. This is evident from the properties, 1 and 2, of the parallelogram referred to above; therefore, in the case we are considering, the three equal forces must act at equal angles, as I showed otherwise must be the case at the close of the last lesson.

Second Example.—Let a weight hang from the ceiling by means of two cords of unequal length, as in Fig. 7. It is evidently at rest. Whatever be the forces called into action, they produce equilibrium. Is there nothing further to ascertain? There is; it may be desirable to know by how much each cord is strained. Our assurance that the cords will support the weight depends on this knowledge. Let P and Q be the two points of support of the strings which meet at O . Now, whatever be the strains on the cords, $O P$, $O Q$, they make equilibrium with w , the weight. Therefore, if we suppose a length, $O A$, of $O P$ to represent the strain on $O P$, and from A draw a line $A R$, parallel to $O Q$, on $O Q$, then, since the three forces are in equilibrium, the line, $R O$, closing up the triangle must be equal to, and be in the direction as, the third force, or weight, w . This, then, tells us what to do. Measure on $O R$ upward as many inches as there are pounds in w ; and from R then draw $R A$ parallel to the cord $O Q$ to meet the cord $O A$. The number of inches in $O A$ will represent in pounds the strain on $O P$, and those on $R A$ the strain on $O Q$. All, therefore, that we desire to know is determined.

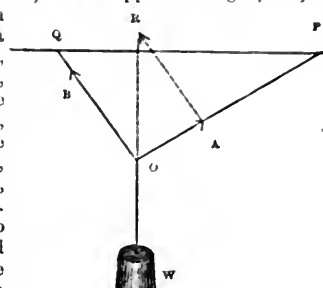


Fig. 7.

Third Example.—A horse pulls a roller up a smooth inclined plane or slope; what is the force he must exert when he just keeps the roller at rest? And by how much does the roller press on the plane?

Let the horse pull in any direction, $O A$. Then there will be three forces acting on the roller; namely, its own weight right downwards, the horse's pull, and the resistance of the plane or slope, perpendicular to itself. There must be this third force, not being opposite to each other, cannot make equilibrium. The roller is somehow supported by the plane; and that it cannot be unless by its resistance; and a plane cannot resist except perpendicularly to itself. This third force, you thus see, must be taken perpendicular to the plane. It is represented in the figure by $O B$.

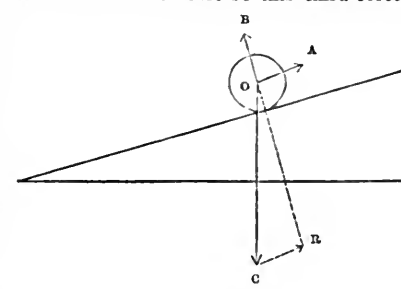


Fig. 8.

Now apply the polygon of forces. Let O represent the weight of the roller, and from c suppose a line, $c R$, drawn equal and parallel to $O A$, the horse's pull. Then, since there is equilibrium, the polygon of forces should close up and become a triangle—that is, the line joining R with O should be the pressure, and therefore should be perpendicular to the plane. What then are we to do? Take $O c$, equal in inches to the number of pounds in the roller, draw then from c a line $c R$ parallel to the horse's pull, to meet the line drawn from the centre O of the roller perpendicularly to the plane; $c R$ so determined will in inches tell the pounds in the horse's pull, and $O R$ the amount by which the roller presses the plane. You can easily see from this that as the slope increases the pull will increase and the pressure diminish. This is what naturally we should expect. The plane I have supposed to be smooth; for, where there is friction against the roller caused by roughness in itself or in the plane, or in both, the question is much altered, as in due time you will see.

LESSONS IN FRENCH.—VI.

SECTION I.—FRENCH PRONUNCIATION (continued).

III. NAME AND SOUND OF THE VOWELS.

41. **I, i.**—Name, *EE, ee*; sound, like the letters *ee* in the English word *see*.

This vowel receives but one kind of accent, and that is the circumflex, viz.—*î, î*; though it is comparatively seldom found thus accented. This vowel has two sounds, viz., long and short; long, as *ee* in the English word *see*, and short, like *i* in the English word *pin*, or nearly like it. It becomes *nasal* in combination with the letters *m* and *n*, in which case the character of its own sound is completely changed, which is indeed true of all the vowels.

In these Lessons, the vowel *I, î*, will be represented by the two letters *ee*, when long or under the circumflex accent, and by *e* when it has the short sound.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Cire	Seer	Wax.	Liquide	Lce-keed	Liquid.
Diré	Deer	To say.	Lire	Leer	To read.
Dit	Dee	Said.	Lit	Lee	Bed.
Il	Ill	He.	Mille	Meel	Thousand.
Iris	Ee-ris	Iris.	Qui	Kee	Who.
Lime	Loem	File.	Rite	Reet (trill the r)	Rite.

42. **Î, î**, CIRCUMFLEX.—Name, *EE, ee*; sound, like the letters *ee* in the English word *see*; sound prolonged.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Abime	Ab-eem	Abyss.	Épître	Ay-pectr'	Epistle.
Assit	Ass-ee	Might assist.	Finir	Fo-nee	Might finish.
Battit	Bat-tee	Might beat.	Gîte	Zheet	Lodging-place.
Dime	Deem	Tenth.	Île	Eel	Island.
Diner	Dee-nay	To dine.	Mit	Mee	Might place.

SECTION XII.—AGREEMENT OF ADJECTIVES.—PLURAL OF ADJECTIVES.

1. An adjective qualifying a plural noun, or two or more singular nouns of the same gender, assumes the gender of the noun or nouns, and is put in the plural.

Les arbres et les fruits sont beaux, *The trees and fruits are fine.*
 Les fleurs et les plantes sont belles, *The flowers and plants are fine.*
 Vos jardins sont très-beaux, *Your gardens are very fine.*

2. An adjective qualifying two or more nouns of different genders is put in the plural masculine [§ 18].

Mon frère et ma sœur sont contents, *My brother and sister are pleased.*
 Le canif et la plume sont bons, *The penknife and pen are good.*

3. The plural of the feminine of adjectives is invariably formed by the addition of an *s*.

Vous avez de jolies maisons, *You have pretty houses.*
 Ces demoiselles sont attentives, *Those young ladies are attentive.*

4. The plural of the masculine of adjectives is generally formed by the addition of an *s*.

Ces écoliers sont attentifs, *Those scholars are attentive.*
 Vos bois sont magnifiques, *Your woods are magnificent.*

5. The terminations *s* and *x* are not changed for the plural masculine.

Nos fruits sont mauvais, *Our fruits are bad.*
 Vos oiseaux sont hideux, *Your birds are hideous.*

6. To the termination *eau*, *x* is added for the plural masculine.
 Vos champs sont très-beaux, *Your fields are very fine.*

7. The termination *al* is generally changed into *aux* for the plural masculine [§ 17 (3)].

Les hommes sont égaux, *Men are equal.*

8. For more explicit rules, and for exceptions, see § 17, Part II.

9. PRESENT OF THE INDICATIVE OF ETRE, TO BE.

Negatively.		Negatively and Interrogatively.	
Je ne suis pas,	I am not.	Ne suis-je pas?	Am I not?
Tu n'es pas,	Thou art not.	N'es-tu pas?	Art thou not?
Il n'est pas,	He is not.	N'est-il pas?	Is he not?
Elle n'est pas,	She is not.	N'est-elle pas?	Is she not?
Nous ne sommes pas,	We are not.	Ne sommes-nous pas?	Are we not?
		n'êtes-vous pas?	Are you not?
		Ne sont-ils pas?	Are they not?
		Ne sont-elles pas?	Are they not?

Vous n'êtes pas, *You are not.*
 Ils ne sont pas, m., *They are not.*
 Elles ne sont pas, f., *They are not.*

RÉSUMÉ OF EXAMPLES.

Avez-vous des écoliers attentifs?	Have you attentive scholars?
Idees écoliers et mes écolières sont très attentifs et très-studieux.	My scholars (male and female) are very attentive and very studious.
Ces demoiselles sont-elles studieuses?	Are those young ladies studious?
Elles ne sont pas très-studieuses.	They are not very studious.
Ces règles sont-elles générales?	Are those rules general?
Ces principes sont généraux.	Those principles are general.
Leurs habillements sont superbes.	Their clothes are superb.
Avez-vous peur de ces chevaux rétifs?	Are you afraid of those restive horses?
Vos montres d'or sont excellentes.	Your gold watches are excellent.
Les miennes sont-elles meilleures que les vôtres?	Are mine better than yours?
Les vôtres sont meilleures que les miennes.	Yours are better than mine.

VOCABULARY.

Agréable, agreeable.	Mauvais, -e, bad.	Souvent, often.
Ainé, -e, elder.	Mule, f., mule.	Travail, m., labour.
Allemaude, f., German.	Oisif, -ve, idle.	Très, very.
Jamais, never.	Pantoufles, f., slippers.	Utile, useful.
Indulgent, -e, indulgent	Personne, m., nobody.	Velours, m., velvet.
Laine, f., wool; woollen.	Rétif, -ve, restive.	Vif, -ve, quick, lively.
Maroquin, m., morocco.		

EXERCISE 21.

1. Les chevaux de notre ami sont-ils rétifs? 2. Ses chevaux ne sont pas rétifs, mais ses mules sont très-rétives. 3. Les chevaux et les mules de votre frère sont excellents. 4. Vos sœurs sont-elles très-vives? 5. Mes frères et mes sœurs sont très-vifs. 6. Sont-ils souvent oisifs? 7. Non, Monsieur, mes sœurs ne sont jamais oisives. 8. Avez-vous peur de votre frère? 9. Non, Monsieur, je n'ai peur de personne. 10. Ne sommes-nous pas indulgents? 11. Vous êtes indulgents, et vous avez raison. 12. Ai-je vos livres? 13. Vous ne les avez pas, vous avez ceux de mon frère aîné. 14. Ne les avez-vous pas? 15. Je ne les ai pas. 16. Avez-vous une bonne paire de bas de laine? 17. J'ai une belle paire de bas de soie. 18. Avez-vous les bonnes maisons ou les mauvaises? 19. Je n'ai ni les bonnes ni les mauvaises, j'ai celles de ma cousine. 20. Le travail est-il agréable? 21. Le travail est utile et agréable. 22. Avez-vous mes beaux souliers de maroquin? 23. Je n'ai pas vos beaux souliers de maroquin, j'ai vos belles pantoufles de velours.

EXERCISE 22.

1. Are your brothers and sisters very (*bien*) quick? 2. My brothers are quick, but my sisters are not quick. 3. Have you not two restive horses? 4. No, but I have a restive mule. 5. Have you not two good pairs of silk gloves? 6. I have a good pair of cotton gloves, and two pairs of silk gloves. 7. Are you not afraid of your friends? 8. No, Sir, I am never afraid of my friends. 9. I am afraid of nobody. 10. Are you right or wrong? 11. I am right. 12. Have you my beautiful leather slippers, or my old satin slippers? 13. I have your old leather shoes and your velvet slippers. 14. Are those ladies pleased? 15. Those ladies are pleased, and they are right. 16. Has the German lady your father's shoes or mine? 17. She has neither his nor yours, she has my sister's. 18. Has your older brother good houses or bad? 19. His houses are better than yours and than mine.* 20. Are his houses old? 21. His houses are old, but they are good. 22. Have you them? 23. No, Sir, I have them not, I have no houses. 24. Have you my brother's or my sister's? 25. Your sister has hers and my mother's. 26. Are your scholars attentive? 27. My scholars are very attentive and very studious. 28. Are those German ladies studious? 29. They are very studious and very attentive. 30. Are you often wrong?

SECTION XIII.—PLACE OF THE ADJECTIVES.—RELATIVE PRONOUN EN.

1. The adjective in French follows the noun much more frequently than it precedes it [§ 85 (1)].

Vous avez des amis fidèles, *You have faithful friends.*
 Ma sœur a des livres instructifs, *My sister has instructive books.*

* *Que* meaning *which*, and *que* conjunction, are never understood in French, they must be repeated before every noun, pronoun, and verb [§ 17. R. 1].

2. Those adjectives which generally precede the nouns have been mentioned [Sect. VI. 5], and will be found [§ 85 (11)].

Nous avons de belles maisons, *We have beautiful houses.*
 Votre jolie petite fille est studieuse, *Your pretty little girl is studious.*

3. The adjectives which are placed after nouns are:—1st. All participles, present and past, used as adjectives.

Nous avons une histoire intéressante, *We have an interesting history.*

Vous avez des enfants polis, *You have polite children.*

4. 2nd. All such as express form, colour, taste; such as relate to hearing and touching; such as denote the matter of which an object is composed; as also such as refer to nationality, or to any defects of the body [§ 85 (4) (5) (6) (7)].

Nos parents ont des chapeaux noirs, *Our relations have black hats.*
 Vous avez des pommes douces, *You have sweet apples.*
 Voilà de la ciré molle, *There is soft wax.*
 Cette dame espagnole a un enfant boiteux, *That Spanish lady has a lame child.*

5. 3rd. Almost all adjectives ending in *al, able, ible, ique*, and *if*.

Ces hommes libéraux sont aimés, *Those liberal men are loved.*
 Voilà un esprit raisonnable, *That is a reasonable mind.*
 Voilà un esclave fugitif, *That is a fugitive slave.*

6. Some adjectives have a different meaning, according to their position before or after the noun [§ 86].

Un brave homme, a worthy man. | Un homme brave, a brave man.

7. *En* is used for the English words *some* or *any*, expressed or understood, but not followed by a noun; *en* has also the sense of *it, of them, thereof*, generally understood in English sentences, particularly in answers to questions [§ 39 (17), § 104, § 110 (2) (3)].

Avez-vous des souliers de cuir? *Have you leather shoes?*
 J'en ai, *I have some, I have (of them).*
 Votre fils en a-t-il? *Has your son any?*

8. An adjective used substantively, and having a partitive signification (in a sentence containing the pronoun *en*), must be preceded by the preposition *de* in the same manner as if the noun were expressed [see Sect. VI. 4].

Avez-vous de bonnes plumes? *Have you good pens?*
 Non, mais j'en ai de mauvaises, *No, but I have bad ones.*

RÉSUMÉ OF EXAMPLES.

Avez-vous de beaux jardins? *Have you fine gardens?*
 Oui, j'en ai de beaux. (R. 7.) *Yes, I have fine ones.*
 Votre frère n'a-t-il pas des souliers noirs? *Has not your brother black shoes?*
 Il n'en a pas, mais ma sœur en a. *He has none, but my sister has some.*
 N'a-t-elle pas aussi une robe blanche? *Has she not also a white dress?*
 Oui, elle en a une. *Yes, she has one.*
 Non, elle n'en a pas. *No, she has none.*
 Qui en a une? *Who has one?*
 Qui n'en a pas? *Who has none?*
 Le boucher n'a-t-il pas de la viande fraîche? *Has not the butcher fresh meat?*
 Il en a, il n'en a pas. *He has some, he has none.*
 Il en a beaucoup. *He has much (of it).*
 Il n'en a guère. *He has but little (of it).*
 Il en a deux livres. *He has two pounds (of it).*

VOCABULARY.

Amusant, -e, <i>amusing.</i>	Bijou, m., <i>jewel.</i>	Laine, f., <i>wool.</i>
Américain, -e, <i>American.</i>	Blanc, -he, <i>white.</i>	Mademoiselle, f., <i>Miss.</i>
Anglais, -e, <i>English.</i>	Brave, <i>brave, worthy.</i>	Monsieur, m., <i>Sir, Mr., gentleman.</i>
Arabe, <i>Arabian.</i>	Châle, m., <i>shawl.</i>	Parent, m., <i>relation.</i>
Aubergiste, m., <i>inn-keeper.</i>	Couteau, m., <i>knife.</i>	Soldat, m., <i>soldier.</i>
Beaucoup, <i>much, many.</i>	Français, -e, <i>French.</i>	Terre, f., <i>land.</i>
Belge, <i>Belgian.</i>	Guère, <i>little, but little.</i>	
	Guitare, f., <i>guitar.</i>	

EXERCISE 23.

1. Avez-vous une bonne guitare? 2. Oui, Monsieur, j'ai une guitare excellente. 3. Avez-vous de bons habits? 4. Oui Madame, j'ai de bons habits noirs et de belles robes blanches. 5. Votre mère n'a-t-elle pas un châle de soie? 6. Oui, Mademoiselle, elle en a un de soie et un de laine. 7. L'aubergiste a-t-il de bons chevaux anglais? 8. L'aubergiste a des chevaux anglais, français, et arabes. 9. Il en a de superbes. 10. L'ami de votre frère a-t-il des bijoux d'or? 11. Oui, Monsieur, il en a. 12. A-t-il aussi des bijoux d'argent. 13. Il en a aussi. 14. En a-t-il beaucoup? 15. Non Monsieur, il n'en a guère. 16. Votre

ami a-t-il des parents? 17. Oui, Monsieur, il en a. 18. Ce Monsieur a-t-il une bonne plume d'acier ou une belle plume d'or? 19. Il en a une d'acier et nous en avons une d'or. 20. Le général n'a-t-il pas de bons soldats? 21. Il en a de très braves. 22. Les Américains n'ont-ils pas de bonne terre? 23. Ils en ont d'excellente. 24. Le marchand a-t-il des couteaux anglais ou français? 25. Les couteaux du marchand ne sont ni anglais ni français, ils sont belges.

EXERCISE 24.

1. Has your brother Arabian horses? 2. Yes, Sir, he has some. 3. Has he handsome ones? 4. Yes, Sir, he has handsome ones. 5. Are the good Americans wrong? 6. No, Miss, they are not wrong, they are right. 7. Have you a French shawl? 8. Yes, Sir, I have one, I have a handsome French shawl. 9. Has your innkeeper your silver knife or mine? 10. He has neither yours nor mine, he has his sister's handsome steel knife. 11. Has the Belgian a good guitar? 12. He has an excellent French guitar. 13. He has an excellent one. 14. Has the gentleman amusing books? 15. Yes, Sir, he has two. 16. Has the general French or Arabian horses? 17. He has neither French nor Arabian horses, he has English horses. 18. Who has Arabian horses? 19. The Arabian has some. 20. Has the Englishman any? 21. The Englishman has some. 22. Has your friend's sister a good steel pen? 23. My friend's sister has one, but my relations have none. 24. Are you not wrong, Sir? 25. Yes, Madam, I am wrong. 26. Are those knives English? 27. No, Sir, they are Belgian. 28. Have you relations? 29. I have two, and they are here (*ici*). 30. Has the Englishman butcher meat? 31. Yes, Sir, he has much. 32. Has he much money? 33. He has but little. 34. Has the Belgian general brave soldiers? 35. Yes, Sir, he has good ones.

HISTORIC SKETCHES.—III.

SIR RICHARD GRENVILLE, WHEN HE CRIED "NO SURRENDER!"

DURING the time Queen Elizabeth was on the throne of England (1558 to 1603), there was a public feeling of a kind and intensity unequalled by any that has existed either before or since. It was a feeling in which political and religious hatred were closely combined, and which was fanned from a spark to a flame by repeated provocations. There are those yet living who can freshly remember the rancorous animosity which existed in this country towards the French, when the great French war was at its height. That animosity, bitter as it was, and tersely expressed in the summary of advice which Nelson is said to have given his midshipmen—"Fear God; honour the king; and hate a Frenchman as you do the devil"—was not, if we may judge from the circumstances attending it, so bitter, or so uncompromising as the hatred Elizabeth's Englishmen had for the Spaniard and the Pope.

In that day, the kingdom of Spain, which now has sunk so low, was only being weighed in the balance. She had been found wanting in many things which, as the event proved, were necessary to her life as a nation; but she had not been found wanting in strength. Her power was enormous, and the ambition of her princes aimed at universal dominion. Spain, the Netherlands, Naples, and Sicily were her European possessions, and in Germany her influence was all-powerful. In the East Indies the sovereignty of the King of Spain was acknowledged in many a place, while the whole of the Western hemisphere was under his sway. By succession, by marriage, by purchase, or by conquest, the territory of the Spanish king was so great that it was well said the sun never set in his dominions. The wealth of the mines of Mexico and Peru was his; the most splendid troops that Europe could produce did his bidding; diplomatists the most subtle and the most accomplished were his servants, and among his naval and military commanders were men of names the most renowned and illustrious. No other power in Europe, whether allied or single-handed, was willing to measure itself with Spain; the odds were so great, the issues so momentous, that lesser nations preferred to put up almost with anything rather than bring down upon their people the wrath of the cruel and haughty Spaniards. It was only when desperation made men blind to the consequences that resistance was offered to the dominant and domineering power—and then, as in the Netherlands, when

the people were goaded into insurrection, the fight was long and bloody, and the victory dearly won.

The strength of Spain was tremendous, crushing; but there was a canker in it, which, eating through, eventually proved fatal to the life of the tall tree. The King of Spain, Philip II., arbiter as he was of the fate of millions, mighty and feared as he was, was the abject slave of another power. The priests of the Roman Church were his masters, the Pope of Rome was his lord, and the mind of the man was in perfect subjection to the rule of his spiritual guides. So the interests, or supposed interests

over. Protestants and freedom-loving Catholics learned in the Low Countries, from the Duke of Alva, Requesens, and other Spanish rulers, how that the tender mercies of the cruel are cruel also. In the newly-discovered regions of America, which the enterprise of Columbus had opened to Spain, the religious system of the Spaniards was so unlike the religion of Him whom "the common people heard gladly," that

"the poor Indian, whose untutor'd mind
Sees God in clouds, or hears him in the wind,"

fled in horror from it, preferring death to conversion. *Champe*



SIR FRANCIS DRAKE.

of the Roman-Catholic Church became identified with those of the Spanish crown. Wherever the Spaniard came, there came the priest, and the two together represented pure despotism in the State, and a Church system which was carried out through the medium of the Inquisition. Countries in which the Roman Church was already deeply rooted viewed the approach of the Spanish ecclesiastics with jealousy and dislike, though they were not necessarily in danger of injury at their hands. But in countries where the Roman faith was not the faith of the people, where the Protestant form of Christianity, or no Christianity at all, was the popular religion, the coming of the Spaniards and the Pope was a thing to be dreaded and grieved

lain, the navigator, after whom the American lake of that name is called, and who visited the West Indies in 1599-1602, thus wrote of the Spanish priests and the Indians:—"At the commencement of his conquests, he (the King of Spain) had established the Inquisition among them, and made slaves of, or caused them to die cruelly in such great numbers, that the sole recital would cause pity. This evil treatment was the reason that the poor Indians, for very apprehension, fled to the mountains in desperation, and as many Spaniards as they caught they eat them; and on that account the said Spaniards were constrained to take away the Inquisition, and allow them personal liberty, granting them a more mild and tolerable rule

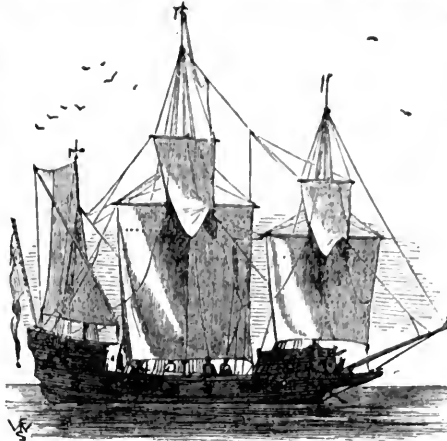
of life, to bring them to the knowledge of God and the belief of the holy Church; for if they had continued still to chastise them according to the rigour of the said Inquisition, they would have caused them all to die by fire."

Such then were the causes of the deep hatred already spoken of as existing among Englishmen during the reign of Elizabeth. The Spanish political power and the Spanish ecclesiastical power, each lusted after dominion, and allowed no considerations nor scruples to stand in their way. Each helped the other; the priests taught the "right divine" of the Spanish king "to govern wrong," and the Spanish king in return upheld, with brutal obstinacy, the priests' Inquisition—an institution of which more will be said in another paper; but of which it will be enough here to say that it was a spiritual tribunal, irresponsible and acting in secret, which punished men and women with all punishments, including death, for not acting in strict accordance with the rules of the Roman-Catholic Church.

Englishmen, after the Reformation especially, hated both these powers. The one cramped their action and their enterprise, forbidding them under pain of being treated as pirates to trade to places where the Spaniards claimed to have a monopoly, as in America; the other oppressed their souls with burdens too heavy to be borne, and then killed them for stumbling. Generous sympathy also for those who suffered wrong at the oppressor's hands, and were unable to help themselves, glowed in the English breast; and that sympathy, in an age of adventure and of chivalrous feeling, was not slow to express itself in action. It had received a filip, too, in a point which nearly concerned the best interests of the nation. An attempt had been made after the death of Edward VI., in 1553, to introduce both the detested powers into England. Philip II. of Spain, was actually married to Queen Mary of England, and though the nation was, to a man, hostile to the introduction

could be nothing but perpetual war between the nations, and a fresh declaration of an old fact would have been useless as well as tiresome. So whenever a Spanish treasure fleet was coming home, or a Spanish squadron of merchantmen was known to be on the seas, the English royal vessels slipped out of port, and smote the Philistines wherever they found them.

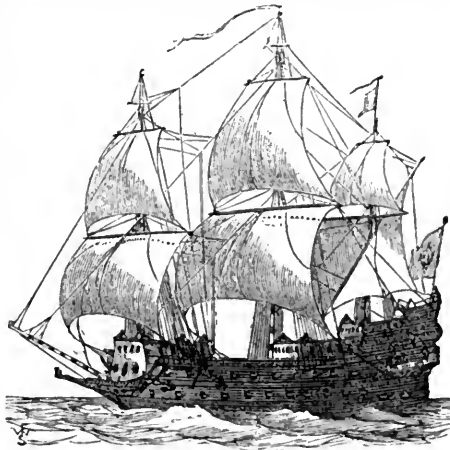
One of the most courageous and indomitable of the English rovers was Sir Richard Grenville, of Stowe, in Cornwall, a gentleman of ancient family and large fortune, an enthusiastic admirer of all that was generous and manly. He hated the Spaniards with an exceeding bitter hatred, and again and again left his pleasant home in Cornwall to roam the seas after the enemies of God and man, as he considered them to be. He had been eminently successful, both in distant expeditions and in repelling the attack of the Armada on the English coast itself; and his name was a terror to many a Spanish sailor. It happened, in the year 1591, that a Government expedition of the kind above-mentioned was about to sail under orders of Lord Thomas Howard, to intercept the Spanish treasure ships on their way from the West Indies. Sir Richard was appointed second in command, and hoisted his flag on board the *Revenge*; the rest of the squadron including eight fighting ships, with tenders and victuallers. The account of the action in which the *Revenge* fought



ENGLISH SHIP OF WAR. TIME OF ELIZABETH.

single-handed for England is given here as best showing the kind of spirit it was which animated Englishmen at the time when their enemies were the detested upholders of Absolutism in Church and State.

Lord Thomas Howard sailed with his ships in August, 1591, and after cruising about for some time, put into the Western Islands, to recruit his men, ill with scurvy, and to wait there for the treasure ships. On the 31st of August, 1591, the lookout men reported a fleet in sight, and great was the joy and greedy, perhaps, the expectation of the English warriors. But a nearer view disclosed, not the Spanish treasure ships, but a fleet of fifty-three ships of war, which had been equipped and sent out for the very purpose of pouncing on the pouncers. Half the English crews were on shore, ill, and the rest were busy watering and victualling the ships. Lord Thomas looked at his vessels and sickly crews, and then at the enemy's ships, concerning which the cry was still, "They come." Eight against fifty-three—the disproportion was too great. He determined not to try conclusions with them, and having recalled his crews by signal, stood out of the Bay of Flores, and succeeded in getting away.



SPANISH THREE-DECKER. TIME OF ELIZABETH.

Her subjects were imbued with the same spirit as the Queen. The Spaniards were looked upon as public enemies, whom to destroy was to do God service; and many was the private adventure made by persons of good name and reputation, to make war upon them. In a time when the two governments were at peace, cruisers were fitted out in England—notably in West-country ports—to prey upon the enemy's commerce on the Spanish Main and in the West Indies. Such men as Sir John Hawkins, Sir Martin Frobisher, Sir Walter Raleigh, Sir Francis Drake, Sir Humphrey Gilbert, and Sir Richard Grenville, sailed on their own account upon expeditions which, directed against any other power than Spain, would have been called piratical, or at least, buccaneering; and they won honour and no small profit in the course of them. After the Spanish Armada, sent in 1588 for the avowed purpose of conquering England and establishing despotism and priestcraft therein, had shown the depth of the Spanish ill-will, the Government acted pretty much as its subjects had done, and made war whenever it chose. There was no declaration of war. After the Armada there

There was one ship, however, which did not follow. Sir Richard Grenville felt it to be almost an immoral act to retreat before a Spaniard, and though he was too good an officer wilfully to disobey the orders of his superior, he was not loth to take advantage of some unavoidable delay which occurred in getting his men from the shore, to stay behind. The other English ships gained the offing, and thither, too, was sent the master of one of the victuallers, who, seeing Sir Richard's danger, offered to stay and share it with him.

On came the Spanish fleet, on the weather bow of the *Revenge*. Some of the officers remonstrated with the admiral, and advised him to crowd all sail and try to outsail the enemy; but Sir Richard declared "he would much rather die than leave such a mark of dishonour on himself, his country, and the Queen."

Don Alonso de Baçan, the Spanish admiral, bore down on the *Revenge*, and becalmed her sails, so that she was not manageable. The *San Philipe*, a huge three-decker, and a number of other large ships came down like vultures on the prey, and the battle began. A dreadful fire was kept up from the *Revenge*, which blazed away, right and left, with cross-bar shot and grape, compelling the *San Philipe* to drop out of the fight, and causing enormous destruction to the other ships. On the side of the Spaniards the fight was well sustained, though they were to some extent embarrassed by their numbers; many of their guns, also, being mounted high, could not be depressed, and fired harmlessly over the heads of the English.

The battle of fifty-three to one began at three o'clock in the afternoon. Towards evening, a "double flie boat, of 600 tons, and admiral of the flie boats," with another vessel, went down, so cut up were they by the fire of the *Revenge*. That good ship was dreadfully riddled. At eleven o'clock at night, Sir Richard Grenville, being wounded a second time, was obliged to go below, and while his wound was being dressed, he received another severe hurt in the head, and the surgeon was killed beside him. Forty men out of 103—all he had on board—were killed, the rest were almost all wounded; the ship's masts had been shot away, the rigging was gone; the hull was pierced through and through; powder was running short: but Sir Richard's cry was still, "No surrender!" and when after two hours more of the dreadful work had passed it was proposed to make terms, the admiral advised his men to trust to God's mercy rather than to the Spaniards, and to blow up the magazine. The master, however, went on board the Spaniard about daybreak, and surrendered; Sir Richard being too ill to prevent him.

On board the *San Paulo*, the dying man had every attention paid to him; his wounds were dressed, and the Spanish officers came to condole with and to admire him. Feeling the end to be near, he said in Spanish, that all might understand: "Here die I, Richard Grenville, with a joyful and quiet mind, for that I have ended my life as a true soldier ought to do, fighting for his country, Queen, religion, and honour, leaving behind the lasting fame of having behaved as every valiant soldier is in his duty bound to do." He died, and the *Revenge*, the first English ship that had fallen into Spanish hands, refused to survive him. In a storm which arose shortly after the action, she sank, with 200 Spaniards on board, "so that it may be said the *Revenge* made good her name, and forced the Spaniards to pay dear for their victory."

SYNOPSIS OF THE LIFE AND REIGN OF ELIZABETH.

Elizabeth was the daughter of Henry VIII. by his second queen, Anne Boleyn. She was the twenty-third Sovereign of England after the Norman Conquest, and the fifth and last of the Tudor Dynasty.

Born at Greenwich, Sept. 7 1533
 Began to reign . . . Nov. 17 1558
 Protestant religion re-established . . . 1559
 Colonization of Ulster, Ireland, by the English . . . 1568
 Mary Queen of Scots takes refuge in England . . . 1568
 Elizabeth excommunicated by Pope Pius V. . . 1570

Massacre of St. Bartholomew (France) . . . Aug. 23 1572
 Trial of Mary for treason at Fotheringay Castle . . . 1586
 Execution of Mary. Feb. 8 1587
 Destruction of the "Invincible Armada" . . . 1588
Cadiz burnt by the English . . . 1597
 Tyrone's rebellion in Ireland 1598
 Died at Richmond. Mar. 24 1603

SOVEREIGNS CONTEMPORARY WITH ELIZABETH.

Denmark, Kings of.
 Christian III. . . 1534
 Frederick II. . . 1559
 Christian IV. . . 1588

France, Kings of.
 Henry II. . . 1547
 Francis II. . . 1559
 Charles IX. . . 1560
 Henry III. . . 1574
 Henry IV. . . 1589

Germany, Emperors of.
 Ferdinand I. . . 1558
 Maximilian II. . . 1564
 Rodolph II. . . 1576

Poland, Kings of.
 Sigismund II. (afterwards King of Sweden) . . . 1548
 Henry de Valois (afterwards King of France) . . . 1573
 Stephen Bathori 1575
Interregnum from 1586
 Sigismund III. . . 1587
Portugal, Kings of.
 Sebastian . . . 1557
 Henry . . . 1578
 Anthony . . . 1580
 [The Portuguese dominions in Europe and

America were seized by Philip II. of Spain in 1580, and remained annexed to that Country until 1640.]

Rome, Popes of.
 Paul IV. . . 1555
 Pius IV. . . 1559
 Pius V. . . 1566
 Gregory XIII. . . 1572
 Sixtus V. . . 1585
 Urban VII. . . 1590
 Gregory XIV. . . 1590
 Innocent IX. . . 1591
 Clement VIII. . . 1592

Russia, Cæars of.
 Ivan IV. . . 1533
 [This monarch wished to marry Queen Elizabeth.]
 Feodor I. . . 1584
 Boris Godonof . . 1598
Scotland, Kings of.
 Mary Queen of Scots . . . 1542
 James VI. . . 1567

Spain, Kings of.
 Philip II. . . 1556
 Philip III. . . 1598
Sweden, Kings of.
 Gustavus Vasa . . 1523
 Eric XIV. . . 1590
 John III. . . 1568
 Sigismund . . . 1592

Turkey, Sultans of.
 Solyman II. . . 1520
 Selim II. . . 1566
 Amurath III. . . 1574
 Mahomet III. . . 1595
United Provinces of the Netherlands, Stadtholders of.
 William the Silent . . . 1579
 Maurice . . . 1587

LESSONS IN MUSIC.—II.

It is important that the learner should become thoroughly and practically familiar with the structure of that musical "scale of all nations and of all time" which was partially described in the last lesson. The following account, by General T. Perronet Thompson, who is no less distinguished for his philosophical and learned disquisitions on the science of music than for the other great services which, by pen and speech, he has rendered to his countrymen—the following account by him, of the first attempts of philosophy to measure this scale, will interest the student:—

"The dispute upon this point (the application of science to music), is at least as old as the contest between Aristoxenus and the Pythagoreans, which dates as early as 300 years before the Christian era. * * * The opposition of Aristoxenus was, in reality, nothing but a good ear declaring itself against a faulty division. The musical mathematicians of antiquity took as many as three successive steps into the truth, but their next was a marvellous blunder. * * *

"The histories of all nations refer to very early periods the discovery that certain successions or combinations of sounds have the effect upon the ear which is implied by *music*; and it may be assumed that in all countries a considerable degree of practical acquaintance has been acquired with the sounds before any person has thought of investigating the cause. The story of Pythagoras listening to blacksmiths' hammers, and discovering that the different sounds had some relation to the weights, has been sufficient to secure to that philosopher the renown of being the first who sought for the explanation of musical relations in the properties of matter. The account given by Nicomachus is, that Pythagoras 'heard some iron hammers striking on an anvil, and giving out sounds that made most harmonious combinations with one another, all except one pair,' which led him to inquire what were the peculiarities of the hammers which produced these different effects. Whether this is an exact account or not, some observation of this kind appears to have speedily led to the discovery, that of *strings of the same thickness and composition, and stretched by the same weight, those gave the same musical sound* (or were what is called in unison) *which were of equal lengths*;—that if of two strings in unison, as above, one was shortened by a half, it produced a sound which, though very far from being in unison with the sound of the other, might be heard contemporaneously with it, with a strong sensation of satisfaction and consciousness of agreement, and that the two sounds in fact bore that particular relation to each other by which two voices, of very different kinds, like those of a man and a child, can sing the *same* tune or air as really as if they sang in unison, being what musicians have since distinguished by the title of *octaves*;—that if, instead of a half, the string were shortened by a third part, there was produced a note which, heard either in combination with or succession to the first, created one of those marked effects which all who had attained to any degree of musical execution by the guidance of the ear had treasured up as one of the most efficient weapons in the armoury of sweet sounds, being what modern musicians name the *fifth*;—and that if, instead of a third part, it was shortened by a fourth, there was produced another note very distinct from the last, but which, like it, was immediately recognisable as one of the relations which experimental musicians had agreed in placing among their sources of delight, being the same which in modern times is called the *fourth*.

"So far, Pythagoras and his followers appear to have run well. Instead, however, of pursuing the clue of which they already had hold, and examining the effects of shortening the original string by a fifth part and by a sixth, they strayed into

shortening the results of previous experiments by a third, and lengthening them by an eighth, * * and here was the beginning of sorrows. * * The attempt (beyond these three steps) at the division of the "Canon"—in other words, at the division of a string into the lengths which produce the sounds that make music in a single key—was a failure."

The experiments of modern philosophers have been rewarded with the discovery that a musical string divided in the proportions given underneath will produce the notes of the scale as there described. Let it be noticed that the figure 1 stands for the whole length of the string, whether a foot, a yard, or any other measure, and whatever sound (in pitch) it gives—that sound being taken for the key note—DOH. It may also be mentioned that the same numbers denote the comparative lengths of organ pipes capable of sounding the corresponding notes.

Name of Notes.	DOH	RAY	ME	FAH	SOH	LAH	TE	DOH'
Length of String.	1	$\frac{8}{9}$	$\frac{4}{5}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{3}{5}$	$\frac{8}{15}$	$\frac{1}{2}$

Perhaps these proportions will be better understood by the annexed diagram. A single string thus stretched and used for these experiments is called a monochord. If the student is of a mechanical turn, let him make one and verify the measurements here given. Let him suspend a board of four or five feet in length against a wall. To the upper part of this board fasten the end of a piano-forte-wire or other musical string which is of the same thickness throughout. Let the wire pass down the face of the board, over a firm wooden bridge, an inch or so high, and close to the top, and over a movable bridge at the bottom; and let it be kept stretched by a heavy weight. Set your movable bridge (which the weight will keep in its place) at the bottom, marking the spot, and take the sound of the whole string, by the help of a fiddle bow, for your DOH, or key-note. Then (having properly measured and marked the board) move the bridge to the other divisions, sounding each note as before. It may be well to mention that Colonel Thompson maintains, and with good show of reason, what he calls the "duplicity" of RAY and TE. They are sometimes sounded by good singers and violin-players a very small degree lower than their usual position given above. These experiments will fix in your mind a clear notion of the scale.



when one of the holes in the disk is opposite to that of the pipe; and when the former is made to revolve rapidly, the resulting aerial impulses cause a series of isochronous vibrations that produce a musical note, and the corresponding number of its vibrations can very easily be computed, from knowing the number of holes and of revolutions of the plate. The results obtained by this instrument agree exactly with those found by other methods." The more rapid the vibrations of the sonorous body, the more "acute" (shriller, or higher) the note produced.

The following are the results of such experiments as those just referred to. Arithmeticians may notice that the proportion of the vibrations is *inversely* as the length of the strings given above. But we here print the fractions with a common denominator to make the relations more obvious.

THE NOTES OF THE SCALE.	DOH	RAY	ME	FAH	SOH	LAH	TE	DOH'
The proportion of vibrations given by each note.	24	27	30	32	36	40	45	48
While the key note gives the following number.	24	24	24	24	24	24	24	24

If our arithmetical friend will now work a few sums in proportion, he will be able to show the value of the intervals between the several notes of this scale. Thus the vibrations of DOH differ from those of RAY, in being *three less*, and (three being one-ninth of twenty-seven) DOH has therefore only *eight-ninths* of RAY's vibrations. The same proportion will be found between FAH SOH, and LAH TE. These intervals are called the "great tones." The proportion of RAY ME, and of SOH LAH is *nine-tenths*. These are the "small tones." The proportion of ME FAH, and of TE DOH, is *fifteen-sixteenths*. These are called semitones, or, more properly, Tonules. If you calculate from the length of the string given above you will find still the same proportions existing.

Let our arithmetical friend reduce these "ratios," or proportions, of the three intervals in the scale to fractions having a common denominator. They will then stand thus:—

$$\text{THE GREAT TONE} = \frac{1280}{1440} \quad \text{THE SMALL TONE} = \frac{1296}{1440} \quad \text{THE TONULE} = \frac{1350}{1440}$$

Now this evidently means that the lower note of the "great tone" has 1,280 vibrations, while the higher note has 1,440, and (as the lengths of string are in inverse proportion to the vibrations) that it takes 1,440 degrees of the string, while the higher takes only 1,280 such degrees. Therefore the proportional difference between them, whichever way you look at it, is *one hundred and sixty degrees*. In the same way you will find that the difference between the two notes of this "small tone" is *one hundred and forty-four degrees*, and that the interval of the "tonule" is *ninety degrees*. The degrees in each case are of similar value, all measured on the same scale (common denominator) of 1,440 degrees. We may therefore treat them as belonging to one scale, and adding three "great tones," two "small tones," and two "tonules" together, we shall obtain a perfectly measured scale of 948 degrees. As all these numbers, however, will divide by 2, retaining, of course, the same proportion to one another, it is better to regard the scale as composed of 474 degrees, containing three "great tones" of 80 degrees, two "small tones" of 72 degrees, and two "tonules" of 45 degrees, and this is the smallest perfect measurement of the scale in plain figures. But if the pupil will go one step further, and divide each of these intervals by nine, he will see how we obtain the *proximate* scale of fifty-three degrees. The tonule will be exactly 5 degrees, the small tone exactly 8 degrees, and the great tone only one-ninth of a degree less than 9 degrees. Adding these together, as before, you will have the "Index scale," as Colonel Thompson calls it, "of fifty-three," and you will see that it is three-ninths or one-third of a degree too large. We strongly advise the pupil to construct a "monochord," and try for himself whether this is not in truth an accurate description of that scale of related notes which God has made most suitable to human ears and souls. All the books of science are agreed that it is; and experience bears the same testimony. It is the more important that you should understand these points, because the true scale is dreadfully abused by the common keyed-instruments. Many of these are tuned by what is called "equal temperament;" that is, the scale is divided into twelve equal semi-tones, and it follows that the tones are all 79 degrees (of the perfect scale of 474), while they ought to be sometimes 80 and sometimes 72 degrees! and the tonules (semitones) are both 39½ instead of 45! They might as well cut down the fingers of a statue to "equal temperament!" Human ingenuity will surely deliver us soon from this monstrous distortion. You will understand now why it is so often pleasanter to sing "without the piano."

You will have noticed, in connection with these statements, that a sound produced by twice the number of vibrations (or half the length of string), as compared with any other sound, is so much like that other sound as to be called by the same name—thus, DOH and DOH'. Notes thus related are said to be at the interval of an "octave" (eighth), the one to the other.

They are also called "replicates" of one another. Each note of the scale, therefore, has its higher and lower replicates as far as the voice can reach. A figure "one" (or "two," if needed) above the note shows that it is the higher replicate. A figure below a note shows it is the lower replicate. Be careful to notice this in connection with the exercises which follow.

EXERCISE 5.—KEY G.

In this exercise you should take a middle sound of your voice (neither high nor low) for the key-note or DOH. A friend again will be needed to set you a "pattern" with voice or instrument. Tell him to play or sing G, D, B, G, D, B, G. He may understand these names better than those by which you are learning, and to which your attention must at present be confined. Take care to sing the upper SOH with a clear trumpet-like sound, and ME with a calm but firm effect. Sing the exercise *slowly*, but with sustained decision. It will greatly add to your pleasure if you can get a friend to sing the second line of notes while you are singing the first. This exercise, too, will give you confidence. [If you are singing from the staff above, remember that one voice will take the higher notes of each couple while the other voice is taking the lower notes. The open notes, which you have here, when they occur in the same tune with the black notes,

which were used in the former exercises, are to be sung twice as long, in time, as the black notes; and the open notes without a stem, like the last note in this exercise, are to be twice as long as those with a stem. This relative length does not, however, hold true out of the same tune. An open note in one tune may be no longer than a black note in another, and a black note in one tune no shorter than an open note in another. Let it, however, be repeated that it will be much better for the learner not to pay any attention at present to the old "notation" (way of writing), or to the remarks thus placed between brackets. He may get his mind puzzled with the notation of music, when he ought to be giving his whole attention to music itself. Sing exclusively from the syllables, and never leave an exercise until you can sing it correctly from memory, pointing on the modulator the while.]

EXERCISE 6.—KEY D (OR C).

Take some low sound of your voice for this and the next exercise. Be careful to give an "accent" (additional force, not length of sound) to the notes which follow an upright bar.

The exercise which follows differs from the present only in this quality of "accent," and yet how great the difference! Learn to sing both the upper and the lower "parts."

EXERCISE 7.—KEY D (OR C).

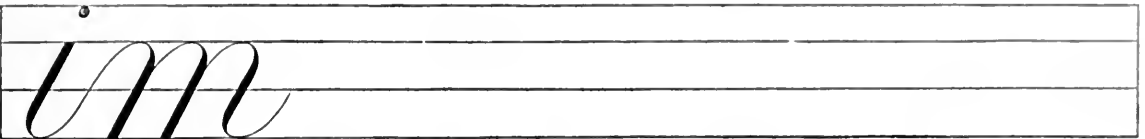
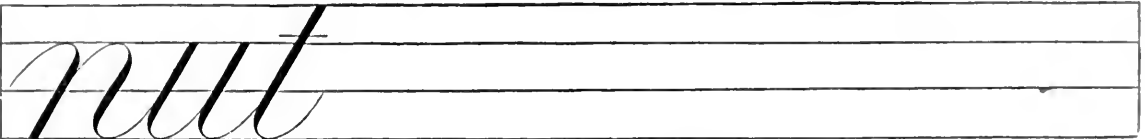
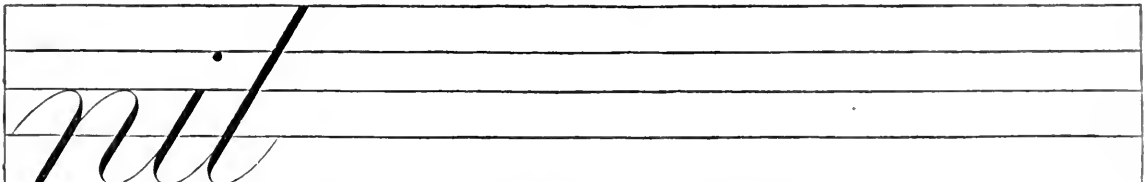
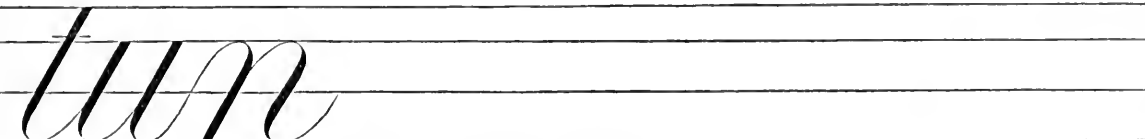
EXERCISE 8.—BRAILSFORD'S CHANT.—KEY F.

The attention of the learner is directed exclusively to that which lies between the two staves of five lines. Do not attempt the words until you have perfectly mastered the syllables. Tell your musical friend, who sets you the "pattern," to play in the treble clef with one flat. If, however, you can sing the "scale" with accuracy you will not need his help. Take some rather low sound for DOH. Sound the "tonic chord," or DOH, ME, SOH. Let the three notes be well established in your ear. Then notice that the first note of the upper line is ME. Sing ME with a somewhat prolonged sound, as indicated by the mark of continuance. Then trace the other notes on the modulator

as you sing them, at every mistake or uncertainty striking the "chord," and beginning again with great patience. When you can sol-fa the chant from the modulator by memory, then learn to use, instead of the syllables, the words "One, two, three, four; one, two, three, four, five, six," still pointing to the right notes on the modulator. It may be well for you now to learn the second line of notes (to be sung by another voice along with the upper line) as you learnt the first, and not, for the present, attempt the words. But if you wish to use the words, then first learn to sing the words "Trust in the Lord with" on the single note ME. To do this with distinct utterance, you should divide

the note (in your mind) into two equal beats or "pulses" of time (you can mark them by beating on the table with your hand); and then the words "Trust in the" will go to the first beat, and "Lord with" to the second. The large dot above the line shows this division. The words "all thine heart" fall easily to their right notes. To the note *SON* you will sing the words "and lean not unto thine." "And" is scarcely heard. Dividing *SON*, like the other "reciting note" *ME*, into two beats (and reciting notes of a chant like this may be divided into as many beats as you please), you will have the words "lean not unto" to the first beat, and "thine" alone filling the second. The word "own" you perceive is "slurred" on to two

notes. Take care not to sing the syllables "standing" quickly and sharply. Let them take as much time as the syllables "under" in the same word. The second verse of words, printed underneath, is divided on the same plan as the first. The double bar, you will observe, separates the words of the "reciting note" from those of the "cadence" (as it is called) of the chant. On the upper "staff" you miss the square note for *DOH*, because the tune begins on *ME*, and *DOH* does not occur in the "air." The place of *DOH*, however, is in the first space, reckoning from the bottom of the staff. On the lower staff it was necessary to make an additional line to carry *SON*. This is called a "ledger line."

COPY-SLIP, NO. 15.—COMBINATION OF THE LETTERS *u*, *n*.COPY-SLIP, NO. 16.—COMBINATION OF THE LETTERS *i*, *m*.COPY-SLIP, NO. 17.—COMBINATION OF THE LETTERS *n*, *u*, *t*.COPY-SLIP, NO. 18.—COMBINATION OF THE LETTERS *n*, *i*, *l*.COPY-SLIP, NO. 19.—COMBINATION OF THE LETTERS *t*, *u*, *n*.

LESSONS IN PENMANSHIP.—VI.

In our last lesson we showed our learners how to make the letters *m* and *n* by combinations of the top-turn and the top-and-bottom-turn. In the present lesson we set before them five Copy-slips for practice, comprising various combinations of the letters *m* and *n* with the letters *i*, *u*, *t*, and *l*, which they learned to form from the simple bottom-turn. Doubtless many of those who have been endeavouring to teach themselves the art of Penmanship by the aid of our lessons, are now beginning to see that, after all, it is not such a difficult matter to learn to write, since by learning to form only three strokes of a very simple kind, they have found that they have acquired the power of writing six out of the twenty-six letters that form the alphabet. They will soon see that this is by no means the utmost limit of their progress, when in the course of future lessons they discover how many letters there are into whose composition these three elementary strokes also enter.

In preparing paper for copying all our elementary copy-slips in large text, the learner must not omit to insert the diagonal lines as they appear in Copy-slips Nos. 1 to 6 inclusive, as long as he finds them absolutely necessary for the regulation of the slope of his letters, and to enable him to preserve a proper distance between them. To save trouble in ruling sheet after sheet of paper with horizontal and diagonal lines at the proper distances from each other, and to save expense as well, the learner might rule with a sharp-pointed steel instrument, such as a bradawl, one side of a cheap slate with sets of lines similar to those in our copy-slips, taking care, however, to leave a space of one inch and a quarter between each set, to enable him to add the extra horizontal lines that will be required when he begins to make looped letters, and letters such as *p* and *q*, that extend below the lower of the two horizontal lines that contain what we have called the body of the letter. A slate thus prepared will be found useful for acquiring facility in forming the various letters, but the learner must by no means omit to write on paper as well.

LESSONS IN GERMAN.—V.

SECTION XI.—FORMATION OF ADJECTIVES DENOTING MATERIAL.

ADJECTIVES denoting the material of which a thing is made are formed by suffixing to nouns the letters *n, en, or ern*. Ex., *Leiter, ledern* (leather, leathern); *Gold, golden* (gold, golden); *Blei, bleiern* (lead, leaden), etc. If the root vowel be *a, o, or u*, it is frequently changed to its corresponding *umlaut*, as:—*Glas, gläsern* (glass, made of glass); *Holz, hölzern* (wood, wooden). (See Sect. II. 12, *at*, etc.)

VOCABULARY.

Becher, <i>m.</i> cup, beaker.	Koch, <i>m.</i> cook.	Reif, ripe.
Bleiern, leaden.	Kupfern, copper.	Silbern, silver.
bleistift, <i>m.</i> pencil.	Marmor, marble.	Tintenfaß, <i>n.</i> inkstand.
Eisern, iron.	Mein, <i>my</i> .	Tisch, <i>m.</i> table.
faß, <i>n.</i> barrel, cask.	Mörser, <i>m.</i> mortar.	Tischler, <i>m.</i> joiner.
fleißig, diligent.	Obst, <i>n.</i> fruit.	Wetter, <i>m.</i> cousin.
Hölzern, wooden.	Obstmesser, <i>n.</i> fruit-knife.	Weder—noch, neither—nor.
Kessel, <i>m.</i> kettle, boiler.		

RÉSUMÉ OF EXAMPLES.

Ihr silberner Löffel ist schön, und mein eisernes Messer ist schwer. Your silver spoon is beautiful, and my iron knife is heavy.
Dieser steinerne Tisch ist schwer. This stone table is heavy.
Das Leben des Kindes ist ein goldener Traum. The life of the child is a golden dream.
Ist nicht ein eisernes Schiff dauerhaft? Is not an iron ship durable?

EXERCISE 12.

1. Haben Sie mein reifes Obst? 2. Nein, ich habe Ihr silbernes Obstmesser, und Ihr alter Freund, der Lehrer, hat das reife Obst. 3. Haben Sie meinen silbernen Bleistift? 4. Nein, der gute Lehrer hat ihn. 5. Hat der alte Koch meinen hölzernen Tisch? 6. Nein, der Tischler hat ihn, aber der Koch hat einen marmornen Tisch. 7. Hat er auch ein hölzernes Faß? 8. Ja, und dieser fleißige Schüler hat ein schönes, bleiernes Tintenfaß. 9. Hat er auch einen silbernen Becher? 10. Ja, und er hat auch einen kupfernen Kessel und einen eisernen Mörser. 11. Haben Sie das neue Messer meines jungen Freundes? 12. Nein, ich habe ein neues Messer von dem guten Kaufmann. 13. Hat dieser fleißige Schüler das gute Buch des alten Freundes, oder den silbernen Bleistift seines guten Veters? 14. Er hat weder ein gutes Buch, noch einen silbernen Bleistift—er hat nur einen hölzernen Bleistift. 15. Wo ist der kupferne (Section IX. 2) Kessel des Kochs? 16. Der arme Mann hat nur einen eisernen Kessel.

EXERCISE 13.

1. Has she [sic] my ripe fruit? 2. The old cook has my silver [silbernen] pencil. 3. Has he also a new [neues] knife? 4. The good merchant [Kaufmann] has an [einen] old marble table. 5. He has neither a golden [goldenes] fruit-knife nor a silver [silbernen] cup. 6. Summer [Der Sommer] is a [eine] golden time [Zeit]. 7. The diligent joiner has the iron [eisernen] kettle of the cook.

SECTION XII.—THE FEMININE GENDER OF ARTICLES, NOUNS, ADJECTIVES, Etc.

The articles in the feminine singular are declined thus:—

Die, the;	(die) eine, a;	(meine).
Der, of the;	(der) einer, of a;	(meiner).
Dem, to or for the;	(der) einer, to or for a;	(meiner).
Der, the.	(die) eine, a.	(meine).

The pupil having now had in due course all the forms of the article in the singular, may note, that like *tiefer* (which differs from the definite article only in having *es* instead of *a*) in the nom. and acc. neuter, Sect. VII., are declined all the words in list 2, Sect. IX.; and that like *ein*, are inflected all those in the list, *ein, mein, sein*, etc., Sect. X.

Feminine nouns are in the *singular* indeclinable; as, *nom. die Seite* (the silk); *gen. der Seite*; *dat. der Seite*; *acc. die Seite*.

The adjective in the *feminine singular* has two forms. When it stands alone, or unaffected by a preceding word (§ 29), the nominative and accusative end in *e*, the genitive and dative in *en*. It is then said to be of

THE OLD DECLENSION.

Die, Gut-e, good;	rotz-e, red;
Der, Gut-en, of good;	rotz-en, of red;

Die, Gut-er, to or for good;	rotz-er, to or for red;
Der, Gut-e, good;	rotz-e, red.

When preceded by either of the articles, or by any one of the adjective pronouns (see lists Sect. IX. and X.), the adjective terminates in the nominative and accusative as in the old declension, but in the genitive and dative in the letters *en*. Thus:—

Die, die gut-e, the good;	meine alt-e, my old;
Der, der gut-en, of the good;	meiner alt-en, of my old;
Dem, dem gut-en, to or for the good;	meiner alt-en, to my old;
Der, die gut-e, the good;	meine alt-e, my old.

I. The personal pronoun *Sie* (*you*) is always written with a capital initial, while *sie* (*she* or *her*) is only thus written at the beginning of a sentence. Hence in *writing*, no ambiguity can arise. Ex., *Ich sehe Sie*, I see you; *ich sehe sie*, I see her. When *Sie* is used in the nominative, the form of the verb determines the person. Ex., *Sie sehen ihn*, you see him; *Sie sieht ihn*, she sees him. Whether, however, *Sie* (when in the accusative) stands for *you* or *her*, can only be determined by the context. The orthography of the possessive pronouns *Ihr* (*your*) and *ihr* (*her*) is also identical, and, in speaking, is liable to equal ambiguity. Thus, *Ihr Buch* ist groß, may signify, *your* book is large, or *her* book is large; and, *Ich habe ihr Buch*, may mean, I have *their* book, or I have *her* book. The significations of *sie* in the accusative, and of *ihr* in all the cases, must of course, when spoken, be determined by the connection. (See Declension, Sect. XVII.)

VOCABULARY.

America, <i>n.</i> America.	Freundin, <i>f.</i> friend, \$10.	Opernglas, <i>n.</i> opera-glass.
Bibliothek, <i>f.</i> library.	Gläsern, glass.	Schere, <i>f.</i> scissors.
Brille, <i>f.</i> spectacles.	Gold, golden.	Schwester, <i>f.</i> sister.
Dame, <i>f.</i> lady.	Ihr, her (see above).	Seite, <i>f.</i> silk.
Feder, <i>f.</i> pen.	Kein, no, not any.	Tante, <i>f.</i> aunt.
Fein, fine.	Kette, <i>f.</i> chain.	Uhr, <i>f.</i> watch, clock.
Frankreich, <i>n.</i> France.	Lampe, <i>f.</i> lamp.	Uhrtafel, <i>f.</i> watch-pocket.
Fräulein, <i>n.</i> miss, young lady.	Leinwand, <i>f.</i> linen.	
	Mutter, <i>f.</i> mother.	

RÉSUMÉ OF EXAMPLES.

Der Bruder hat das Buch der Schwester. The brother has the book of the sister.
Der Vater giebt der Tochter ein Buch. The father gives the daughter a book.
Der Hut meiner Mutter ist schön. The hat of my mother is beautiful.
Wo ist die Uhr Ihrer Fräulein Cousine? Where is your cousin's watch?
Sie ist in der Hand ihrer Mutter. It is in her mother's hand.

EXERCISE 14.

1. Ist die junge Schwester dieser jungen Dame in Deutschland? 2. Nein, sie ist in Frankreich, aber ihr Bruder ist in America. 3. Wo ist meine neue, goldene Feder? 4. Ihre junge Freundin, Fräulein S., hat sie (Sect. XVII. 3.) 5. Hat Ihre Mutter die schöne Seide Ihrer Tante? 6. Ja, und auch die schöne, feine Leinwand. 7. Wo ist Ihre goldene Brille? 8. Ich habe keine goldene Brille. 9. Haben Sie eine silberne, oder eine goldene Uhr? 10. Ich habe eine silberne Uhr. 11. Ist sie eine gute Uhr? 12. Ja, aber sie ist nicht sehr schön. 13. Wo ist Ihre Uhr? 14. Sie ist in meiner Uhrtafel. 15. Hat Ihre Schwester eine goldene Uhr? 16. Ja, und sie hat auch eine schöne, goldene Kette. 17. Wo ist meine neue Schere? 18. Ich habe sie, aber sie ist nicht sehr schön. 19. Wo ist Ihre Schwester? 20. Sie ist bei der (Sect. XVII. 3.) Mutter in der Bibliothek. 21. Wo ist meine gläserne Lampe? 22. Ich habe sie. 23. Wer hat mein neues Opernglas? 24. Ich habe es und Ihre neue Brille.

EXERCISE 15.

1. The mother of this lady is in France. 2. Has the beautiful daughter of the good [ter guten] aunt a golden [goldene] watch? 3. My diligent brother has neither a golden watch nor a good [gutes] opera-glass. 4. My good sister has no [feine] fine linen, but [aber] she has a new [neue] glass lamp. 5. My cousin with [mit] the [ter] golden spectacles is with [bei] my [meinem] beautiful brother in the library.

LESSONS IN ARITHMETIC.—VI.

ABRIDGED METHODS OF MULTIPLICATION AND DIVISION.

1. The methods of multiplication and division explained in the previous lessons are those ordinarily employed; and the learner must make himself perfectly familiar with them before proceeding farther.

These processes, however, in particular cases, can often be materially facilitated by various artifices. Some of these shorter methods we subjoin, not only because they are useful in themselves, but because they are valuable as exercises, in explaining the fundamental principles of arithmetic.

2. Any number which is formed by multiplying two or more numbers or factors together is called a *composite* number. It has already been explained in a former lesson that the same numbers multiplied together will give the same product, in whatever order the multiplication is effected.

Hence, to multiply any number by one which is composite—*i.e.*, which is composed of several factors—we have only to multiply the number first by one factor, the result by another factor, and so on.

Thus, to multiply 352 by 28, since $28 = 7 \times 4$, we can perform the operation as indicated in the margin.

$$\begin{array}{r} 352 \\ 7 \\ \hline 2464 \\ 4 \\ \hline 9856 = 28 \times 352 \end{array}$$

EXERCISE 10.

(1.) Resolve the following sets of numbers into their factors:

- | | |
|------------------------|------------------------|
| 1, 9, 10, 14, 22. | 4, 8, 16, 18, 20, 24. |
| 2, 35, 54, 56, 63. | 5, 27, 32, 36, 40, 48. |
| 3, 45, 72, 64, 81, 96. | 6, 12, 28, 54, 72, 84. |

(2.) What will 24 horses cost at 74 crowns apiece.

(3.) What will 45 hogsheads of tobacco cost, at 128 crowns a hogshead?

(4.) What will 54 acres of land cost, at 150 crowns per acre?

(5.) At 118 shillings per week, how much will it cost a family to board 49 weeks?

(6.) If a man travel at the rate of 72 miles a day, how far will he travel in 64 days?

(7.) At 163 crowns per ton, how much will 72 tons of lead cost?

(8.) What will 81 pieces of broadcloth cost, at 245 shillings apiece?

(9.) What will 84 carriages cost, at 384 crowns apiece?

(10.) What will a railway 132 miles in length cost, at the rate of £1,960 a mile?

(11.) If I can walk a mile in 16 minutes, how long will it take me to walk 374 miles?

3. Similarly, it will be seen that to *divide* by any composite number, we have only to divide by one factor, then divide the quotient by another factor, and so on.

$$\begin{array}{r} 28 \left\{ \begin{array}{l} 7 \\ 4 \end{array} \right. \begin{array}{l} 9856 \\ 1408 \\ \hline \end{array} \end{array}$$

Thus, to divide 9856 by 28, arrange the 352 Answer. process as indicated in the margin.

In this case there is no remainder. But suppose it be required to divide 9873 by 28.

$$\begin{array}{r} 28 \left\{ \begin{array}{l} 7 \\ 4 \end{array} \right. \begin{array}{l} 9873 \\ 1410-3 \\ \hline 352-2 \end{array} \end{array}$$

Proceeding as before, we get a remainder 3 after the division by 7, and a remainder 2 after the division by 4. The first remainder 3 means 3 units; and the 2 which remains after dividing 1410 by 4, means two sevens of the 1410 sevens which are contained in 9873. Hence the whole remainder will be 2 sevens + 3 units—*i.e.*, 17.

The process may be exhibited analytically thus:—

$$\begin{aligned} 9873 &= 1410 \times 7 + 3 \\ &= 352 \times 4 \times 7 + 2 \times 7 + 3 \\ &= 352 \times 28 + 14 + 3 \\ &= 352 \times 28 + 17 \end{aligned}$$

Therefore 9873 divided by 28 has a quotient 352, and remainder 17. Hence, when there are two factors, to find the whole remainder, multiply the second remainder into the first divisor, and add the first remainder.

4. If there are more than two factors, similar considerations will show that the following rule will give the whole remainder:—Multiply the last remainder into the continued product of all the divisors but the last, the last but one remainder into the

product of all the divisors except the last two, and so on. Add all these results and the first remainder together; the sum will be the whole remainder.

EXAMPLE.—To divide 17285 by 84.

$$\begin{array}{r} 84 = 7 \times 4 \times 3 \\ 7)17285 \\ \hline 4)2469-2 \\ \hline 3)617-1 \\ \hline 205-2 \end{array}$$

And the whole remainder is $2 \times 4 \times 7 + 1 \times 7 + 2$, that is, $56 + 7 + 2$, or 65.

It does not follow that this process is in all cases simpler than the method of Long Division; sometimes, however, it is more convenient.

EXERCISE 11.

(1.) Work the following examples in division:

- | | |
|----------------|------------------|
| 1. 16128 ÷ 24. | 4. 91680 ÷ 72. |
| 2. 17229 ÷ 84. | 5. 142857 ÷ 112. |
| 3. 25760 ÷ 56. | 6. 123456 ÷ 168. |

(2.) How many acres of land, at 35 crowns an acre, can you buy for 4650 crowns.

(3.) A man divided 837 crowns equally among 27 persons, who belonged to three families, each family containing nine persons: how many crowns did each person receive?

(4.) A man bought a quantity of clover seed amounting to 507 pints, which he wished to divide into parcels containing 64 pints each: how many parcels can he make?

5. *Multiplying and dividing by powers of 10, and by numbers ending in any number of ciphers.*

The products of two tens, three tens, four tens, etc., are called respectively the second, third, fourth, etc., *powers* of 10. They are 100, 1000, 10000, etc. Thus, the second power is 1 followed by two ciphers, the third 1 followed by three ciphers, and so on; the number of the ciphers in each case being the same as that of the power.

It has been already explained that to *multiply* by 10, or any power of 10, we have only to annex to the multiplicand the number of ciphers corresponding to the power. Thus, 345 multiplied by 1000 is 345000.

If any number of the right-hand figures in the multiplier be ciphers—as, for instance, in 75000—then, as we have already seen in Lesson IV., Art. 5, we need only multiply the multiplicand by 75, and annex to the product the same number of ciphers, in this case three.

EXERCISE 12

(1.) Work the following examples in multiplication:

- | | |
|--------------------------------|--------------------------|
| 1. 153483 × 10000. | 11. 2370000 × 52. |
| 2. 3120467 × 1000000. | 12. 48120000 × 48. |
| 3. 52690078 × 10000000. | 13. 356300000 × 74. |
| 4. 689063457 × 100000000. | 14. 1623000000 × 89. |
| 5. 494603506 × 1000000000. | 15. 540000 × 700. |
| 6. 67831206507 × 10000000000. | 16. 1563800 × 20000. |
| 7. 67856005109 × 100000000000. | 17. 31230000 × 120000. |
| 8. 14376 × 25000. | 18. 5310200 × 3400000. |
| 9. 350634 × 410000. | 19. 82065000 × 8100000. |
| 10. 4630425 × 6200000. | 20. 210909000 × 5100000. |

(2.) What will 10 boxes of lemons cost, at 63 shillings per box?

(3.) How many bushels of corn will 465 acres of land produce, at 100 bushels per acre?

(4.) Allowing 365 days for a year, how many days are there in 1000 years?

(5.) How much will 50 hogs weigh, at 375 pounds apiece?

(6.) If 1 barrel of flour weighs 192 pounds, how much will 500 barrels weigh?

LESSONS IN GEOMETRY.—III.

INSTRUMENTS USED IN PRACTICAL GEOMETRY.

In the operations of practical geometry, a case of mathematical instruments must be considered as an essential requisite. These instruments vary in number and quality, according to their price. Some are made of wood, bone, and ivory—as rulers and scales; others are made of brass and steel, German

silver, and other compound metals, such as compasses, drawing pens, and protractors. We shall proceed to describe the most useful, and afterwards to show their application.

The *Common Ruler* or *Straight-edge*.—This instrument generally consists of the bevelled edge of the plane or diagonal scale, of the common Gunter's scale, of an ordinary foot rule, or of a plain flat rule made with a fine straight edge, for the sole purpose of drawing straight lines from one point to another, or through any two points. It is sometimes made in the form of a right-angled triangle (Fig. 1), with a similar edge, to serve the various purposes of drawing straight lines, perpendiculars, right-angled triangles, and parallel straight lines. In the mechanical arts, a straight line is most readily obtained by fixing a well-chalked string firmly at both ends over the place where it is wanted, on a board or stone, raising it, when tense (i.e., stretched), above the same, and then letting it drop suddenly, when the white or chalky trace of the string will be marked on the board or stone as a straight line.



Fig. 1.

The *Parallel Ruler*.—This very useful instrument is constructed in a variety of forms. Those represented in Figs. 2, 3, and 4, are the most common, and the cheapest. The defect of the construction in Fig. 2 is, that in drawing a parallel to a straight line through a given point, if the latter be at a considerable distance from the former, the ruler may, from its

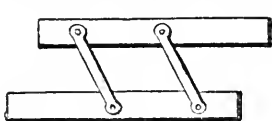


Fig. 2.

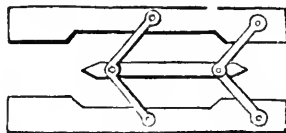


Fig. 3.

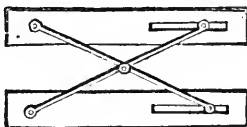


Fig. 4.

lateral motion, pass the point altogether, and render the problem nugatory. This defect is obviated by the construction in Figs. 3 and 4, provided they be properly managed; but this management is the result of a little practice.

The triangular ruler represented in Fig. 1 being made to slide against a fixed ruler or straight-edge, as represented in Fig. 5, is frequently employed for the purpose of drawing parallel straight lines. In many cases this apparatus will be found even more handy for this purpose than the parallel rulers represented above. Fig. 5 represents the same triangle in two different positions, and not two separate triangles.

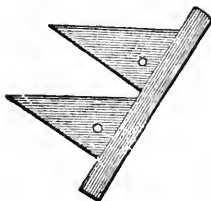


Fig. 5.

In order to test the accuracy of a ruler, let it be applied to one eye, and viewed along its edge from one end to the other; the slightest departure from the straight line will then become visible. A good ruler, besides having a straight edge, must be perfectly flat and even, flexible, and made of well-seasoned wood. Some are made of ivory, bone, and metal; these are less liable to be affected by changes in temperature, or by the humidity of the atmosphere. Parallel straight lines are

most easily drawn by artists and mechanics, with an F or a T square, of which the form is distinctly noted by the name.

The *Compasses*.—Of compasses there are several kinds. This instrument, which usually consists of two equal legs jointed at one extremity, is employed for measuring the lengths of straight lines, measuring and laying off distances, and describing circles or arcs of circles in general. The *Dividers*, or compasses with dry points, represented in Fig. 6, are chiefly used for dividing straight lines into equal parts, or into parts having any other proportion to each other. The best kind are furnished with a turn-screw for tightening the screw-axle at the joint. Others

are furnished with an arc and tangent screw to fix the legs at any required distance apart.

The *Socket Compasses*, represented in Fig. 7, are furnished with movable points, or pieces, which can be inserted in the socket at pleasure, according to the use which is to be made of them. It is chiefly employed in *describing*, that is *drawing circles*, in ink, or in



Fig. 6.



Fig. 8.



Fig. 9.



Fig. 10.



Fig. 7.

pencil, or in mere trace. The *tracing-point* in Fig. 7 is furnished with a joint and a screw, in order to keep it perpendicular to the paper when the legs are stretched to a great length. The *ink-point*, represented in Fig. 8, is furnished with a screw, to admit more or less ink at pleasure, with a joint for the same purpose as the tracer, and with a joint in one of the leaves of the point to admit of its being cleaned. The *pencil* or *crayon-point*, represented in Fig. 9, is furnished with a joint for keeping the pencil or crayon perpendicular to the paper, and a socket or case for holding it. The socket compasses are also furnished with a *lengthening bar*, represented in Fig. 10, which is furnished with a socket exactly the same as that of the leg, in order to admit of the *description*, that is, the *drawing* of larger circles than those which can be drawn only by the use of the movable points and legs of the compasses.

The *Bow Compasses*, so called because in their first construction they could be shut up into a hoop, which served as a handle to them; or the *Plug Compasses*, represented in Fig. 11, and so called because the stationary leg screws out and in like a plug, are only used for describing circles of a very small size. Such compasses are of the greatest utility to draughtsmen and engineers in drawing their plans. The plug construction seems to present some advantages over the old bows.



Fig. 11.

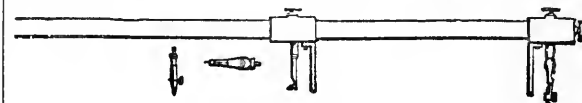


Fig. 12.

Beam Compasses are employed for describing circles of very large radius, and such as are far beyond the reach of a case of mathematical instruments. They consist of a long beam or bar, carrying two brass *cursors*, that is, pieces on which it runs. One of these is fixed at one end, and the other slides along the beam, and is furnished with a screw to fix it at any required distance. To the cursors may be screwed points of any kind, whether steel tracers, pencils, or crayons, or ink points. This apparatus is represented in Fig. 12. To the fixed cursor there is sometimes applied an adjusting or micrometer screw, as seen in the figure, to enable a given distance or radius to be taken with the greatest nicety.

In a case of mathematical instruments are also contained a *Tracer* and *Drawing Pen*, for drawing straight lines in trace, or in ink. These two are usually joined in one instrument, the tracing point being screwed into the drawing pen; this instrument is represented in Fig. 13, where the *ink-point* is constructed exactly on the same principle as that of the socket compasses. In choosing a drawing pen, it is better to select one which has an ink-point made of German silver. The steel ink-points are apt to get rusty if they are not kept carefully wiped, and lines drawn in red ink with a steel-pointed drawing pen soon get discoloured, owing to the action of the ink on the metal while in the pen.



Fig. 13.

ANIMAL PHYSIOLOGY.—III.

THE EYE (concluded).

THE eyes of the animals lower than fish, none of which have a backbone, and which are called invertebrate animals, are closely related to their powers of moving from place to place. If an animal can dart rapidly about, more especially if it can move swiftly for some time at a stretch, its eyes are usually very perfect; but if it can only crawl sluggishly, its eyes are of an inferior structure.

If we omit those lowest of all animals, which Cuvier classed together as radiate, because their parts were disposed like the spokes of a wheel, the rest are divided into two great sub-kingdoms. The type of the one, called mollusca, is the snail; and of the other, named articolata, the honey-bee is the representative.

It is impossible to say which of these two sub-kingdoms is the highest, but they are very different. That of which the insect is the type is noted for the swiftness and agility of the movements of the animals that form it; while the other is equally remarkable for the sluggishness of the species which compose it. Indeed, the word just used is derived from this peculiarity in the slug.

These peculiarities are, however, but general ones, applying to most, but not all the species of each sub-kingdom; for each sub-kingdom contains several thousands of different kinds of animals. Thus we find some insects more inert than most slugs, and some of the slug class as active as many insects.

In accordance with what has been written, the eye of the garden-snail is evidently an organ not at all comparable to eyes we have described as those of the higher classes.

This eye is situated at the end of the longer and upper pair of horns, and is only exposed when these are at their longest. Even when so exposed its sense of sight is so obtuse that it seems only conscious of light and darkness, as our skin makes us conscious of heat and cold, and has no knowledge of images. The organ seems little better than a refined organ of touch, for garden-snails will withdraw their eyes far sooner if blown upon, or the hand be placed between them and the light, than when threatened by the fingers. Nevertheless, the eye has a spherical lens, sclerotic, choroid, and retina, but all of very simple structure. The most remarkable circumstance connected with this eye is that it can be retracted by drawing it down through the tubular horn, as one might draw the end of the finger of a glove down through the rest of the finger; and this is done by a special muscle, which is a slip of the great muscular band, with which the snail draws in, not only its horns, but its whole head, strongly though slowly.

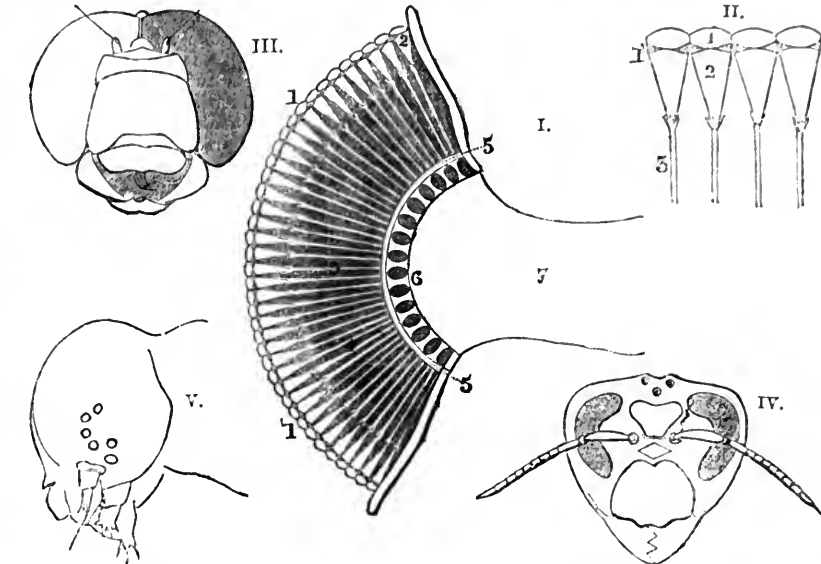
The eye is exposed by a successive contraction of the circular muscles which are round the horn, beginning at the base and ending at the top; this action has the same effect on the parts of the tube, and finally upon the eye, as driving a coin into the end of an old-fashioned purse by the aid of a ring which slides on the

outside. The rest of the slugs and snails, which creep on their bellies, have eyes somewhat similar, and similarly situated; but while the garden-snail has four horns, some water-snails have only two, and the eyes are placed on the outside of these, half-way up, while the whip-like extremities act as feelers, as the short horns of the garden-snail do. The lower orders of the mollusca, such as the oyster, etc., have eyes inferior even to those, though they are sometimes numerous and curiously placed; thus, the kind of oyster which occupies the fan-shell, and is called a pecten, has a row of eyes running round the edge of the two sides of the animal's cloak, which lines the two shells that enclose it.

The highest class of mollusca have greater power of motion than any of the rest, and swim rapidly through the sea, both backwards and forwards, seizing their prey with long, whip-like arms: and these creatures have large and elaborate eyes, not unlike those of animals, but even more complex in some respects; for there is not only a thin retina to receive the light, backed, as the retina always is, by a black membrane, but behind this choroid is another expanded retina, as though this had some other office

than to receive impressions. Perhaps some process analogous to the development of the image in the dark room of the photographer is effected in this singularly situated organ. The creature whose large eyes have just now been mentioned has been introduced as a prominent character in Victor Hugo's "Toilers of the Sea," and the description is probably about as faithful as the description of brigands and other horrors described by novelists usually are.

Turning now to the articulate sub-kingdom, we find in it eyes of the most remarkable description. They are best explained by the diagram.



I. VERTICAL SECTION OF THE EYE OF AN INSECT. II. THE LENSES AND CONES ENLARGED. III. FRONT OF HEAD OF DRAGON-FLY, SHOWING THE POSITION OF THE COMPOUND EYES. IV. FRONT OF CATERPILLAR'S HEAD, WITH THREE EYES. V. SIDE OF CATERPILLAR'S HEAD, SHOWING THE POSITION OF THE EYES.
 Ref. to Nos. in Figs. I., II.—1, surface lens; 1', layer of paint (iris); 2, cone, vitreous humour; 3, special optic nerve; 4, common pigment; 5, common retina; 6, secondary optic nerves; 7, main nerve.

If we examine the head of a wasp or bee, we find on the top of the head, looking towards the sky, three eyes set in a triangle. These eyes are simple, and not unlike the eyes of other creatures; but besides these, on the side of the head, stretching almost from its crown to the jaws beneath, are two compound eyes, which, under the microscope, are seen to present innumerable six-sided spaces, which look like the ends of the cells of a honeycomb. On dissection, each of these six-sided faces is found to be the outer surface of a double convex lens, behind which is a layer of black paint, which is comparatively thick at the edges of the lens, but thin towards the centre, where a hole is left through its middle. This hole is the pupil. Behind the pigment is a cone of transparent matter, whose point is directed inwards, and embracing this point is the end of a nerve thread. The threads from each eyelet run inwards to a sheet of nervous matter common to the whole eye, and from this sheet other nerve cords, but much fewer in number than the first, run to the main thick optic nerve. The space between the nerve cords is filled up with black paint, so that each can only receive impressions from its end. An insect, therefore, one would think, receives thousands of distinct pictures; but whether it so harmonises them in its common

retina as to be conscious of only one, as we are though we have two eyes, must remain a secret.

The simple eyes of insects seem to be used for distant objects, for if these be painted over with red sealing-wax dissolved in strong spirit, so as to blind them, the insect has no power of directing its flight, but towers straight upward towards the sky. The curious compound eyes must be used, therefore, for near objects, and as they stretch round the head and look every way, they must save the insect much trouble in turning the head as it runs in and out the bells and tubes of flowers searching for honey and pollen.

Lobsters and crabs, belonging to another order of the jointed animals, have similar eyes, but they are set on a two-jointed stem, and the facets are square, and not six-sided.

This kind of eye, however, is by no means found in all animals of this sub-kingdom. The whole tribe of spiders has only simple eyes; but there are usually eight of them set in two rows on the front part of the head.

It is singular to find also that caterpillars, though they exhibit beneath the skin of the head indications of the compound eye, which as butterflies they afterwards possess, have totally different temporary eyes, six on each side placed in a half-circle just above the jaws.

Some of the lower families of jointed animals have but one eye, in the middle of their heads, and this of peculiar structure, intermediate between a simple and a compound eye. One of these is hence called cyclops.

Among the animals of lower grade than those of the soft slug-like and the jointed sub-kingdom, little has been made out about the organ of vision. In many of them specks of colour with a nerve running to them are found; but as we cannot ask these animals what their sensations are, and their intelligence is of so low an order that we can infer but little from their movements, we can only conjecture them to be eyes.

Thus, the star-fish has specks at the ends of its rays, and the reader may have noticed the beautiful blue knobs which appear round the outside of the base of the arms of the common sea anemone when it has fully opened. The great floating jelly-fish, which, as it is seen from a ship, reminds one of an animated umbrella, has specks round the edge, where the whalebone knobs should be. All these and a thousand other structures seem to be made in reference to light; but probably the impressions they receive are as faint and dull compared to the vivid pictures presented to the sense of the higher animals, as the information which light brings to the infant, whose eye is not yet sufficiently educated to guide its wandering hands, is crude when compared with the ideas which are presented to the mind of a man by means of wondrous light, its marvellous recipient—the eye, and its yet more marvellous interpreter—the mind.

LESSONS IN LATIN.—IV.

NOUNS, SUBSTANTIVE AND ADJECTIVE.

OUR English nouns remain unchanged, whether they form the subject or the object of a proposition.

Reader, do you know the exact meaning of these terms, namely, "the subject or the object of a proposition?" I will endeavour to explain them. You probably know what in English grammar is meant by the nominative case, and the objective case. Well, the subject of a proposition or statement corresponds to the English nominative case, and the object of a proposition corresponds to the English objective case. What in English grammar you call the objective case, is in Latin grammar called the accusative case.

View the matter in another way. Here is a proposition—
The dog bit a man.

In this proposition or sentence, *dog* is the subject, and *man* is the object. If you will study the proposition you will see that *dog* is the doer or actor, and *man* is that which is acted upon. Hence you may form the general rule, that the *subject* is the doer, the actor, or agent, and the *object* is the being or thing which is acted upon. You may put the same rule in these words: the *subject* originates the action spoken of in the verb; the *object* receives the action spoken of in the verb. Or, again, you may say, the *subject* is that from which the action comes; the *object* is that on which the action falls. The *act* of biting came from the dog, and fell upon the *man*.

As I wish to make everything clear as we proceed, I will enter here a little more into this matter.

A proposition is the enunciation or statement of a thought or a fact. Thus, *fire burns; you are good; boys love play*, are each a proposition. Of course the statement must be complete, or there is no proposition. What you say must make sense in itself, or there is no proposition, but only one word or more. Thus, if, instead of saying *fire burns*, you say merely *fire*, or *burns*, you do not utter a proposition, for you do not make a statement. If you affirm *you are*, I naturally ask, *what?* for you have left the sentence unfinished. So if you declare that *boys love*, the question arises, *what?* and only when you have added the word *play*, do you finish the sentence by making the sense complete.

Now, of the three propositions given above, the first is the shortest. It is indeed a specimen of the simplest proposition there is, or can be. Less than two words, then, cannot in English form a proposition. But of what does this proposition consist? It consists of the noun *fire*, and the verb *burns*. Hence you learn that in every sentence there must be at least a noun or pronoun, and a verb. The noun, you see, is the *subject* of the proposition, for it is the agent or the cause of action. In grammar, we have also a designation for the verb; we say the verb *burns* is the *predicate*. By the *predicate* of a proposition, we mean that which is asserted or declared of the *subject*. What is here asserted? this, namely, that *fire burns; burns*, then, is the *predicate*.

In this case, the *predicate* is one word, a verb. Sometimes the *predicate* consists of two words. It may even comprise several words. In the instance given above, *you are good*, the predicate is, *are good*. Hence, the predicate consists of the verb *are*, and the adjective *good*. The former predicate, *burns*, was a simple predicate; this predicate is a compound predicate. Now, this compound predicate has two parts; first, the verb *are*, which is called the *copula*, or link; and the adjective *good*, which is called the *attribute*, or that quality which is ascribed to the subject *you*. Thus explained, the sentence stands as follows:—

Subject.	Predicate.	
	Copula.	Attribute.
You	are	good.

You will easily see how this sentence may receive additions to modify the sense. It is, as it stands, an affirmative sentence. By adding *not* to *are*, you make it a negative sentence. You may also qualify the attribute *good* by prefixing an adverb, as, *very good*. If you wish to make it interrogative, you may have to invert the *copula* and the *subject*, and say, *are you good?*

In the third of the instances given above, there is a rather different kind of sentence, *boys love play*.

Now, according to what I have just said, *boys* is the subject, *love* the copula, or verb, and *play* the object. The difference here is, that instead of an attribute in the predicate, you have an object. The proposition, viewed logically, stands thus:—

Subject.	Predicate.	
	Copula.	Object.
Boys	love	play.

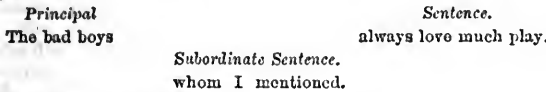
Observe, too, here, how, having got the main parts, the essential parts of a sentence or proposition, you may at will add others. Thus, for *boys*, you may say *the boys; or bad boys; or the bad boys*. The verb, too, you may qualify by an adverb, thus, *always love*. Or you may qualify *play*, by putting an adjective before it, as *much play*. But whatever words you thus insert, the essential parts of the sentence remain the same, as you may see in this arrangement:—

Subject.	Predicate.	
	Copula.	Object.
The bad boys	always love	much play.

The *bad boys*. Which *bad boys?* Something is implied or understood, that is, there is something in the speaker's mind which is not expressed in his words. Say that he means the *bad boys whom I mentioned*, then, you see, the sense is complete, thus:—

The bad boys whom I mentioned always love much play.

But here we have a compound sentence, a complex or double proposition. As it stood before, it was a single sentence. A single sentence is the statement of one fact or one thought. Two facts are mentioned in the last state of the sentence. Those two facts are these, *I mentioned some boys, and boys love play.* And these two facts are so stated that the sense of the one is not complete without the sense of the other, for you do not say merely *I mentioned some boys, and boys love play*; but *the boys whom I mentioned love play.* You thus see that the one proposition is intimately connected with the other. Consequently, a compound sentence, such as I have now presented to you, is a sentence *within a sentence.* Of these two sentences, the one is the *principal*, the other the *subordinate* one. The subordinate sentence is that which is introduced by the relative pronoun *whom*; the principal sentence is that into which the subordinate sentence is introduced; as you see in this diagram:—



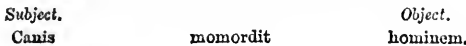
Revert now to the single sentence.



and turn the sentence, thus:—



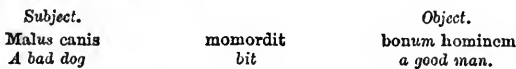
What I wish to set before you is, that *dog* and *man* remain the same in form, they are unchanged in this respect, whether they form the *subject* or the *object* of a proposition. In Latin, it is not so. In Latin, the former sentence or statement is,



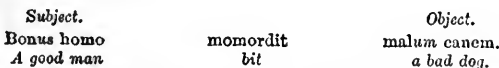
The latter sentence is,



A change, you see, has taken place: the *subject*, *canis*, has become the *object*, *canem*; and the *subject*, *homo*, has become the *object*, *hominem*. A similar change takes place in the Latin adjectives; as thus:—

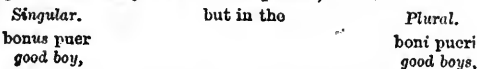


Invert the statement,



Hence you learn that the *subject* and the *object* are, in Latin, marked by different terminations in the nouns and the adjectives.

Diversities of termination are used in Latin to mark *number* in nouns and adjectives. In English we say *good boy* and *good boys*, denoting the plural by adding *s* to a noun, but leaving the adjective the same in the *plural* as it is in the *singular*. In Latin, however, both adjective and noun undergo a change in passing from the *singular* into the *plural*, thus:—



where, observe, *us* has become *i*, and *r* has become *ri*. You thus see that there are two ways of forming the plural in Latin; first, by changing the termination, as *us* is changed into *i*; or by adding to the termination, as *r* becomes *ri*, by the addition of *i*. If, instead of operating on *us*, you operate on the stem *bon*, then the plural in both cases is formed by addition, and in both by the addition of *i*. Instead of *i*, sometimes *es*, and sometimes *us* is added to form the plural. But that which I now particularly wish you to mark is, that while in English adjectives undergo no change in standing before nouns in the *plural*, in the

Latin they do undergo a change; and that change is at the end of the adjective, as it is at the end of the noun. A change for another purpose takes place at the end of nouns and adjectives in Latin. By such changes *gender* or *sex* is denoted. In English, you know, we say, *good bride, good bridegroom*; that is, *good* is the same whether it qualify a *feminine* or a *masculine* noun. Not so in Latin. In Latin, *good* in the former instance would be *bona*; in the latter, *bonus*. So *sponsus, bridegroom*, becomes in the feminine, *sponsa, bride*.

KEY TO EXERCISES IN LESSONS IN LATIN.—III.

EXERCISE 5.—LATIN-ENGLISH.

1. Thou owest (oughtest).
2. He teaches.
3. He is exercised.
4. We flourish.
5. You rejoice.
6. They are bitten.
7. We move.
8. You move.
9. They move.
10. Thou fearest.
11. He fears.
12. He is frightened.
13. You are frightened.
14. I owe (that is, I ought) to obey.
15. If you obey you are praised.
16. If we are silent we are praised.
17. Thou art taught and art educated.
18. They are silent and are praised.
19. I am bitten and am wounded.
20. If thou woundest thou art blamed.
21. They are held.

EXERCISE 6.—ENGLISH-LATIN.

1. Times et terroris.
2. Si taceo vituperor.
3. Gaudet.
4. Gaudemus.
5. Gaudent.
6. Tentat morder.
7. Tentamus educare.
8. Pares et ludaris.
9. Mordemus.
10. Si mordemus vituperamur.
11. Exercent.
12. Movemini.
13. Saltat.
14. Delectantur.
15. Ornamin.

EXERCISE 7.—LATIN-ENGLISH.

1. Thou deceivest.
2. He is deceived.
3. We are deceived.
4. I deceive and am blamed.
5. He yields.
6. Thou readest.
7. He writes.
8. He reads well.
9. Thou deceivest greatly.
10. If he is loved he rejoices.
11. We are pricked.
12. Thou conquerest.
13. We are conquered.
14. They are conquered.
15. He falls.
16. Thou slayest.
17. If thou slayest thou art blamed.
18. He reminds (advises) well.
19. Thou art badly educated.
20. We are greatly moved.
21. We dance and rejoice.
22. He is injured.
23. You are injured.
24. You defend.
25. They are defended.
26. I am loved.

EXERCISE 8.—ENGLISH-LATIN.

1. Pareo.
2. Si pareo diligor.
3. Valde diligitur.
4. Scribit bene.
5. Pingunt male.
6. Saltant bene.
7. Gaudet si valde legit.
8. Pingit.
9. Parent et landantur.
10. Si regitis bene diligimini.
11. Defendunt.
12. Defendimini.
13. Fallitur.
14. Punguntur.

EXERCISE 9.—LATIN-ENGLISH.

1. Thou guardest.
2. He is supported.
3. He comes.
4. Why sleepest thou?
5. He sleeps well.
6. He is instructed.
7. Thou prickest.
8. He slays.
9. Thou deceivest greatly.
10. He is heard.
11. If thou sleepest much thou art punished.
12. He finds.
13. If thou instructest well thou art praised.
14. He is bound.
15. Why art thou silent?
16. He is silent and is punished.
17. They are found.
18. Thou art clothed.
19. They are well clothed.
20. If you are clothed well you are delighted.
21. They are badly instructed.
22. If thou art conquered thou art bound.

EXERCISE 10.—ENGLISH-LATIN.

1. Cur occidis.
2. Custoditur.
3. Custodiunt.
4. Si custodimini vincimini.
5. Vituperat et punit.
6. Audit et eruditur.
7. Bene educamini.
8. Valde dormis.
9. Legunt.
10. Si saltatis delectamini.
11. Fulcitur.
12. Cur puniuntur?
13. Audiuntur.
14. Male vestior.
15. Feriuntur et moventur.

EXERCISE 11.—LATIN-ENGLISH.

1. I yield.
2. Thou readest.
3. We move.
4. Thou art exercised.
5. They bite.
6. They flourish and rejoice.
7. He tries to read.
8. Why dost thou read badly?
9. He sleeps badly.
10. Thou art much loved.
11. You are conquered.
12. They write well.
13. If you paint well you are praised.
14. We are defended.
15. We strike.
16. Why do you punish?
17. We are clothed.
18. We bind.
19. We are conquered.
20. We are bound.
21. You conquer.
22. Thou art guarded.
23. He is adorned.
24. They are praised.
25. We are feared.
26. Thou fearest much.
27. You are bitten.
28. We educate.
29. They dance badly.

EXERCISE 12.—ENGLISH-LATIN.

1. Cedunt.
2. Si ceditis vincimini.
3. Si vincimini vincimini.
4. Fulcior.
5. Dormiunt.
6. Cur puniunt?
7. Cur puniuntur?
8. Male vestimini.
9. Vincis.
10. Vincis.
11. Vincis.
12. Vincis.
13. Pungunt.
14. Punguntur.
15. Cur moves?

EXERCISE 13.—LATIN-ENGLISH.

1. We are good.
2. He is good.
3. Thou art good.
4. I am not good.
5. He is blind.
6. He is not blind.
7. They are very learned.
8. You are safe.
9. You are not safe.
10. I am unlearned.
11. You

are unlearned. 12. He is not unlearned. 13. Thou art very learned. 14. Why art thou bad? 15. I am not bad. 16. We are good. 17. He is unlearned. 18. Why art thou unlearned? 19. I am not unlearned. 20. We are safe. 21. Safe are we. 22. Thou art learned and safe.

EXERCISE 14.—ENGLISH-LATIN.

1. Doctus sum. 2. Non sum doctus. 3. Doctus est. 4. Docti sunt. 5. Mali estis. 6. Non estis mali. 7. Bonus es. 8. Boni sunt. 9. Non sunt boni. 10. Cur boni non sunt? or, Cur non sunt boni? 11. Cæcus est. 12. Non est cæcus. 13. Cur est cæcus? 14. Non es indoctus. 15. Cæcus es et non salvus, or, Cæcus et non salvus es. 16. Cæci sunt. 17. Boni et salvi estis. 18. Valde indoctus est.

LESSONS IN GEOGRAPHY.—IV.

ARABIAN NOTIONS—EUROPEAN TRAVELS—DISCOVERY OF AMERICA.

FROM the time of Ptolemy down to the tenth century of the Christian era, no geographical work appeared, either to supply the place of his, or to add to the knowledge which it conveyed. The invasion of the Roman empire by the northern hordes, the general anarchy which followed, and the seclusion into which literature was driven, produced a retrogression of all the arts and sciences, and especially of geography. A proper judgment may be formed of the ignorance which prevailed in this science immediately anterior to the time of the crusades, by inspecting a map of the world published at that period. The sea, as in the age of Homer, is made to surround the world, which is divided into three parts, Europe, Asia, and Africa. Asia is as large as the other two parts; Africa is joined to Asia on the south, and the Indian Ocean is made an inland sea. On the east, there is a small place indicating the position of the garden of Eden, by the words *Hic est paradisis*. Europe and Asia are separated from Africa by a very long canal, which some believed to be the Nile, others the Hellespont, and others again the Indian Ocean. Africa is considered the country of fable and mystery; its northern part only is seen, the rest is unapproachable on account of the torrents of flame poured on it by the sun. After the discovery of the Canary Isles and Cape Bojador, geographers represented in one of these islands the figures of colossal statues brandishing formidable clubs to warn navigators that they must not go beyond this point.

A fantastic dream, filled with chimeras and ridiculous sights, hovered over the world during the middle ages. The cosmological theories then rife, were inferior to the happy notions which prevailed in pagan antiquity. Light, however, had begun to dawn. At the commencement of the eighth century, pious monks had retired into Ireland and the Farøe Isles. In A.D. 795 Christian missionaries had visited Iceland, which was considered as the ancient Thule of Pytheas. In A.D. 855 the Norwegians landed on this island; proceeding farther west, they reached Greenland, and enlarged the boundary of geographical knowledge. Certain writers have advanced the opinion that the problem of a communication between the Atlantic Ocean and the great ocean, now called the Pacific, was really current among the maritime people of that period. It is nevertheless an historical fact that America had been discovered by the Scandinavians at this remote period. Yet the discovery of Greenland detracts nothing from the glory of Columbus. The hardy adventurers of Norway were the first who penetrated into the midst of the mountains of ice which bristle round the confines of the polar countries. We are equally struck with wonder and admiration at their daring courage, in reading the history of the eighth, ninth, and tenth centuries, when we find that all the known seas were during this period covered with the vessels of the Scandinavians. The conquests of these pirates in Europe are well known. Their voyages in the icy regions are almost unknown to the general reader.

The expeditions we have now referred to were turned to some advantage by the geographers of the period, but all the light they were calculated to give was not rendered available. The learned writers of the tenth, eleventh, and twelfth centuries still believed the Frozen Ocean, the Baltic Sea, the White Sea, and the Caspian Sea to be united. They believed that all the northern regions formed only one island. Then the Amazons, those famous warriors, whose country antiquity had placed to the north of the Caucasus, were now removed to the countries newly discovered in the north of Europe. Scandinavia became

their birthplace and their residence. "The fiction of the Amazons," says M. Humboldt, "has travelled over all the zones; it belongs to a complete circle, which proceeds from the reveries and ideas in which the poetic or religious imagination of all races of men, and of all periods, instinctively performs its evolutions."

The Arabians, by a series of brilliant conquests under the successors of one of the greatest impostors the world ever saw, had reached a state of comparative ease and power, and had devoted themselves during the dark ages of Christianity to the study of the exact sciences, in as far as they had escaped the ravages of one of their own princes, who destroyed the library of Alexandria, which contained the treasures of the remotest ages. Geography, in connection with astronomy, was one of the most interesting subjects of their investigation. But their cosmological system was scarcely less absurd than that of the ancients. They divided the world into seven climates, and each climate into a certain number of regions. Although some of the Arabs had made long voyages, and one of their geographers had actually explored Africa as far as the Niger, or Joliba, and the region in which is situated the famous Timbuctoo, still their knowledge of this continent was very incomplete. They always made the Indian Ocean an inland sea; and although they were familiar with the use of the astrolabe (an instrument similar to a quadrant) and the mariner's compass, they were afraid to navigate the open seas, a fact which contributed to their continued ignorance. One of the most learned Arabian geographers of the twelfth century, Edrisi by name, the same who constructed for Roger, king of Sicily, the famous silver planisphere which weighed 800 mares (about 400 lb.), had the most singular ideas of the terrestrial globe. He fancied that all the people of the world lived in the northern regions; that the southern regions were desert on account of the sun's heat; that the latter were situated in its lower part; and that, consequently, all the waters were dried up, and that no living being could exist in those regions. He asserted that the ocean entirely enveloped the globe like a circular zone, so that only one part appeared like an egg partly immersed in water in a vessel. He placed Africa in the first climate, which commenced at the western sea, called the *Sea of Darkness*; and beyond this all existence became impossible. He speaks of the two islands called the *Fortunate Islands* (the Canaries), from which, as the first meridian, Ptolemy reckoned his longitudes. Such was the state of geographical knowledge among the most learned of the Arabians.

The call to arms against the infidels, in the various crusades or holy wars which extended over the greater part of the thirteenth century, drew the attention of Europe to the East. This was the epoch of the travels of Carpini, of Rubruquis, and of Ascelin in Tartary. These adventurers, after they had travelled along the shores of the Caspian Sea to its northern extremity, reached Karakorum, the capital of the empire of Cathay (China), situate on the Orchou, a tributary of the Selenga. The narratives of Ascelin and Carpini reveal the existence of numerous tribes in a part of the world hitherto believed by geographers to be occupied by the ocean. "Eoüs," says a modern historian, "that fabulous sea of antiquity, the bed of Aurora, disappeared for ever, and hordes of savages, as well as nations of powerful and warlike people, emerged at once from its imaginary waters."

The celebrated travels of Marco Polo took place towards the end of the thirteenth century, from 1271 to 1297. They made known the centre and the eastern extremity of Asia, Japan, part of the islands of the Eastern Archipelago, and of the continent of Africa, and the large island of Madagascar. Among the descriptions of the illustrious Venetian, that of China was the most curious and important; it was a complete disclosure of that empire, which had been hitherto almost an enigma to Europe. After long and continued suspicions of exaggeration in his narrative, the assertions of Marco Polo have been, after careful examination, acknowledged to be correct and agreeable to fact. It is with justice, therefore, that this traveller has been styled the founder of the modern geography of Asia. A very considerable time elapsed before any addition was made to the brilliant discoveries of the Venetian; but the testimony of other travellers was not long wanting to confirm his original statements. Oderic, of Portenau, visited India and China from 1320 to 1330; Schiltberger, of Munich, accompanied Tamerlane

in his expeditions, and thus travelled over Central Asia; in 1335, an Italian merchant, Balducci Pegoletti, went to Pekin by the central Asiatic route; and in 1403 Clavijo was sent as an ambassador by the court of Spain to Samarcand. About the end of the fourteenth century the brothers Zeni re-discovered Greenland, and announced the existence of a large island, which they called *Frisland*. Modern geographers have not yet arrived at the satisfactory solution of the problem, to what country or island this name applies.

Africa had almost become unknown, when the Portuguese began to explore the western part of this continent. This nation, animated by a zeal for making voyages and discoveries, undertook to rectify the errors of geographers, and to contradict the dreams of Greek and Roman antiquity, as well as the reveries of the middle ages, by experimentally proving the fact that the zone of the globe hitherto deemed uninhabitable was as accessible to man as the temperate regions. Previous to the year 1411, the Portuguese had never ventured beyond Cape Nun, which they considered as an impassable limit. An expedition was then prepared and sent out, which proved completely successful; it not only doubled this redoubtable cape, but extended its researches as far as Cape Bojador. Then commenced that series of successful enterprises which have gained for this people their lasting reputation as early discoverers of unknown lands. Under the direction of Henry of Portugal, a noble and zealous prince, in 1432, exploring squadrons from Lisbon doubled Cape Bojador, discovered the river Senegal, reconnoitred the coast of Africa from Cape Blanco to Cape Verd, landed on the islands which take their name from the latter cape, and took possession of the Azores, situated about nine hundred miles from the African continent. Some years later the Portuguese crossed the equinoctial line or equator, and established the fact, hitherto problematical, that the torrid zone was not only habitable, but also very populous and fertile. No longer did the black statues of the Canary Islands appeal to the fears of the traveller, and forbid him to go a step beyond that limit. Suddenly also was the *Sea of Darkness* illumined by the rays of the tropical sun, and soon were its waves opened up as a public highway to enterprising navigators. After new exploring expeditions to the kingdoms of Benin and Congo, the Portuguese, under Bartholomew Diaz, in 1493, reached the Cape of Good Hope, which was then called by him the *Cape of Tempests*, on account of the stormy aspect which it presented to them on its first appearance. In 1497, however, under the auspices of Emmanuel of Portugal, Vasco de Gama doubled the Cape of Good Hope, and reached India, after having sailed along the whole western and southern coast of Africa.

Whilst the Portuguese were thus striking out a new route to the East Indies, the Spaniards were opening up America to Europe. The latter years of the fifteenth century made this double present to Christendom. The erroneous representations which the maps of the world presented at this period, and which, according to the authority of Ptolemy and the travels of Marco Polo, gave an exaggerated extent to Asia on the east, led Christopher Columbus to imagine that by sailing continually westward, it was possible to reach the continent of Asia and the East Indies. There was, besides, a vague but common belief that there existed towards the west a great unknown land. The history of all the difficulties which the illustrious Genoese met with in the execution of his project, and of all the obstacles which ignorance, indifference, and jealousy raised up against him is well known; but the facts of the discovery must be repeated here. The three vessels charged with this great exploring expedition set sail on the 3rd of August, 1492, and after

a short rest at the Canary Islands, were refitted on the 6th of September following. From that moment the crew of the little fleet, alarmed at the immensity of the ocean, and destitute of the hope of success to sustain their courage, cherished a thousand apprehensions which almost led them to despair. Despondency gave place to anger, and anger produced revolt. The energy of the great leader of the enterprise calmed these extravagant fears, and warded off the dangers with which even his life was threatened. Yet keen anguish continued to agitate his noble heart during those long and dreary nights when the land, indicated by certain customary signs, seemed to fly from his presence. At last, at ten o'clock on the night of the 11th of October, 1492, Columbus distinctly perceived a light. Some hours afterwards, the rising sun showed him in the distance the land which he sought. America was discovered!

The first land seen by Columbus was the island of Guanahani, which is now called *San Salvador*. The Spaniards discovered, in succession, the West India Islands, including Cuba and Hayti, which received the name of *Hispaniola*, and in 1497 Columbus set foot for the first time on the mainland of the continent of North America. It has been said that Amerigo Vesputi visited, a year before Columbus, the coasts of Guiana and Terra Firma, now Venezuela; but this is mere conjecture. Two years later, however, this learned Florentine carefully reconnoitred the northern coast of South America.

In the space of a few years, constant accessions were made to these discoveries in the New World. In 1497, John Cabot, accompanied by his sons Lewis and Sebastian, discovered Newfoundland and Labrador, and is said to have sailed southward along the coast of North America as far as Florida. Yanez Pinzon, in 1500, reached Brazil, and three months after him, Alvarez Cabral landed on the same coast, which he transferred to the sovereignty of Portugal; while Gaspar Cortereal touched at the coast of Labrador, which had already been discovered by Cabot. Ponce de Leon, in 1512, landed in Florida. Three years later, the Rio de la Plata, or *River Plate*, was laid open to Europe by Juan Diaz de Solis. Magellan, one of the most illustrious of these early voyagers, in 1520, established the fact of the existence of the strait which bears his name, saw Tierra



CHRISTOPHER COLUMBUS.

del Fuego, and reached the Philippine Islands, after having ploughed the Pacific Ocean, which Nunez de Balboa had taken possession of, in the name of the king of Spain! This Balboa was the first who saw, from the elevated shores of Central America, the waters of the great Pacific Ocean, which he named the South Sea. Now the Spaniards commenced the exploration of the new continent. The curiosity of Europe was raised to its highest pitch. An unknown and mighty world unfolded its wonders to bold adventurers, when Mexico, Guatemala, and Peru exhibited to the eyes of the astonished Europeans the splendours of their imperial cities, and their inhabitants told them of the priceless store of inexhaustible treasures that lay hid in the bowels of their mountains.

But the wealth of the men of the New World proved their ruin, and led to their speedy subjugation and the overthrow of empires and dynasties that were older, perhaps, than any that existed in that quarter of the globe from which their conquerors came. The sight of gold and silver used for purposes for which the baser metals were thought even too valuable in Europe; the indifference with which Mexicans and Peruvians alike regarded that which the Europeans looked upon as the only thing which could render life desirable; and the incredible news that, any day they liked, they could get more than a strong man could stagger under, at the price of a few hours' work with spade and pick, raised in the human vultures that had flocked west-

ward in the track marked out by Columbus, a hunger and thirst for gold so craving and insatiable, that no amount of the precious metals was able to satisfy the one or allay the other.

The first voyage of Columbus in 1492, and the discovery of Cuba and several of the West India Islands, including Hispaniola, now called Hayti or St. Domingo, at which Columbus settled a small colony before he returned to Spain in the following year, led to the immediate colonisation of the Caribbean Archipelago and the Isthmus of Panama or Darien, that links together the two great peninsulas of the American continent. To these colonies came all the adventurous spirits in Spain who coveted wealth, fame, or glory. Among them were some whose social position debarred them from rising in their own country, and who eagerly seized the opportunity to make a name and reputation as well elsewhere. Of these, the most notable was Francis Pizarro, the natural son of an unnatural parent, an officer in the service of Ferdinand the Catholic and Isabella of Castile, king and queen of all Spain, who cared so little for the "flesh of his flesh, and bone of his bone," that he allowed the lad to grow up to manhood, without care or culture, in no better position than that of the keeper of the hogs that wallowed in the filth of his courtyard. But when Spain was echoing through its length and breadth with the marvellous adventures of Columbus, the news of the discovery of the New World reached even the young swineherd in his obscurity, and turning his back on kinsmen and country without a sigh, he worked his passage to the far Western country, where the base-born hewer of wood and drawer of water could win as much wealth and honour as the noblest and best of the hidalgos of Spain, provided that he had brain enough to scheme and plan, sufficient determination to act, and thwags and sinews strong enough to strike.

To the colony of Darien on the Spanish main went Francis Pizarro, Diego D'Almagro—a man who knew even less about his begetters than Pizarro did, and who took his name from the town in whose streets he was picked up—and a host of kindred spirits with little better lineage to boast of than they had. In Panama, one of the recently established centres to which the wealth of the New World was steadily gravitating, the ex-swineherd rose rapidly to a position of importance, while a doubloon was no more to him than an acorn had been when he drove his hogs to feed in the shady alleys of the oak-woods of old Spain. By plundering and robbing right and left, he had got enough to make him long for more, when a rumour reached him that the great gold-fields of the Western world were to be found in Peru, and put him on the scent of playing the same part in the land of the Incas that Hernan Cortez had played in the country of Montezuma. Cortez had upset a powerful government, that held sway over an empire whose area was more than a thousand thousand square miles in extent, and had done pretty much as he pleased in Mexico, a city of 300,000 inhabitants, with only a trifling force of 600 or 700 Spaniards, of which he lost a third before he reached the heart of the empire. In the space of two years (1519-21) Cortez had reduced this prosperous and powerful country to the position of a Spanish vice-royalty; and what Cortez had done in Mexico, Pizarro could surely do in Peru. So thither he sailed from Panama in 1524, with one ship and about eighty men, and soon found out enough to assure him that he was on the right track to increased wealth and extended power. But hardships and privations quickly thinned the ranks of his followers, and he found it necessary to call fresh recruits to his standard before he attempted to carry out his plans. After a hasty visit to Spain to obtain from Charles V. the governorship of the newly-discovered country, he went back to the Spanish main, and, by the aid of the conqueror of Mexico, equipped a second expedition against Peru. The civil war which was then raging between the Inca Atahualpa and his brother Huascar favoured his attempts. He took the former prisoner, and, having wrung from him gold and silver enough to fill a room twenty-two feet long by sixteen feet broad, as high as he could reach, he murdered him, seized his capital, and declared his country to be henceforth an appanage of the Spanish crown. Following up the good fortune of Pizarro, D'Almagro, who had acted as Pizarro's lieutenant in the conquest of Peru, marched southwards into Chili to win a province for himself. His success led him to aim at making himself master of the whole of the Spanish territories in South America, and a struggle for the supremacy ensued between the former friends which brought death to both, for D'Almagro was taken

prisoner and strangled by order of Pizarro in 1538, while Pizarro himself was assassinated by D'Almagro's son in 1541.

Other leaders at the head of handfuls of men, so to speak, were equally, though not so notably, successful in other parts of the American continent; and fifty years had not elapsed from the time of the discovery of America, ere the whole of the country south of the Isthmus of Panama, and a very large portion of that on the north, had been reduced from the position of independent empires to that of dependencies of Spain and Portugal.

LESSONS IN GERMAN.—VI.

SECTION XIII.—NOUNS OF THE NEW DECLENSION.

NOUNS of the New Declension form their *genitive* by adding *n* or *en* to the *nominative*, as:—Nom. Der Mensch, the man, the human being; *ter Herr*, the lord, or Mr.; *ter Fürst*, the prince; *ter Elefant*, the elephant, etc. Gen. Des Menschen, des Herrn, des Fürsten, des Elefanten, &c. Nouns of this declension retain the form of the genitive in the dative and accusative.

Nearly all *masculine* nouns that end in *e* belong to the New Declension.

NEW DECLENSION OF THE NOUN.

- N. Der gute Knabe, the good boy; *ter Ochse*, the ox;
- G. Des guten Knaben, the good boy's; *des Ochsens*, of the ox;
- D. Dem guten Knaben, to the good boy; *dem Ochsens*, to the ox;
- A. Den guten Knaben, the good boy; *den Ochsens*, the ox.

VOCABULARY.

Anstrengung, fatiguing —toilsome.	Griech, m. Greek.	Pole, m. Pole.
Christ, m. Christian.	Hauptmann, m. cap- tain.	Prinz, m. prince.
Deutsche, m. German.	Heiter, brisk, lively.	Ruheig, quiet, peace- able.
Franzose, m. French- man.	Immer, always, ever.	Russe, m. Russian.
Freiheit, f. liberty, freedom.	Jude, m. Jew.	Schreibtisch, m. writ- ing-desk.
Freistaat, m. republic.	Knabe, m. boy.	Soldat, m. soldier.
Fürst, m. prince.	Land, n. country.	Southern, but.
Geficht, n. counte- nance, face.	Leben, n. life.	Türke, m. Turk.
Gewissen, n. con- science.	Monarchie, f. mo- narchy.	Unser, our.
Graf, m. count.	Nachbar, m. neigh- bour.	Unsicher, unsafe, un- certain.
	Neffe, m. nephew.	Zeichen, n. sign, token.
	Nichte, f. niece.	

RÉSUMÉ OF EXAMPLES.

Karl der Große starb in dem Jahre des Herrn acht hundert und vier- zehn.	Charlemagne died in the year of the Lord eight hundred and fourteen.
Der tapfere Ungar ist der Feind des Russen.	The gallant Hungarian is the enemy of the Russian.
Das duftente Veilchen ist ein schönes Erzeugniß des Frühlings.	The fragrant violet is a beau- tiful production of the spring.
Verdient' des Brod ist süß.	Earned bread is sweet.
Ein gutes Gewissen ist ein sanftes Kissen.	A good conscience is a soft pillow.
Mancher fleißige Mann ist arm.	Many an industrious man is poor.
Noch ist der verdiente Lohn der Fauleit.	Want is the merited reward of idleness.

EXERCISE 16.

1. Hat der Franzose den Wein des Deutsche? 2. Ja, und der Deutsche hat das Tuch des Franzosen. 3. Was hat der Russe? 4. Er hat das Land des Polen. 5. Dieser Grieche ist kein Freund des Türken. 6. Wer hat das scharfe Messer dieses Knaben? 7. Der Freund dieses Griechen hat es. 8. Haben Sie den Schreibtisch Ihres Neffen? 9. Nein, ich habe den Schreibtisch meines Vaters. 10. Haben Sie das Buch dieses Knaben, oder das Papier seines Neffen? 11. Ich habe das Buch des Knaben, und meine Nichte hat das Papier des Neffen. 12. Ist unser Freund, der Hauptmann, ein Franzose, oder ein Grieche? 13. Er ist ein Franzose, und ein großer Feind des Russen. 14. Ist dieses Kind ein Sohn unsers Nachbarn, des Kaufmannes? 15. Nein, es ist der Sohn eines Juden, und sein Vater ist der Nachbar eines Christen. 16. Ein heiteres Gesicht ist nicht immer das Zeichen eines ruhigen Gewissens. 17. Haben Sie das Buch des Grafen? 18. Nein, sondern der Prinz hat das Buch. 19. Das Leben eines Soldaten ist anstrengend und unsicher. 20. Haben Sie eine Monarchie oder einen Freistaat? 21. America hat keinen Fürsten, sondern Freiheit. 22. Ich habe eine goldene Uhr, und Sie haben einen silbernen Bleistift.

EXERCISE 17.

1. The writing-desk of the [the] gallant Pole. 2. The life of a prince is unsafe. 3. The gallant Pole with [with] the [the] lively [lively] countenance [countenance] is an enemy of the Frenchman. 4. Is [is] he a friend of the good [good] captain? 5. That [that] soldier is the brother of his beautiful cousin [cousin]. 6. The diligent son of the brisk German has a good [good] conscience.

SECTION XIV.—ABSOLUTE POSSESSIVES, ETC.

1. When *mein*, *dein*, *sein*, &c. (§ 58) are not followed by an adjective or a noun, they are called absolute possessives, and are declined, as are also *mein* and *dein*, like an adjective of the Old Declension, as—

Mein Hut ist groß, und *sein*-er (*sein* My hat is large, and his (his) Hut) ist klein. hat) is small.
Sein Hut ist groß, und *mein*-er (*mein* His hat is large, and mine (my) Hut) ist klein. hat) is small.
Sein Buch ist neu, *ih*-es (*ih* Buch) His book is new, hers (her) ist alt, und *Ihr*-es (*Ihr* Buch) ist book) is old, and yours (your) schön. book) is beautiful.
Er hat Geld, und *Sie* haben *kein*-es He has money, and you have (kein Geld). none (no money).

Eines and *keines* (the *neuters*) often drop the vowel of the final syllable; thus producing the forms *eins* and *keins*, as:—

Er hat ein Pferd, *Sie* haben eins, Ho has a horse; you have one, und ich habe keins. and I have none.

OLD DECLENSION OF THE ADJECTIVE IN ALL GENDERS.

Masculine.	Feminine.	Neuter.
N. Gut-er Wein, good wine.	Gut-e Seite, good silk.	Gut-es Wasser, good water.
G. Gut-es Weines, of good wine.	Gut-er Seite, of good silk.	Gut-es (§ 28) Wassers, of good water.
D. Gut-em Weine, to, for good wine.	Gut-er Seite, to, for good silk.	Gut-em Wasser, to, for good water.
A. Gut-en Wein, good wine.	Gut-e Seite, good silk.	Gut-es Wasser, good water.

2. *Etwas* is to be rendered "something," "anything," as *Haben Sie etwas?* have you anything? *Ich habe etwas*, I have something.

Nicht (not) is seldom used with *etwas*; "not anything" being translated by *nichts*, which also signifies "nothing," as *Ich habe nichts*, I have not anything, or, I have nothing. So *etwas* is best translated, "such a thing."

3. "At all" in such phrases as "nothing at all," "none at all" and the like, has in German its equivalent in the *particel gar*, which, however, always comes immediately before the word to which it relates. Kindred to this, is the still stronger expression, „*ganz und gar*," wholly and utterly; „*ganz und gar nicht*," wholly and utterly not, *i.e.*, by no means; not at all.

4. When an adjective is used with „*etwas*” or „*nichts*,” it follows the Old Declension, and is written with a capital initial; as—

Ich habe etwas Schönes, I have something beautiful.
Er sagt nichts Schlechtes, he says nothing bad.
Sie sprechen von etwas Neuem, you speak of something new.

5. German verbs are conjugated *negatively* in the present and imperfect tenses, without an auxiliary, like the English verbs "have" and "be;" as—

Ich habe nicht, I have not.
Er sieht nicht, he sees not (he does not see).
Er hatte nicht, he had not.
Ich sah nicht, I saw not (I did not see).
Sie sind nicht, you are not.
Sie hört nicht, she hears not (she does not hear).
Es war nicht, it was not.
Sie liebten nicht, they loved not (they did not love).

VOCABULARY.

Autor, other.	Gerber, m. tanner.	Sauer, sour.
Barbier, m. barber.	Gerste, f. barley.	Schön, beautiful, fine.
Blau, blue.	Hafcr, m. oats.	Seife, f. soap.
Buchbinder, m. book-binder.	Häßlich, ugly.	Stimme, f. voice.
Etwas, something, anything.	Hier, here.	Süß, sweet.
Gar (R. 3 above).	Keter, n. leather.	Weizen, m. wheat.
	Nichts, nothing.	Wenig, little, few.
	Roth, red.	

RÉSUMÉ OF EXAMPLES.

Das Meerwasser hat einen salzigen Geschmack. The sea-water has a salt taste.
 Dieser Schneidergeselle ist ein geschickter Arbeiter. This journeyman tailor is a skilful workman.
 Der Hund ist ein treues Thier, und die Katze ist ein schlaues Thier. The dog is a faithful animal, and the cat is a sly animal.
 Sie haben etwas Schönes, und ich habe etwas Gutes. You have something fine, and I have something good.
 Der Adler ist ein Raubvogel. The eagle is a bird of prey.

EXERCISE 18.

1. Hat tiefer Tuchhändler gutes Tuch? 2. Ja, er hat gutes Tuch; und dieser Gerber hat gutes Leder. 3. Was hat der Barbier? 4. Er hat gute Seife. 5. Wer hat gutes Heu? 6. Tiefer Bauer hat gutes Heu. 7. Was hat der Schmie? 8. Er hat gutes Eisen, und sein Bruder, der Papierhändler, hat gutes Papier, rothes, blaues, und weißes. 9. Haben Sie rothen oder weißen Wein? 10. Ich habe rothen, noch weißen. 11. Ihr Wein ist süß, aber tiefer hier ist sauer. 12. Ihr rother Wein ist stark, und der weiße Wein meines Nachbarn ist schwach. 13. Hat tiefer Müller gutes Mehl? 14. Ja, und tiefer Bauer hat gutes Korn, guten Hafer, und gute Gerste. 15. Dieses Mädchen hat eine schöne Stimme. 16. Mein Bruder hat etwas Schönes und ich habe nichts Häßliches. 17. Dieser Mann hat nur ein wenig Geld und der andere hat gar keins.

EXERCISE 19.

1. Has my brother, the tailor, black [schwarzes] or red cloth? 2. The friend of my [meines] brother has good paper, red, blue [blaus], and white. 3. The son of the bookbinder has something of the [ven tem] barber. 4. The beautiful daughter of the old blacksmith has a [einen] dog and a cat. 5. The diligent carpenter [Tischler] has something beautiful. 6. The draper is a son of the industrious merchant [Kaufmanns]. 7. The old tanner had not seen [gesehen] the sly cat and the faithful dog. 8. Is the carpenter at home [zu Hause]? No [nein], he is not. 9. Have you taken [genommen] something? I have taken nothing. 10. Has pump-water [Brunnenwasser] a sweet or a salt taste? It has not [feinen] a salt taste, but [süßeren] a sweet taste.

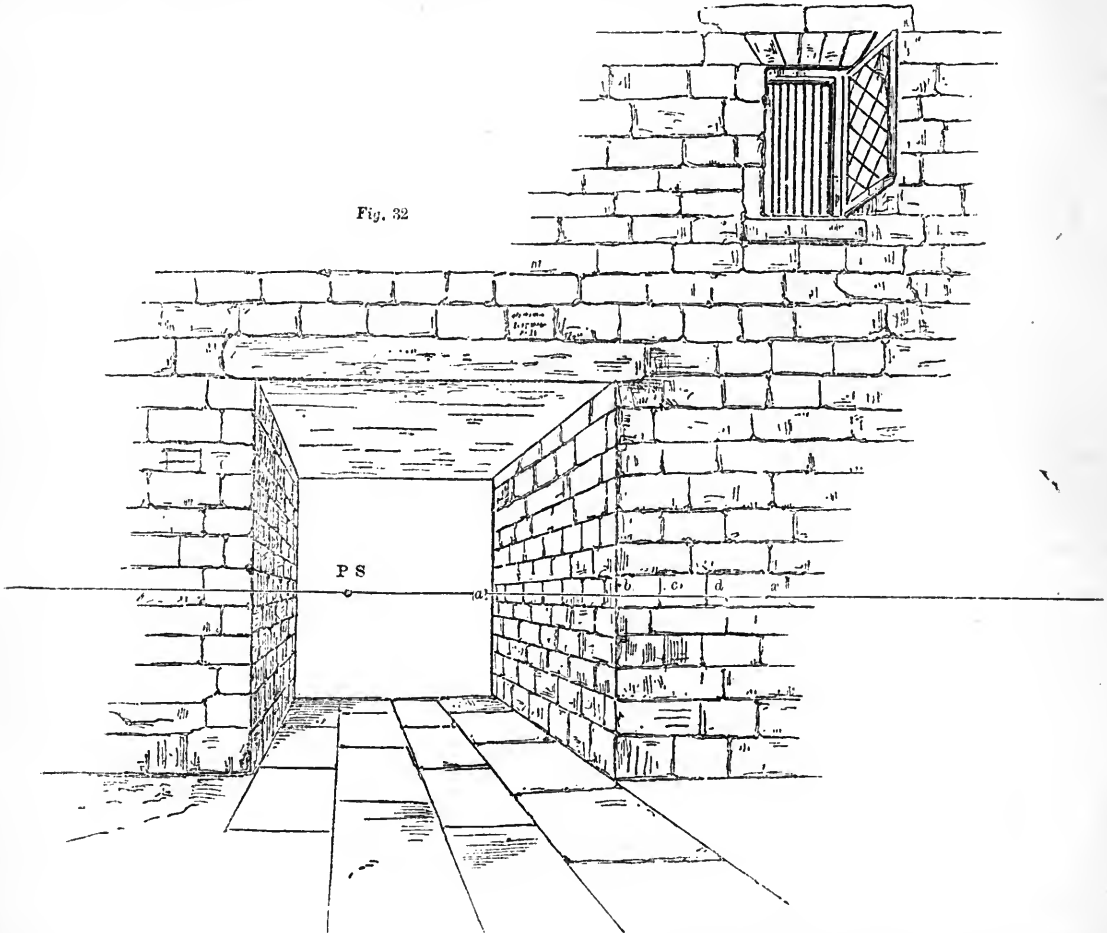
LESSONS IN DRAWING.—IV.

As it is necessary to dwell a little longer upon Parallel Perspective, in order to lay before our readers as many varied examples as we can in this division of the subject, we will for a few minutes restrict our observations to the details and method of drawing Fig. 32. But before taking up our pencil, let us say a few words upon a general principle of procedure, which merits the careful attention of all who are seeking to acquire a knowledge of Drawing by the aid of these lessons. There is one question almost always asked by beginners, and as, no doubt, the inquiry will be made by many, if not all, of our readers who wish to become good draughtsmen, we answer it now. The question we allude to is, "Where shall I begin?" This is a very natural query, and may be answered in more than one way, according to the nature of the subject to be copied.

We wish our readers to understand that the instructions contained in these lessons apply to drawing from objects as well as drawing from copies, and the same method is to be observed in both cases. If the subject before us is a drawing of a building, as in Fig. 32, begin by drawing the line of sight; this line may be ruled, but let it be the only ruled line in the work. Then place the point of sight, and mark in the distance of the nearest line to this point on each side of it, and then the succeeding ones, without passing over a single line. It is much easier to mark in the distances between lines close together than when they are wide apart. The whole distance from *p* s to *x* is made up of the intermediate distances, *p s a, a b, b c, c d*, and *d x*, and if we correctly determine all the intermediate distances, we undoubtedly obtain the whole distance correctly. The reason we commence upon the line of sight from the point of sight is, because the eye is on a level with the parts of the subject on and near this line and point, from which we gradually extend our drawing to the outer limits. Once more we must impress upon our readers that this plan is to be followed when drawing from both copies and Nature, as it must be evident, when drawing from Nature, that the parts opposite the eye can be

more easily and correctly arranged for the commencement of a drawing than those parts which are much above, or to the right or left of the eye. We have frequently seen beginners sit down to draw a house from a copy, and commence with the chimney, scratching away without having made any settlement as to the walls, doors, windows, etc., and when they got to the bottom find it altogether out of proportion. Who can expect anything but difficulty and failure, if he attempt to copy a drawing after this manner? No, we must copy from copies as we would copy from objects. When we are seated opposite the house of which we are about to make a drawing, it will naturally occur to the mind that the parts most in view, and best seen and understood, must be the first to be drawn, for from them the proportions of

with the wall have the same vanishing point. A question may be asked with regard to the point of sight, as to whether the drawing, Fig. 33 (or any other where the point of sight is the principal vanishing point), could have been correctly made if the point of sight had been to the left of the door at *g*, instead of the right? Certainly it could. We have stated the point of sight determines the part of the building which is directly opposite us from the spot where we stand. This spot, remember, is called the "station point." If the point of sight had been to the left in this subject, we should not have seen such a broad extent of the retiring side of the projecting wall, *c e*; if it had been at *h*, we should not be able to see this retiring side at all, since we cannot see round a corner. Therefore



all the rest of the subject are made and arranged. It very rarely occurs to any one, when drawing from the object, that to begin with the chimney is the right thing; then why should we do it when drawing from copies? When drawing a building, always commence with the parts opposite and on a level with the eye, and proceed to the foundation; then the superstructure may next be sketched, and the chimneys added last of all. Follow this practice in drawing from copies, and then you will not find any difficulty when you are drawing from objects.

When the question, "Where are we to begin?" refers to ornament, or to an arrangement of objects which can be placed on a table, look well at the whole first; then examine it carefully to discover the principal lines and characteristic angles, and begin with those nearest to the centre, passing outwardly from all sides of the centre gradually, without allowing any line of importance to be unnoticed, that is, unmarked.

In Fig. 32 the eye of the pupil will quickly recognise the lines which go to the point of sight, and he will observe that the retiring lines of the window thrown open at a right angle

it will be evident that four or five persons might sit in a row, all draw the same object, and all produce correct drawings, though not all alike, arising from the difference of position, each having his own point of sight, and each drawing his retiring lines to that point.

We said, when giving an explanation of the definitions or fixed principles relating to retiring lines and planes, that the last (Definition 11) should engage our attention at a future time; we will now endeavour to make it clear with the help of a drawing, after repeating the definition itself, which was as follows:—"All lines inclined with the horizon and with the picture plane, have their vanishing points above or below the line of sight, according to the angle they form with the horizon, their vanishing points being always on a line perpendicular to the vanishing point upon the line of sight, to which they would have retired had they been horizontal."

In Fig. 33 the learner will perceive that the inclined retiring lines are the lines of the roof *ab* and *cd*. If the roof had been flat—that is, horizontal—its line would have been *ce*, and would

be directed towards PS ; but one end being raised from e to d , the whole plane of the roof becomes inclined, consequently the vanishing point is raised according to the angle of inclination; thus $e d$ being determined, continue it until it cuts the perpendicular line drawn from the point of sight, PS , which will be at

improve, the hand by practice will soon become able to carry out with facility all that the mind and eye require.

We call perspective a portion of the grammar of Art, which assists us to draw correctly, as the grammar of a language helps us to speak and write correctly; and, without a grammar, it

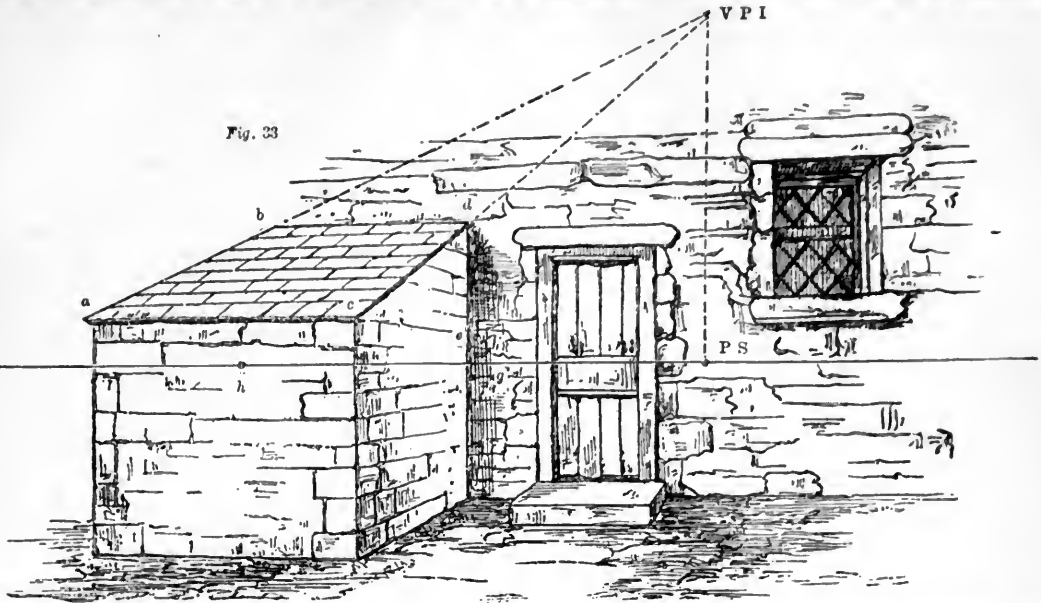


Fig. 33

VP . Then, as the opposite side, $a b$, is, in reality, parallel to $c d$, $a b$ must have the same vanishing point; and all inclined lines of the slates would, if produced, meet at the same point, namely, VP . We regret that at this stage we cannot give a geometrical proof of this fact, because we fear to confuse the mind of a beginner with too many rules; but we propose to give him this proof

would be as hopeless to succeed in the one as it would be in the other.

Our readers will begin to see the importance of having a vanishing point, by the help of which we are enabled to draw parallel retiring lines, both horizontal and inclined, accurately. The eye of the draughtsman may be very correct, but he must

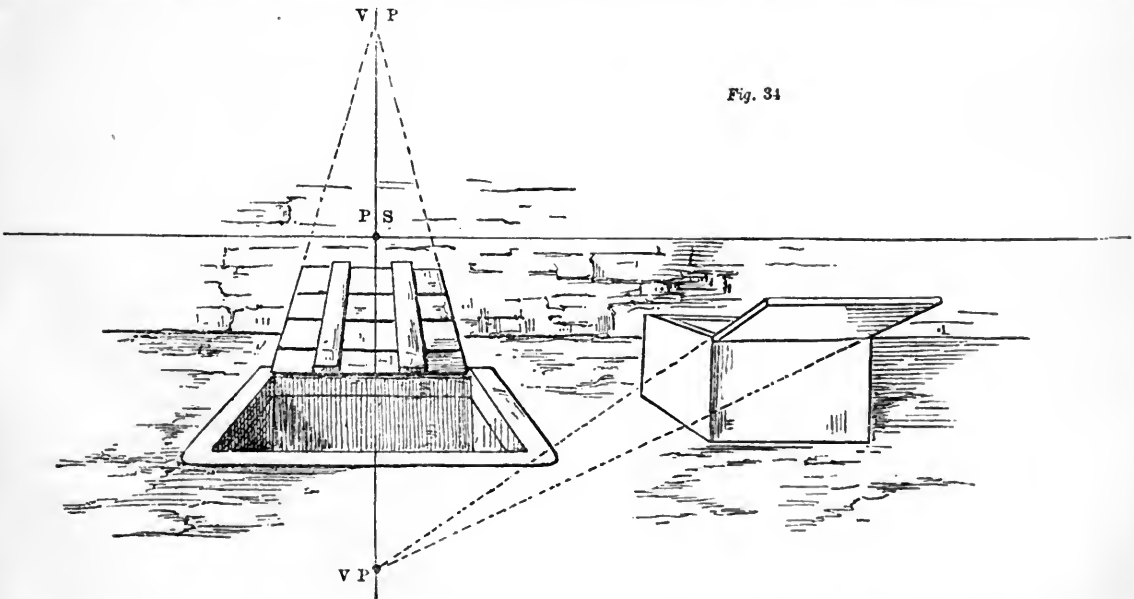


Fig. 34

hereafter. He must, in copying this example, mark the distance from e to d in the usual manner, draw $c d$, and carry his pencil on to the perpendicular from PS ; the vanishing point, VP , will then be a guide for the remaining inclined lines. The eye, in determining the positions and proportions of lines, is very deceptive; many have recourse to measuring, in order to ensure a correct outline. We beg the pupil not to measure; the understanding and the eye must be educated; and, as these

not disdain to use a help which is not only true in principle, but a ready and decisive way of setting at rest every doubt and uncertainty relating to the treatment of these lines, which without vanishing points would be very difficult to determine. In Fig. 34, the lid of the box to the right inclines downward—that is, the upper edge is nearest us—consequently, the VP of the lid is below the line of sight; the lid of the cellar retires upwards, having its VP above the line of sight.

LESSONS IN FRENCH.—VII.

SECTION I.—FRENCH PRONUNCIATION (*continued*).

III. NAME AND SOUND OF THE VOWELS.

43. O, o.—The o has, in French, three different sounds: short, as in *cob*; broad and prolonged, as in *cord*; and full, as in *coat*.

The short sound, as in *cob*, is the most common one. The o has a broad and prolonged sound, as in *cord*, when followed by an r, thus—*castor*, *encore*, etc. The full sound, as in *coat*, is always given to the o when it has a circumflex accent over it. It is also full when final, as in *coco*, *loto*, etc., and when followed by a mute consonant, as in *mot*, *dos*, etc.

EXAMPLES OF THE SHORT SOUND.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Bloc	Blok	Block.	Gobelet	Gob'-lay	Cup.
Bodine	Bo-deen	Keel.	Locale	Lo-kal	Local.
Botte	Bot	Boat.	Mode	Mod	Fashion.
Crosse	Kross	Crosier.	Morale	Mo-ral	Moral.

EXAMPLES OF THE BROAD, PROLONGED SOUND.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Castor	Kas-tor	Beaver.	Essor	Es-sor	Flight.
Butor	Bu-tor	Bittern.	Port	Por	Port.
Encore	Aun-kor	Again.	Bord	Bore	Shore.
Corde	Kord	Cord.	Corridor	Kor-ree-dor	Corridor.

EXAMPLES OF THE FULL SOUND ACCENTED.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Côte	Kote	Hill.	Prévôt	Pray-vo	Provost.
Dépôt	Day-po	Storhouse.	Rôle	Role	Part.
Dôme	Dome	Dome.	Rôti	Ro-tee (trill the r)	Roast-meat.
Drôle	Drôle (trill the r)	Rogue.	Tôt	To	Soon.
Nôtre	Notr'	Ours.	Trône	Trone	Throne.
Pôle	Pole	Pole.	Vôtre	Vostr'	Yours.

EXAMPLES OF THE FULL SOUND UNACCENTED.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Mot	Mo	Word.	Zéro	Zay-ro	Zero.
Dos	Do	Back.	Lot	Lo	Lot.
Repos	R'po	Repose.	Os	O	Bone.

44. U, u.—Name, U, u; sound, like the letter u in the English word *brunette*.

The sound of this vowel is peculiar, and very difficult for Englishmen to obtain. We have no sound in the English language which exactly corresponds to it. The nearest approach to it is the sound of u in the word *brunette*.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
But	Bu	Am.	Tribu	Tre-bu	Tribe.
Elu	Ay-lu	Elect.	Tribune	Tre-bune	Gallery.
Justice	Zhus-teess	Justice.	Une	Une	One.
Lune	Lune	Moon.	Unité	U-nee-tay	Unity.
Nature	Na-ture	Nature.	Urne	Urne	Urn.
Plus	Plu	Morc.	Vertu	Ver-tu	Virtue

45. Û, û CIRCUMFLEX.—Name, U, u; sound, like the letter u in the English word *brunette*.

It must be acknowledged, however, that the English letter u does not represent the correct sound of the French u, which is a combination of sounds not recognised in our language. Still, we must use it as the representative of the sound of the French u, for the want of a better one.

The following rule has also been given, and found useful.—The sound of the French u is based upon that of English e. Pronounce the English letter e as naturally as possible, observing at the same time the position of the internal organs of the mouth. Now keep these organs in the same position as nearly as possible, protrude the lips as if to whistle, drawing them nearly together at the same time, and then try to pronounce the English e again, which will give you the correct sound of the French u.

Practise often *aloud*, according to the directions of this rule, and success will crown your efforts. The rule has never yet failed to impart the correct sound of the French u in this manner, when seconded by the *patient*, *persevering*, and *determined* efforts of the pupil.

EXAMPLES.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Bûche	Bush	Log of wood.	Dû	Du	Due.
Brûlable	Bru-labl'	That is to be burnt.	Flûte	Flute	Flute.
Brûlot	Bru-lo	Fireship.	Fû	Fu	A cask.
Brûler	Bru-lay	To burn.	Mûre	Mure	Ripe.
Crû	Kru	Growth.	Sûreté	Sur-tay	Safety.
			Sûr	Sure	Certain.

SECTION XIV.—PLAN OF THE EXERCISES IN COMPOSING FRENCH.

Hitherto the student has been occupied exclusively in acquiring facts, forms, and principles, and in *translating*, by the aid of these, French into English, and again, English into French. Following still the plan of the work, let him now undertake the higher business of endeavouring to *compose* in French. With this intent, let him take some of the words given for this purpose in the following lists, and seek to incorporate them in sentences entirely his own. The words taken from the lists are to be used merely as things suggestive of thought. The *form* which, in any given case, the sentence may assume, should be determined by the models found in the sections preceding; for every sentence which the pupil has once mastered in the regular course of the sections, is, or should be, to him, a *model* on which he may at pleasure build other constructions of his own. Indeed, this constructing sentences according to models—that is, shaping one's thoughts according to the forms and idioms peculiar to a foreign tongue—is the true and only secret of *speaking and writing* that language well. The pupil, therefore, as he passes along in the ordinary course of the sections, should frequently be found applying his knowledge in the way of actually composing independent sentences; and thus he will soon acquire a facility and accuracy in the language, which is hardly otherwise attainable at all.

LIST OF WORDS FOR EXERCISES IN COMPOSING.

The words in the following lists are given as *suggestive* of thought. In conducting the exercise a particular word is selected, as *relieur* (bookbinder), and the student is required to compose a French sentence containing this term. He is duly notified that he is at liberty to take *any* thought suggested by the word, and to produce a sentence of *any* form found in any of the sections; regard being had all along to all the rules, notes, exceptions, etc., that may bear upon the case. Thus, adopting as a model the sentence, *Votre marchand est bien obligéant* (Sect. XVI., Résumé), or, *Le Danois a-t-il quelques pommes?* (Sect. XVII. 7), etc. etc., let him endeavour to produce others of the like kind.

A little practice will render the exercise both easy and interesting. It will soon come to be easy to incorporate not only one, but two, three, or more of the words taken from the lists.

1. PROFESSIONS ET MÉTIERS.—PROFESSIONS AND TRADES.

Acteur, m., actor.	Fruitière, f., fruit-woman.
Apothicaire, m., apothecary.	Gantier, m., glover.
Artiste, m., artist.	Graveur, m., engraver.
Aumônier, m., chaplain.	Horloger, m., clock and watchmaker.
Auteur, m., author.	Instituteur, m., institutrice, f., schoolmaster, mistress.
Barbier, m., barber.	Imprimeur, m., printer.
Bijoutier, m., jeweller.	Joaillier, m., jeweller.
Blanchisseuse, f., washerwoman.	Maçon, m., mason, bricklayer.
Boucher, m., butcher.	Maître d'école, m., schoolmaster.
Brasseur, m., brewer.	Manouvrier, m., day-labourer.
Brodeuse, f., embroiderer.	Marchand-de-chevaux, maquignon, m., horse-dealer.
Charbonnier, m., coalman.	Maréchal ferrant, m., farrier, shoeing-smith.
Charlatan, m., quack.	Maréchal, m., blacksmith.
Charetier, m., cartman.	Moissonneur, m., reaper.
Chaudronnier, m., coppersmith.	Musicien, m., musician.
Chirurgien, m., surgeon.	Naturaliste, m., naturalist.
Cordier, m., ropemaker.	Orateur, m., orator.
Corroyeur, m., currier.	Orfèvre, m., gold and silver smith.
Coutelier, m., cutter.	Pape, m., pope.
Couturière, f., seamster.	Pâtre, m., shepherd, herdsman.
Couvreur, m., slater, tiler.	Perruquier, m., hairdresser.
Curé, m., vicar.	Philosophe, m., philosopher.
Dentiste, m., dentist.	Poissonnier, m., poissonnière, f., fishmonger.
Drapier, m., draper.	Prédicateur, m., preacher.
Ecclesiastique, m., clergyman.	Prêtre, m., priest.
Épicier, m., grocer.	
Évêque, m., bishop.	
Faneheur, m., mower.	
Fripier, m., a dealer in old clothes.	

Raffineur de sucre, de sel, *refiner of sugar, of salt.*
 Ramoneur de cheminées, m., *chimney-sweeper.*
 Relieur, m., *bookbinder.*
 Savotier, m., *cobbler.*
 Sculpteur, m., *sculptor.*

Sellier, m., *saddler.*
 Serrurier, m., *locksmith.*
 Tapisier, m., *upholsterer.*
 Teinturier, m., *dyer.*
 Tisserand, m., *weaver.*
 Tonnelier, m., *cooper.*
 Vitrier, m., *glazier.*

2. L'HOMME.—MAN.

Ancêtres, m. pl., *ancestors.*
 Arrière-petit-fils, m., *great-grandson.*
 Beau-fils, m., *son-in-law, step-son.*
 Beau-frère, m., *brother-in-law.*
 Beau-père, m., *father-in-law, step-father.*
 Belle-fille, f., *daughter-in-law, step-daughter.*
 Belle-mère, f., *mother-in-law, step-mother.*
 Belle-sœur, f., *sister-in-law.*
 Bisaul, m., *great-grandfather.*
 Bru, f., *daughter-in-law.*
 Descendants, pl., *descendants.*
 Enfance, f., *childhood.*
 Époux, m., *husband, consort.*
 Famille, f., *family.*
 Femme, f., *woman, wife.*
 Fiançailles, f. pl., *betrothal.*
 Fiancé, m., *fiancée, f., betrothed.*

Gendre, m., *son-in-law.*
 Grand-père, m., *grandfather.*
 Grand-mère, f., *grandmother.*
 Jeune homme, m., *young man.*
 Jeune fille, f., *young woman, girl.*
 Jeunesse, f., *youth.*
 Jumeau, m., *jumelle, f., twin.*
 Marraine, f., *godmother.*
 Mari, m., *husband.*
 Naissance, f., *birth.*
 Nourrice, f., *nurse.*
 Nouveau marié, *bridegroom.*
 Nouvelle mariée, *bride.*
 Orphelin, m., *orpheline, f., orphan.*
 Parrain, m., *godfather.*
 Petit-fils, *grandson.*
 Petite-fille, *granddaughter.*
 Veuf, m., *widower.*
 Veuve, *widow.*
 Vieillesse, f., *old age.*

SECTION XV.—COMPARISON OF ADJECTIVES, ETC.

1. Adjectives and adverbs are always compared in French, as they often are in English, by means of adverbs.

Plus beau, plus souvent, *Handsome, oftener.*

2. The comparative of equality is expressed by aussi—que, as, or *as much—as*, before an adjective, an adverb, or a pronoun.

Aussi aimé que son frère, *As much loved as his brother.*

Autant de—que de, *as much, or as many—as*, before a substantive.

Autant de crayons que de plumes, *As many pencils as pens.*
 Autant de science que de modestie, *As much science as modesty.*

3. The comparative of superiority is expressed by plus—que, *more—than*, before an adjective, an adverb, or a pronoun.

Il est plus docile que son frère, *He is more docile than his brother.*

Plus de—que de, *more—than*, before a noun.

Plus de bonté que de jugement, *More goodness than judgment.*

4. The comparative of inferiority is expressed by pas si; pas aussi; moins—que, *not so; not so; less—than*, before an adjective, an adverb, or a personal pronoun.

Vous n'êtes pas si grand que votre sœur, *You are not so tall as your sister.*

Il est moins poli que son cousin, *He is less polite than his cousin.*

Pas tant de; pas autant de; moins de—que de, *not so much, or so many; less; fewer—than*, before a substantive, a demonstrative, or possessive pronoun.

Il n'a pas tant de courage que de patience, *He has not so much courage as patience.*

Il a moins d'argent que de viande, *He has less money than meat.*

5. Tout autant—que is used for *quite as many—as; as much, just as much, or as many:*

J'en ai tout autant que vous, *I have quite as many as you.*

RÉSUMÉ DE EXEMPLES.

Avez-vous autant de livres anglais, que de livres italiens? *Have you as many English books as Italian books?*

J'en ai tout autant. *I have just as many.*

J'ai autant de ceux-ci que de ceux-là. *I have as many of these as of those.*

Il est aussi heureux que vous. *He is as happy as you.*

Avez-vous plus d'assiettes que de plats? *Have you more plates than dishes?*

J'ai plus de ceux-ci que de ceux-là. *I have more of these than of those.*

Est-il plus complaisant que ses frères? *Is he more obliging than his brothers?*

Le Français a-t-il moins de légumes que de fruits? *Has the Frenchman fewer vegetables than fruits?*

Il a moins de livres que de manuscrits. *He has fewer books than manuscripts.*

Il n'a pas autant de ceux-ci que de ceux-là? *He has not so many of these as of those.*

En a-t-il moins que votre frère? *Has he less (of them) than your brother?*

Il en a tout autant. *He has quite as many.*

VOCABULARY.

Bleu, -e, <i>blue.</i>	Fer, m., <i>iron.</i>	Manuscrit, m., <i>manuscript.</i>
Courage, m., <i>courage.</i>	Foinage, m., <i>cheese.</i>	Maréchal, m., <i>blacksmith.</i>
Davantage, <i>more.</i>	Hollandais, m., <i>Dutchman.</i>	Modestie, f., <i>modesty.</i>
Drap, m., <i>cloth.</i>	Italien, -ne, <i>Italian.</i>	Soie, f., <i>silk.</i>
Ennemi, m., <i>enemy.</i>	Jardin, m., <i>garden.</i>	Très, <i>very.</i>
Espagnol, -e, <i>Spaniard.</i>	Manteau, m., <i>cloak.</i>	Verre, m., <i>glass.</i>
Estampe, f., <i>engraving.</i>		

EXERCISE 25.

1. Êtes-vous aussi content que votre frère? 2. Je suis aussi content que votre frère. 3. Votre père a-t-il autant de courage que de modestie? 4. Il a moins de modestie que de courage. 5. Le libraire a-t-il autant de manuscrits que d'estampes? 6. Il a plus de celles-ci que de ceux-là. 7. A-t-il autant d'amis que d'ennemis? 8. Il a plus de ceux-ci que de ceux-là. 9. A-t-il autant de pain que de fromage? 10. Il a tout autant de celui-ci que de celui-là. 11. Le maréchal a-t-il plus de chevaux que votre frère? 12. Il en a plus que mon père et plus que mon frère. 13. N'avez-vous pas froid? 14. Non, Monsieur, je n'ai pas froid, j'ai très chaud. 15. Avez-vous deux manteaux de drap? 16. J'en ai un de drap et un de velours bleu. 17. N'avez-vous pas plus de verres que d'assiettes? 18. Nous en avons davantage.* 19. Le maréchal a-t-il plus de fer que d'acier? 20. Il n'a pas autant de celui-ci que de celui-là. 21. Il a moins de celui-ci que de celui-là. 22. Les Hollandais ont-ils de beaux jardins? 23. Leurs jardins sont très beaux. 24. Les jardins des Italiens sont plus beaux que ceux des Espagnols.

EXERCISE 26.

1. Are you more attentive than your sister? 2. I am not so attentive as your brother. 3. Have you more courage than my brother? 4. I have quite as much. 5. Has the blacksmith as much money as iron? 6. He has more of the latter than of the former. (Sect. VIII. 5.) 7. Has he more modesty than the Spaniard? 8. He has more. 9. He has more than your friend's sister. 10. Are you not cold, Sir? 11. No, Sir, but I am afraid and sleepy. 12. Has the Dutchman more cheese than the Italian? 13. He has more cheese and more money. 14. Have you as much English silk as Italian silk? 15. I have more of this than of that. 16. Who has more friends than the Spaniard? 17. Your friend has more. 18. Has the Spaniard as much of your money as of his? 19. He has less of mine than of his. 20. Have we more silk cloaks than cloth cloaks? 21. We have more of these than of those. 22. Have you good cloaks? 23. Yes, Sir, I have good cloaks, good hats, and good leather shoes. 24. Have you more plates than dishes? 25. I have not more plates than dishes, but I have more glasses than plates. 26. Are you not very cold? 27. No, Sir, I am neither cold nor warm. 28. Has your carpenter wood? 29. Yes, Sir, he has wood, money, cheese, and meat. 30. Who has more money than the carpenter? 31. The Dutchman has more. 32. Who has more engravings than books? 33. The bookseller has more of these than of those. 34. Are you as attentive as your friend? 35. I am more attentive than my friend.

LESSONS IN ENGLISH.—IV.

PARSING AND COMPOSITION.

By *parsing* is meant the telling of the parts (pars, Latin, a part) of speech of which a composition consists. Parsing, besides assigning the parts of speech, states the condition in which the words are, and the relations in which they stand. In its complete form, parsing cannot be done until the student is acquainted with the entire grammar. But he may parse as he goes, and as far as he goes. Viewed in this light, parsing is a sort of practical review made by the student of what he has done at each step of his progress. Such a practice, if pursued to the end, leads to a system of complete parsing. And such a practice will greatly conduce to a thorough familiarity with the

* *Davantage* means *more*. It can never be placed before a noun. It may be used instead of *plus* at the end of a sentence.

English or any other tongue. Through such a practice, I shall endeavour to conduct my readers.

Let it, then, be understood that every exercise given for parsing is intended to embrace everything that has previously been taught. For instance, we have been occupied with the definition and the classification of the parts of speech considered as members of a simple sentence. In the first lesson on parsing, then, you are expected to make a practical application, in the sentences supplied for the purpose, of the information already conveyed. Similar must be your proceeding in every successive lesson, always embracing the whole past in the present. I will give an instance. Let the sentence to be parsed be

A virtuous mind dislikes flattery.

Viewing the sentence, first in relation to the parts of speech, I enter into its structure and mark it thus :—

SUBJECT.	PREDICATE.
A virtuous mind	dislikes flattery.

I then take up each word in succession, and give as full an account of it as I can, e.g. :—

A is the indefinite article, abbreviated from *an*, which has the same root as *one*; *an* is used before words beginning with a vowel, and *a* before words beginning with a consonant.

Virtuous is an adjective, qualifying the word *mind*; it comes from the Latin *virtus*, which originally meant *valour*, the conduct of *vir*, that is, *a man*.

Mind is a noun, or name, forming, with its adjective *virtuous* and the article *a*, the subject to the verb *dislikes*.

Dislikes is a verb; it is a verb because it avers or declares something, and together with *flattery*, it constitutes the predicate of the proposition, or that which is stated of the subject, *virtuous mind*.

Flattery is a noun, being the object to the verb *dislikes*. The whole forms a simple sentence.

EXERCISES FOR PARSING.

A nimble tongue often trips. The language of truth is plain. Truth is never evasive. Flattery is the food of vanity. The smiles of the world are deceitful. Constancy in friendship denotes a generous mind. Fidelity is inseparable from love. One vice is more expensive than many virtues. Wisdom is never sullen. The proper test of friendship is adversity. The number of offenders lessen the disgrace of crime. I will praise the name of God with a song. Go to the ant, thou sluggard. The wise in heart will receive commandments. The way of the Lord is strength to the upright. A soft answer turneth away wrath. The patient ox quietly submits to the yoke. The love of money is the root of all evil. Unthinking persons care little for the future. Still waters are commonly deepest.

After having carefully gone through the exercises in parsing, and so ascertained that you are well acquainted with the previous instruction, you should, at the end of each successive lesson or section, attempt to write a short composition out of your own head. For this purpose, you may choose as your subject some one of the sentences given you to parse, and express your thoughts upon it as well as you can. At first, never mind that your words are few—never mind that your sentences are ungrammatical—never mind that your thoughts are poor and superficial. Only write something, and let that which you write be your own. If you wanted a lesson in spelling, or in tracing letters, then transcription would be right. But you have to practise in composition. Composition is the expression of thought; therefore think, and then put down what you think; and put down nothing but your own thoughts.

You will be assisted in finding materials for composition, if you put to your own mind some questions. Suppose that the theme or subject on which you intend to write is this proposition, or

THEME.

One vice is more expensive than many virtues.

Ask these questions :—

1. Do I know the meaning of each word and the import of the whole?
2. Is the statement true?
3. If true; on what grounds, or for what reasons?
4. If not true; can I state it so as to make it true? if not, can I show that it is untrue?
5. If true; can I write down any fact or anecdote exemplifying its truth? something that I have read? heard? known?
6. If true; can I, by blending together reasoning and fact, produce an essay illustrative of its truth?

The great difficulty with young writers is to find materials. In consequence, historical subjects are most suited to them. But in historical subjects, mere copying is easy, and hence it is apt to be substituted for original composition. It is, then, dangerous to entrust boys with mere historical subjects. As, however, I write for young men and young women, I shall supply historical subjects; and, in order that the source of information may be accessible to all my scholars, I shall take some of these subjects, at least at the first, from the Bible. And narrative being the easiest form of composition, I shall begin with supplying you with subjects for short narratives. Here, then, is your first

HISTORICAL THEME.
God made the world.

Now this is the method you are to observe. Read carefully, and as often as necessary, the account given in the commencement of the book Genesis of the creation of the universe. When you have impressed the record on your mind, close the Bible, and, taking slate and pencil, write down as much as possible in your own words, and in simple sentences, the substance of the account. Look over what you have written and correct it. Having corrected it according to the best of your own judgment, compare it with the original. Compare it first in relation to the facts; if in respect to the facts your report is not correct, make it correct. Compare it next in regard to the spelling, and correct your spelling by the spelling of the Bible. Again compare it as to the words. You have one word, the Bible has another. If your word is positively inaccurate, strike it out, and put in its place the scriptural word. But a deviation in word on your part is desirable rather than not, for it shows that you have comprehended the meaning of the passage, and that you possess, instead of a mere slavish imitation, a power of reproduction which may in time enable you to write truly original compositions. If, therefore, your word is only somewhat less appropriate than the word in the sacred page, let it stand; but at the same time ask yourself, and endeavour to ascertain, why your word is less suitable. Should you, as you can hardly fail to do, at least as your mind grows and your taste improves, meet in the Scriptures with forms of expression which seem to you specially happy or specially forcible, transcribe them into a little note-book, kept in the pocket, ever at hand to receive *memoranda*, or *things deserving to be remembered*, things requiring explanation, things illustrative of important truth, etc.; and having transcribed them, look at them from time to time until you have made them permanently your own.

There is what may be called *domestic history*, out of which you may draw a constant supply of useful and interesting materials. By domestic history I mean the occurrences and events of your own home, even in their humblest details. Here you may find themes enough. Take as a

DOMESTIC THEME.
My own history during a day.

Write down on your slate every minute particular, such as the time you rose, the meals you took, where you took them, the times at which you left the house, where you went to, what you did, whom you met, with whom you conversed, what was said, etc., until the day's duties and pleasures are closed and you retire to your bed. Do not commit the folly of thinking such a subject unworthy of your notice. You are learning to inform yourself, and can begin well only by beginning with that with which you are familiar. If you are poetically inclined, you may narrate

A morning walk.

But begin with prose; let rhyme alone for a while; it is very easy to tag together similar sounds. It is good sense and good feeling expressed in correct English that I want to lead you to, and for so important a purpose practice in prose is indispensable.

But whatever your theme is, be very rigid with yourself; pass no error; correct all mistakes; be as particular as if you were writing for the press. And having, according to the best of your ability, made your exercise correct, copy it out into an essay-book—a book kept exclusively to receive your attempts at composition; copy it into the book as neatly and as well in every respect as you can. The attention to neatness, which I recommend, is closely connected with the attainment of accuracy. You will find benefit as well as pleasure in looking back on your

earlier efforts, and comparing together your power of execution as it was at different periods.

It may be desirable to show you in an example how an humble theme may be well treated in composition. I take for the purpose one of Pestalozzi's "Paternal Instructions." It is on the domestic business of

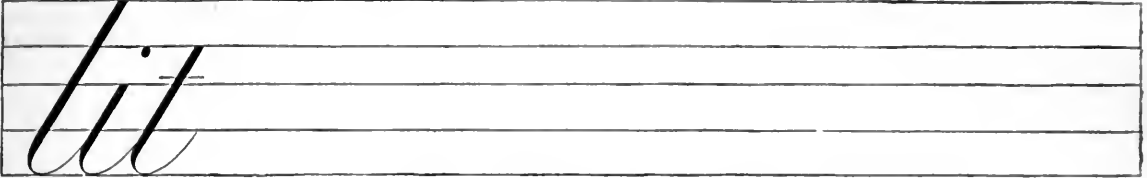
BAKING.

Baking, like all cooking, is a fruit of civilisation. The savage knows of no preparation for his food; he eats everything raw, like the brutes; and accordingly he eats it like them, with brutal greediness. A proper diet is possible only when the food is prepared by art. Baking, therefore, and every other sort of cooking, is a far more important business than at first sight it appears to be. By baking we procure the most wholesome of all nutriment—that bread which, as a common necessary of life, we daily ask of God in the most comprehensive of all prayers.

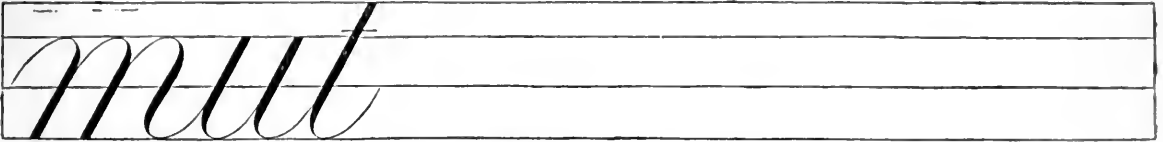
It may be useful to beginners to see the same thought expressed in simple propositions—that is, propositions or sentences, not having more than one subject and one object.

BAKING.—*The same in simple sentences.*

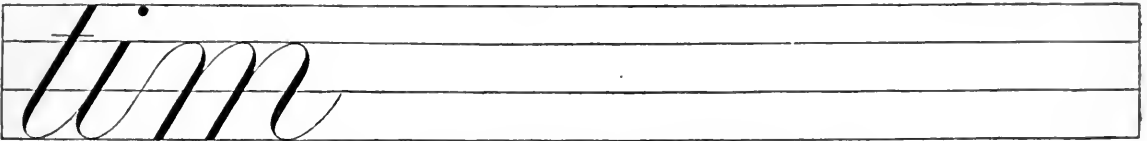
Baking is a fruit of civilisation. Indeed, all cooking is a fruit of civilisation. The savage knows of no preparation for his food. The savage eats everything raw. The brutes eat everything raw. The brutes also eat with greediness. With similar greediness does the savage take his food. Art may be employed in preparing food. In a proper diet food is prepared by art. Baking, therefore, is an important business. Indeed, cooking in general is an important business. Cooking is thought to be important. Still more important in reality is baking. By baking we procure the most wholesome of all nutriment. By baking we obtain bread. Bread is a common necessary of life. We daily ask bread of God. We ask bread of God in the most comprehensive of all prayers.



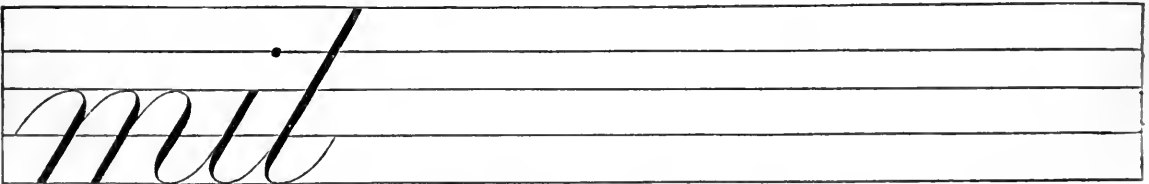
COPY-SLIP NO. 20.—COMBINATION OF THE LETTERS i, i, t.



COPY-SLIP NO. 21.—COMBINATION OF THE LETTERS m, u, t.



COPY-SLIP NO. 22.—COMBINATION OF THE LETTERS t, i, m.



COPY-SLIP NO. 23.—COMBINATION OF THE LETTERS m, i, l.

LESSONS IN PENMANSHIP.—VII.

OUR readers, who have accompanied us thus far in our lessons in Penmanship, finding that they are now beginning to form letters composed of the bottom-turn, the top-turn, and the top-and-bottom turn, with comparative ease, may be wishing to hasten on a little more rapidly, and to be trying their hand at writing capitals as well as the small letters. This is a laudable wish, without doubt, and one which will be gratified in due time; but, for the present, our learners must be content to advance slowly, remembering that slow progress is the surest and safest method of attaining proficiency in any art, as the pupil is thereby saved from the danger of hurrying on from one point to another, for the sake of novelty, before he is thoroughly grounded in the rudiments of the art that he is seeking to acquire. Many who now find themselves able to make a thick down-stroke of uniform breadth throughout, such as is found in the letter l, would lose much of the facility with which they are now imi-

tating the copies we have placed before them, if they tried to copy capital letters at this stage of their instruction. The reason is this, that the letters which the pupil has hitherto been copying consist, for the most part, of a *straight* stroke, while there is not a single capital letter that is not formed of *sweeping curves*, which cannot be made in a sufficiently graceful manner, unless the learner has obtained that pliancy of wrist, freedom of execution, and command over his pen, which can only be acquired by constant practice on the simpler letters. If he were now to try to trace out the curves, that form the letter **A**, he would find that his hand would begin to shake, and his down-stroke be crooked and ragged throughout, owing to the change of direction in which he is compelled to turn his pen; and when he returned to the easier letters, he would further find that the check he has received had rendered him less able to write letters that he had previously formed with ease. For this reason we continue our copies in large text, as exhibited above.

LESSONS IN ARITHMETIC.—VII.

ABRIDGED METHODS OF MULTIPLICATION AND DIVISION
(continued).

6. To divide by 10, or any power of 10.

If the dividend have more ciphers for its right-hand figures than occur in the power of 10 by which it is to be divided, we need only take away from it the number of ciphers in the divisor to obtain the quotient. Thus, 873000 divided by 100 and 1000 respectively, gives quotients 8730 and 873. But suppose that the dividend has no ciphers for its right-hand figures. Take, for instance, the case of 87346 divided by 100. Cut off the two right-hand figures—viz., 46—from the dividend; then 873 will be the quotient and 46 the remainder. This is evident by exhibiting the process analytically, thus:—

$$\begin{aligned} 87346 &= 87300 + 46 \\ &= 873 \times 100 + 46 \end{aligned}$$

Therefore 873 is the quotient, and 46 the remainder.

The same rule applies to dividing by any power of 10.

7. Next, suppose the divisor to be not a power of 10, but to have ciphers for its extreme right-hand figures; for instance, to divide 2764 by 300. There being two ciphers in 300, cut off the two right-hand figures—viz., 64—from the dividend, and divide the 27 by 3; this gives 9, which will be the quotient, and the 64 will be the remainder. This is evident by exhibiting the process analytically, thus:—

$$\begin{aligned} 2764 &= 2700 + 64 \\ &= 9 \times 300 + 64 \end{aligned}$$

Therefore 9 is the quotient, and 64 the remainder.

8. In this last case there is no remainder after dividing 27 by 3. But suppose we have 2964 to divide by 300:—

Proceeding as before, cutting off the 64 and dividing 29 by 3, we get a quotient 9 and a remainder 2. But evidently this remainder is in reality 2 hundreds, or 200; and therefore, since 64 is also left over, the whole remainder will be 264. Hence, in this case, any remainder which is left must be prefixed to the figures cut off, in order to give the whole remainder. The process is exhibited analytically as follows:—

$$\begin{aligned} 2964 &= 2900 + 64 \\ &= 2700 + 200 + 64 \\ &= 9 \times 300 + 264 \end{aligned}$$

Hence 9 is the quotient, and 264 the remainder.

9. We subjoin one other example:—

To divide 25329483 by 723000.

Cutting off three figures, viz., 483, from the dividend—since there are three ciphers in the divisor—we divide 25329 by 723, by the common process of Long Division. This gives a quotient 35, and a remainder 24. Hence the required quotient is 35, and the whole remainder will be got by prefixing the 24 to the figures 483 cut off from the dividend. Hence the whole remainder is 24483. The process is analytically exhibited as follows:—

$$\begin{aligned} 25329483 &= 25329000 + 483 \\ &= 35 \times 723000 + 24000 + 483 \\ &= 35 \times 723000 + 24483 \end{aligned}$$

Hence the quotient is 35, and the remainder 24483.

EXERCISE 13.

- In one pound there are ten florins; how many pounds are there in 200 florins? In 340 florins? In 560 florins?
- In one metre there are 100 centimetres; how many metres are there in 65000 centimetres? In 765000 centimetres? In 4320000 centimetres?
- Work the following sums in division:—

1. 26750000 ÷ 100000.	3. 582367180309 ÷ 100000000.
2. 144360791 ÷ 1000000.	4. 3360000 ÷ 17000.
- How many vehicles at 70 pounds apiece, can you buy for 7350 pounds?
- How many barrels will it take to pack 36800 pounds of pork, allowing 200 pounds to a barrel?
- We do not go into a detailed explanation of the following artifices, which are often useful in performing calculations without writing, or in mental arithmetic, as it is called. The truth of them will readily be seen by any one who has mastered the previous processes, and their explanation will be a useful exercise for the student.

11. To multiply by 5.—Annex 0 to the multiplicand, and divide by 2.

To divide by 5.—Multiply by 2 and cut off the last figure, half of which will be the remainder.

To multiply by 15.—Annex 0, and to the result add its half.

To divide by 15.—Multiply by 2, cut off the last figure, and divide by 3; prefix the remainder so obtained to the figure cut off; half the number so formed will be the true remainder.

EXAMPLE.—To divide 327 by 15:—

$$\begin{array}{r} 2 \times 327 = 654 \\ 3 \overline{) 654} \end{array}$$

21 quotient,

Leaving 2 as remainder from 65.

Putting this 2 before the figure cut off—viz., the 4—we get 24, which divided by 2 gives 12, the full remainder.

To multiply by 75.—Annex two ciphers to the dividend, and subtract from it its fourth part.

To divide by 75.—Multiply by 4, cut off two figures, and divide by 3. Place before the two figures cut off the remainder got by dividing by 3, and divide the number so obtained by 4; this will give the whole remainder.

Thus, to divide 2351 by 75, we have—

$$\begin{array}{r} 2351 \\ 4 \overline{) 2351} \end{array}$$

$$3 \overline{) 94,04}$$

31 for quotient,

With remainder 1 from the 94.

Prefixing this 1 to the 04 cut off, we have 104, which divided by 4 gives 26, the full remainder.

To multiply by 125.—Annex three ciphers, and divide by 8.

To divide by 125.—Multiply by 8, and cut off the three right-hand figures. These three figures divided by 8 give the remainder, the other figures being the quotient.

The truth of these processes will be better understood after the learner has read the chapter on Fractions.

EXERCISE 14.

1. Work the following sums in division by means of the artifices shown above:—

- | | | |
|----------------|----------------|------------------|
| 1. 6035 ÷ 5. | 7. 3875 ÷ 125. | 13. 7853 ÷ 55. |
| 2. 32561 ÷ 5. | 8. 1125 ÷ 75. | 14. 4860 ÷ 25. |
| 3. 1256 ÷ 15. | 9. 3825 ÷ 225. | 15. 94880 ÷ 25. |
| 4. 3507 ÷ 45. | 10. 8450 ÷ 5. | 16. 25426 ÷ 125. |
| 5. 2350 ÷ 25. | 11. 43270 ÷ 5. | 17. 2876 ÷ 175. |
| 6. 42340 ÷ 25. | 12. 2673 ÷ 35. | 18. 8250 ÷ 275. |

12. To multiply by a number represented by any number of nines repeated.

Annex as many ciphers to the multiplicand as there are nines in the multiplier, and from the number so formed subtract the original number. Thus, to find 49276 × 99 —

$$\begin{array}{r} 4927600 \\ 49276 \text{ subtract} \\ \hline 4878324 \text{ Answer.} \end{array}$$

EXERCISE 15.

1. Work the following examples in multiplication:—

- 4791 × 99. | 2. 7301 × 999. | 3. 6034 × 999. | 4. 463 × 9999.

13. To multiply in one line by a number expressed by two figures.

To the product of any figure in the multiplicand, multiplied by the units' figure of the multiplier, add the product got by multiplying the figure next on the right of the figure first mentioned by the figure in the tens' place of the multiplier. Write down the units' figure of the number obtained by this process, and carry on the other (or others) as in common multiplication.

EXAMPLE.—To multiply 5768 by 73 in one line:—

$$\begin{array}{r} 5768 \\ 73 \end{array}$$

$$421064$$

Thus, we say—

- 3 × 8 = 24; write down 4 and carry 2
- 3 × 6 + 2 = 20; 20 ÷ 7 × 8 = 76; write down 6 and carry 7
- 3 × 7 + 7 = 28; 28 ÷ 7 × 6 = 70; write down 0 and carry 7
- 3 × 5 + 7 = 22; 22 ÷ 7 × 7 = 71; write down 1 and carry 7
- 7 × 5 + 7 = 42, which write down.

A little consideration will show the truth of this method. An analogous method can be applied to multiplication by more than two figures, but it is liable to cause confusion.

EXERCISE 16.

1. Work the following examples in multiplication by the above method:—

- | | | |
|----------------|----------------|----------------|
| 1. 3251 × 29. | 4. 38256 × 86. | 7. 7594 × 78. |
| 2. 25039 × 62. | 5. 4028 × 37. | 8. 70257 × 89. |
| 3. 4275 × 93. | 6. 5039 × 59. | |

14. Multiplication in two lines by a number of four figures.

A multiplication by four figures can often conveniently be effected in two lines as follows:—

Multiply in one line by the figures in the units' and tens' places, as in Art. 13, and then again in one line by those in the hundreds' and thousands' places, placing the second line under the first two places to the left.

EXAMPLE.—Multiply 3456 by 2342.

$$\begin{array}{r}
 3456 \\
 2342 \\
 \hline
 145152 \text{ (= } 3456 \times 42) \\
 79438 \text{ (= } 3456 \times 23, \text{ or by } 2300, \text{ if the} \\
 \text{ciphers were included.)} \\
 \hline
 8093952
 \end{array}$$

EXERCISE 17.

1. Work the following examples in multiplication by the above method:—

- | | | |
|-----------------|-------------------|-------------------|
| 1. 1665 × 8234. | 3. 324325 × 5442. | 5. 69412 × 9543. |
| 2. 7876 × 3963. | 4. 2783 × 9319. | 6. 256721 × 8532. |

15. Multiplication when the number formed by the figure or figures of the multiplier on the extreme right hand is a factor of that formed by the other figures.

Multiply first by the figure in the units' place, and then this partial product by the other factor, as follows:—

EXAMPLE 1.—Multiply 5389 by 427.

$$\begin{array}{r}
 \text{Here } 42 = 6 \times 7. \quad 5389 \\
 \quad \quad \quad \quad \quad 427 \\
 \hline
 37723 \text{ (= } 7 \times 5389) \\
 226338 \text{ (= } 6 \times 7 \times 5389, \text{ the placing} \\
 \text{of the figures making it really} \\
 3301103 \quad 6 \times 70 \times 5389).
 \end{array}$$

EXAMPLE 2.—Multiply 27432 by 9612.

$$\begin{array}{r}
 \text{Here } 96 = 8 \times 12. \quad 27432 \\
 \quad \quad \quad \quad \quad 9612 \\
 \hline
 329184 \times 8 \text{ for second line} \\
 2633472 \\
 \hline
 263676384
 \end{array}$$

16. If the multiplier be such that the number formed by the figure or figures on the extreme left hand is a factor of the rest, we can perform the multiplication by a similar method.

EXAMPLE 1.—Multiply 53496 by 1236.

Here 12 is a factor of 36; $36 = 3 \times 12$.

Commencing then with 12 as a multiplier, we proceed, as in Lesson IV. Art. 9, to multiply by 12, and next we multiply this product by 3.

$$\begin{array}{r}
 53496 \\
 1236 \\
 \hline
 641952 \text{ = product by } 1200 \\
 1925856 \text{ = product by } 3 \times 12 \\
 \hline
 66121056
 \end{array}$$

EXAMPLE 2.—Multiply 53496 by 1236144.

The process will be the same as in the last example, except that there will be a third line formed by multiplying the second line by 4, since $144 = 4 \times 36$. This must be written three places to the right, since the second line really represents the product by 36000.

$$\begin{array}{r}
 53496 \\
 1236144 \\
 \hline
 641952 \\
 1925856 \\
 7703424 \\
 \hline
 66128759424
 \end{array}$$

EXERCISE 18.

1. Work the following examples in multiplication by the above method:—

- | | | |
|-----------------|-----------------|------------------|
| 1. 125 × 255. | 4. 4825 × 1352. | 7. 61234 × 1296. |
| 2. 8812 × 648. | 5. 754 × 549. | 8. 6521 × 1957. |
| 3. 5194 × 1080. | 6. 945 × 7711. | |

OUR HOLIDAY.

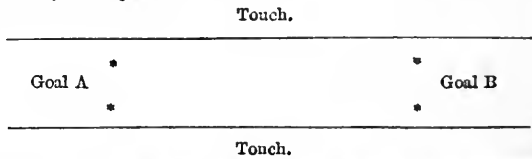
WE leave for the present the subject of gymnastics, which has been the topic of our last two papers, and turn for our recreation to a highly popular game at this season of the year, viz.,

FOOTBALL.

Football is one of the oldest of our English sports, having been played all over the country for some hundreds of years. The rough methods in vogue of playing the game brought it under the censure of one of our monarchs, King James I., but it survived his displeasure, and its popularity, if possible, increased. Towns and villages were pitted against each other—not, as in the case of cricket, through the medium of a few individuals chosen to represent them, but by the aid of nearly all their able-bodied representatives. For football is a game in which a large number of persons can join, and, where space was unlimited, an unlimited number could play. One or two vestiges of the ancient game still linger in Old England, where, on a certain day of the year, the more active members of the population turn out in a body, and play at football in the olden style. But this custom is now considered "more honoured in the breach than the observance," and football occupies a similar position to other games as a holiday recreation.

Many modes of playing football are in use, especially in our chief public schools, each of which has its own cherished rules and practices differing from the rest. The Eton game differs from that played at Harrow, and both from the famous game of Rugby. Winchester, Marlborough, and Shrewsbury, too, have their peculiar styles, and what is allowed in some is strictly forbidden in others.* This variation in practice has been a disadvantage to the game, and several attempts have been made to bring about uniformity. In the case of the chief schools we have mentioned, little progress towards it has yet been effected; but something has been done by an association of football clubs in various parts of the kingdom, which have adopted a set of rules for their guidance. These rules are a digest of all other codes in use, and to these we shall presently refer.

In all football play, whatever the difference of the practice in particular points of the game, the object sought to be gained by the rival players is the same, namely, to drive the ball to the base or goal of their opponents. This will be best understood by a diagram of the ground, which in length should be from 50 yards upwards:



Here the lines drawn on each side represent the boundary within which the game is played. These lines are usually marked out by flags, and the space beyond them is technically known as touch. The two dots towards either end show the position of two posts, which constitute the goal of one of the two parties, say A or B, into which the players are divided. The play begins in the centre of the ground, and the object of each party is to kick the ball through the goal posts of their opponents. On attaining this, the game is won for the side that accomplishes it. It may be renewed again, the parties then changing goals, in order that each in turn may have any advantage arising from fall of ground, direction of wind, etc.; and at the termination of the play each side counts so many games as goals may have been secured by its players. Each side usually has its captain, and its goal-keeper, whose especial duty it is to guard the goal, as far as may lie in his power, when the ball is driven towards it.

The balls are usually made of ox-bladders covered with leather, but india-rubber is sometimes employed for the lining. A good ball for the game may be obtained at from 8s. to 12s.

The rules which we subjoin will be sufficient explanation of the precise mode of commencing and continuing the play. But we may remark with regard to all rules, that the more nearly

* Our readers wishing to obtain information as to the practices of the different schools, will find an account of them in "Cassell's Illustrated Family Paper," for December 31st, 1864.



FOOTBALL.

the practice of the players is confined to the impelling of the ball by *kicks alone*, and the more closely the kicks are confined to *the ball*, and not distributed among the players, the more perfect is the game itself, and the more likely to retain and increase its popularity. It is the barbarous custom (we can use no other term), in some celebrated modes of play, to allow the practice of *hacking*, or kicking freely at the shins or legs of an opponent, in certain positions of the game, in order to disable him from carrying on the ball. From this custom serious consequences have occasionally resulted. Accidents will occasionally happen, from the nature of the game, under any circumstances; and that it requires courage to make an efficient player, and a disregard of the chance of a little danger, will not be considered a drawback by high-spirited youths who engage in it. But there is no occasion to add to the probability of personal injury by rules and practices which seem to invite it.

The following are the laws of the game, as determined in February, 1867, by a general meeting of representatives of clubs forming the Football Association. These laws, however, it is understood, are subject to such modifications as future experience may suggest:—

1. The maximum length of ground shall be 200 yards, the maximum breadth shall be 100 yards; the length and breadth shall be marked off with flags; and the goals shall be upright posts, eight yards apart, with a tape across them eight feet from the ground.

2. The winners of the toss shall have the choice of goals. The game shall be commenced by a place kick from the centre of the ground by the side losing the toss. The other side shall not approach within ten yards of the ball until it is kicked off.

3. After a goal is won, the losing side shall kick off, and goals shall be changed.

4. A goal shall be won when the ball passes between the goal posts, under the tape, not being thrown, knocked on, or carried.

5. When the ball is in touch, the first player who touches it shall throw it from the point on the boundary line where it left

the ground, in a direction at right angles with the boundary line, and it shall not be in play until it has touched the ground; and the player throwing it shall not play it until it has been played by another player.

6. When a player has kicked the ball, any one of the same side who is nearer to the opponent's goal line is out of play, and may not touch the ball himself, nor in any way whatever prevent any other player from doing so until the ball has been played, unless there are at least three of his opponents between him and their own goal; but no player is out of play when the ball is kicked from behind the goal line.

7. When the ball is kicked behind the goal line, it must be kicked off by the side behind whose goal it went, within six yards from the limit of their goal. The side who thus kick the ball are entitled to a fair kick off in whatever way they please, without any obstruction, the opposite side not being able to approach within six yards of the ball.

8. No player shall carry or knock on the ball.

9. Neither tripping nor hacking shall be allowed, and no player shall use his hands to hold or push his adversary.

10. A player shall not throw the ball, or pass it to another.

11. No player shall take the ball from the ground with his hands while it is in play, under any pretence whatever.

12. No player shall wear projecting nails, iron plates, or gutta percha on the soles or heels of his boots.

The following is a definition of the terms used in the above rules:—

A *place kick* is a kick at the ball while it is on the ground, in any position in which the kicker may choose to place it.

Hacking is kicking an adversary intentionally.

Tripping is throwing an adversary by the use of the legs.

Knocking on is when a player strikes or propels the ball with his hands or arms.

Holding includes the obstruction of a player by the hand or any part of the arm below the elbow.

Touch is that part of the field, on either side of the ground, which is beyond the line of flags.

LESSONS IN GEOMETRY.—IV.

INSTRUMENTS USED IN PRACTICAL GEOMETRY (continued).

IN addition to the mathematical instruments described in our last lesson, there is also an instrument called a *Protractor*, for measuring angles upon paper, which is represented in Fig. 14, and consists of a semicircle divided into degrees, from 0° to 180° each way, the 90th degree being right above the centre, O. The straight line, A B, in the figure is the diameter of the semicircle, and is called the *fiducial* (or *true*) edge of the protractor to be applied to one of the legs of the angle to be measured;

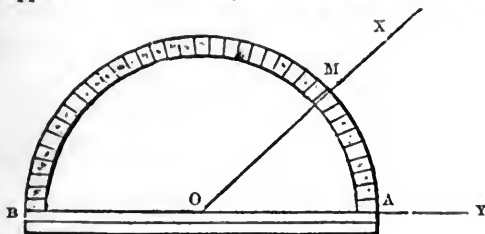


Fig. 14.

the arch, A M B, being the fiducial edge to be applied to the other leg. Thus, in order to measure the angle X O Y, the centre of the instrument is placed on the vertex, O, of the angle, and the edge O A on the leg O Y, so as to coincide with it exactly; then the angle A O M, on the arch A M B, determined by the point M, through which the other leg, O X, passes, is the measure of the angle X O Y. In this case, the measure appears to be nearly 45 degrees, as the figure represents divisions on the arch or limb of the protractor at every five degrees.

This apparatus for measuring angles is sometimes engraven on the upper side of a pair of parallel rulers, and sometimes on the obverse side of a plane scale. The protractor is more commonly made so that the centre of the semicircle, and the fiducial edge containing it, shall be on the outside of the instrument rather than on the inside, as above.

The *Plane Scale* is a flat ruler with several lines of equal parts, on one side divided according to certain proportional parts of an inch; and having, on the other side, the *diagonal scale*, decimally divided so as to measure units, tens, and hundreds of equal parts, with a very considerable degree of exactness. The construction of this scale, so useful in graphical (i.e., *drawing*) operations, such as the construction of plans, maps, and charts, architectural designs, plans and sections of machinery, etc., is founded on the properties of similar triangles, as treated in the sixth book of Euclid. We shall endeavour to give our readers a practical idea of its construction.

On a straight line, A E (Fig. 15), divided into any convenient

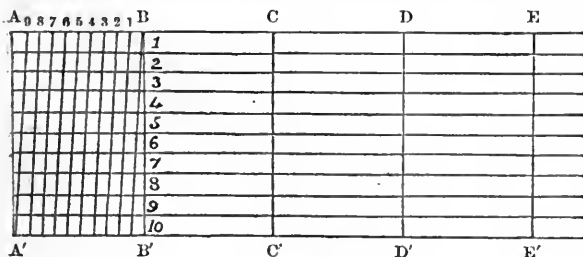


Fig. 15.

number of equal parts, A B, B C, C D, D E, etc., one, A B, is assumed as the standard unit of measure. From the different points, A, B, C, D, E, etc., perpendiculars of a convenient length, as A A', B B', C C', D D', E E', etc., are drawn to the straight line A E, and terminated in the straight line A' E' parallel to A E. The unit A B is divided into 10 equal parts; then the opposite part, A' B', is similarly divided; next the perpendicular B B' is divided into 10 equal parts, and through each division straight lines parallel to A E or A' E' are drawn. The divisions of the straight line A E are now marked with the numbers 1, 2, 3, etc.,

from C to E, to denote units. The divisions of the standard unit A B are marked 1, 2, 3, 4, 5, 6, 7, 8, 9, from B to A, to denote tenth parts of a unit; and the divisions of the perpendicular B B' are marked 1, 2, 3, 4, 5, 6, 7, 8, 9, from B to B', to denote hundredth parts of a unit. Or, if the divisions of the straight line A E denote *hundreds*, those between B and A denote *tens*, and those between B and B' denote *units*. The scale is rendered complete by drawing straight lines from B on B A, to 1 on B' A'; from 1 on B A, to 2 on B' A'; from 2 on B A, to 3 on B' A'; and so on, till one be drawn from 9 on B A, to A' on B' A'.

By the nature of similar triangles, hereafter to be explained, the small part of the parallel to the base 1 B', within the triangle B 1 B', at the division marked 1, is *one-tenth* part of the base 1 B', and consequently *one-hundredth* part of the line A B; the small parts of the other parallels are in succession, *two-hundredths*, *three-hundredths*, etc. Hence, if a straight line is to be measured, take its length in the compasses, and apply it to the scale from B towards E. If it measures an exact number of units, say from B to E, then the straight line may be said to measure 3, 30, or 300 equal parts, according as A B is made to stand for 1 unit, 1 ten, or 1 hundred. If it does not measure from E to B exactly, but extends from E exactly to one of the division marks between B and A, say 4, then the straight line may be said to measure 34, 340, or 3400 equal parts, according to the standard unit, as before. If it does not extend from E to the division marked 4 between B and A exactly, but falls somewhere between 4 and 5, then move the compasses downwards, preserving one point always in the line E E', and both points parallel to A E, till the other point fall on the intersection of the diagonal marked 4, 4, with one of the parallel straight lines marked on B B', say 6; then the straight line may be said to

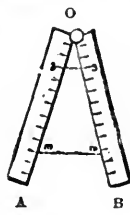


Fig. 16.

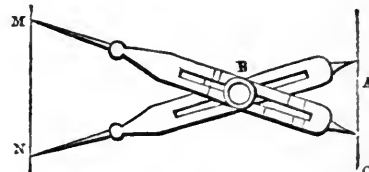


Fig. 17.

measure 3·46, 34·6, or 346 equal parts, according to the standard unit, as before.

For the purposes of navigation, dialling, etc., the plane scale has frequently on the side obverse to the diagonal scale just described, a set of lines, besides those of equal parts, containing divisions for the measurement of leagues, rhumbs, chords, sines, tangents, semi-tangents, secants, lines of longitude, etc. Such scales are considered the best, as they are generally executed with great care. The scale called *Gunter's scale* has the same divisions on one side of it, as are to be found on the plane scale, but of a larger size, and when well constructed, admitting of greater accuracy; but being usually made of boxwood, this is seldom the case. The obverse side of *Gunter's scale* has a set of lines representing the logarithms of the numbers which denote these divisions; by means of the logarithmic lines, arithmetical calculations can be performed instrumentally, that is, without the operation of the ordinary rules. A modification of this instrument, called the *sliding Gunter*, is still more ingenious in its construction, and still more useful as an instrument of calculation. The explanation of these instruments, however, belongs to a more advanced state of knowledge among the generality of our readers. This we hope to reach by their perseverance.

One of the most useful instruments in a mathematical case, is the *sector*; a mere sketch of its appearance is given in Fig. 16. It is composed of two flat rulers, movable on an axis, or jointed at one end like a pair of compasses; hence it is called by the French, *compas de proportion*—the compasses of proportion. From the centre of the axis or joint, several scales are drawn on the faces of the rulers, so as to correspond exactly with each other. The two rulers are called the legs of the sector, and represent the radii of a circle; and the middle point of the joint, its centre. It contains a scale of inches, lines of equal

parts, of chords, secants, and polygons, on one side of each leg; and on the other side of each leg, two lines of sines, tangents, etc., besides lines of the logarithms of the numbers expressing these quantities along the whole length of the sector, when stretched to an angle of 180°, as well as the logarithms of the natural numbers.

As in the case of the plane scale, we can here only give one or two examples of the use of the sector, by way of illustration. Thus, in the figure, o is the joint of the sector, o A and o B are its legs, the marks on the legs represent the divisions of the line into equal parts. Its use is to find straight lines that shall be to one another in a given proportion. Suppose, for example, that it is required to find a straight line whose length shall be to the length of a given line as 3 to 10. Open the sector until the distance of the two points marked 10 on its legs is equal to the length of the given line, which may be easily done by the help of a pair of common compasses or dividers; then, the distance of the two points marked 3 on its legs, will be the length of the straight line required.

Again, suppose that two straight lines are given, and it is required to find their ratio to each other in numbers. Open the sector until the distance of the two points marked 10 on its legs, is equal to the length of the greater of the two given straight lines; then, taking the length of the smaller of the two given lines in a pair of compasses, apply this distance to the two points of any number less than 10 marked on its legs, until it be found that it coincides exactly with that of two points having the same number, say 3; then the two given straight lines are to one another in the ratio of 10 to 3; or, in other words, the smaller is *three-tenths* of the greater.

The *Proportional Compasses*, called by the French *compas de reduction*—the compasses of reduction—are represented in Fig. 17, and consist of two legs A N, C M, intersecting (*i.e.*, crossing) each other at any point within certain limits, according to the position of the button and screw, B, round which they are made to turn. These legs are graduated in such a manner that, by screwing the button at the proper place, the distance from A to C may be at pleasure one-half, one-third, one-fourth, etc., of the distance from M to N. By this instrument, a straight line may be easily divided into any number of equal parts, or into any other proportional parts required.

The invention of this instrument is claimed, by a recent writer, for James Besson, a French mechanician, who published an account of it in his "Théâtre des Machines," a work of which the plates were engraved before 1569. He says it is usually attributed to Justus Byrgius, who published his description of it in 1603. John Robertson, librarian to the Royal Society, in his "Treatise on Mathematical Instruments," London, 1775, ascribes the invention of a similar instrument to Fabricius Mordente in 1554, according to a statement made by his brother, Gaspar Mordente, in his book on the Compasses, published at Antwerp in 1584.

LESSONS IN FRENCH.—VIII.

SECTION I.—FRENCH PRONUNCIATION (*continued*).

III. NAME AND SOUND OF THE VOWELS

46. **Y, y.**—Name, *EE, ee*; sound, like the letters *ee* in the English word *bee*.

This letter is also a *word*; that is, it is one of the parts of speech in the French language. It is usually an adverb, meaning *there*. It is also used as a noun, and a pronoun.

When *y* stands alone, and thus becomes a word, its pronunciation is invariably like that of the letters *ee* in the English word *bee*, *viz.*, —Il y a, pronounced *eel ee a*. This last *a* must be sounded like *a* in the English word *fat*.

Y is also pronounced like the letters *ee* in the English word *bee*, when it *begins or ends* a word; and also when it *occurs in the body of a word, after a consonant*, namely:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Dey	Day	<i>Dey</i> .
Style	Steel	<i>Stylé</i> .
Système	Seess-taim	<i>Systém</i> .
Yole	Ee-ol or E-ol	<i>A yowl</i> .

Whenever *y* is found in the body of a word, *between two vowels*, it has the sound of two French *'s*, that is, of two double *e's*, namely:—

Moyen should be pronounced as if printed thus, namely, *moïen*; divided thus, namely, *moi-i-en*, but pronounced in two syllables, namely, *moi-ien*.

Joyeux should be pronounced as if printed thus, namely, *joïeux*; divided thus, namely, *joï-i-eux*, but pronounced in two syllables, namely, *joï-ieu*.

Royaume should be pronounced as if printed thus, namely, *roïaume*; divided thus, namely, *roï-i-aume*, but pronounced in two syllables, namely, *roï-iaume*.

The pupil need not attempt to pronounce these three French words used as examples, because the combination of vowels and other letters occurring in them has not yet been illustrated.

The pronunciation of *y* with these and other combinations of letters will be explained in future lessons.

In the two following words the *y*, though not placed between two vowels, is under the same rule, namely:—

Pays, meaning a country, should be pronounced as if printed *païs*; divided thus, namely, *pai-is*, and pronounced *pa-ee*.

Paysage, meaning a landscape, should be pronounced as if printed *païsage*; divided thus, namely, *pai-i-sage*, and pronounced *pa-ee-zazh*.

IV. NAME AND SOUND OF THE CONSONANTS.

As a general rule, none of the consonants, when final, have a distinct and independent sound, unless immediately followed by a word commencing with a vowel or *h* mute; in which case the consonant is joined with the following word in pronunciation.

47. **B, b.**—In any position within a word, this letter has the sound of the English letter *b*.

When doubled within a word, only one *b* is sounded, *viz.*:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Abbesse	Ab-ess	<i>Abess</i> .
Rabbi	Rab-ee	<i>Rabbi</i> .
Sabbat	Sab-ah	<i>Sabbath</i> .

At the end of proper names, *b* is always sounded.

In these two words, namely, *a-plomb* and *plomb*, the *b* is silent, and the next two preceding letters in each word, namely, *om*, take the nasal sound of *on*.

48. **C, c.**—This letter has two entirely distinct sounds, namely, *hard* and *soft*. Before the vowels *a, o, u*, and *e*, and also before the consonants *c, l, n*, and *r*, it has the hard sound of the letter *k* in the English word *kill*, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Calamité	Ka-la-me-tay	<i>Calamity</i> .	Succès	Suk-sai	<i>Success</i> .
Comité	Ko-me-tay	<i>Committee</i> .	Classe	Klahss	<i>Class</i> .
Cabe	Kube	<i>Cule</i> .	Cnique	Kneek	<i>Horse-thistle</i> .
Cœur	Kuh-rr	<i>Heart</i> .	Crédit	Kray-de	<i>Credit</i> .

But before *e, i*, and *y*, and also with the cedilla before *a, o*, and *u*, it has the soft sound of the letter *s* in the English word *sea*, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Cèdre	Saidr'	<i>Cedar</i> .	Façade	Fas-sad	<i>Front</i> .
Cinq	Sanh-k	<i>Five</i> .	Façon	Fas-son*	<i>Fashion</i> .
Cycle	Seekl'	<i>Cycle</i> .	Reçu	R'su	<i>Receipt</i> .

When final, and not preceded by the letter *n*, *c* is generally sounded like the letter *k* in the English word *book*, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Avec	A-vek	<i>With</i> .	Caduc	Kad-uke	<i>Declining</i> .
Béc	Baik	<i>Beak</i> .	Échec	Ay-shek	<i>Check</i> .

In a few words, however, *c* final is not sounded, and these exceptions are best found out by consulting a French pronouncing dictionary. In a few words, *c* has the sound of the letter *g* in the English word *go*, namely, *second, secondaire, secondairement, seconde, secondement, seconder, secondine*.

In these words the *c*, which commences the second syllable, has the sound of the *g*, namely, *second*, as if printed *segond*; pronounced *s'-gonh*, etc. We do not illustrate all the sounds of these French words here, because of the nasal sounds contained in them.

49. **D, d.**—This letter generally has the sound of the letter *d* in the English word *deed*. It is usually silent when final, except in proper names.

The principal exception to the above rule is, when *d* is final just before a vowel or an *h* mute. In such a case, the *d* has the sound of the letter *t* in the English word *top*; and in pronuncia-

* See foot-note, page 19.

tion is joined with the following word, as if it were its first letter, as will be seen in the two examples which follow, viz. :—

Un grand acteur, as if printed Un grant acteur.
Un grand homme " Un grant homme.

In another instance, *d* has also the sound of *t*, viz., at the end of the third person singular of the indicative mood of verbs, when followed by the pronouns *il*, *elle*, or *on*. In these cases the *d* has the sound of the English *t*, and is joined to the following word in pronunciation, as if it were that word's first letter, namely :—

Entend-il ? as if printed Entent-il ?
Coud-elle bien ? " Cout-elle bien ?
Vend-il " Vent-il ?
Répond-on ainsi ? " Répont-on ainsi ?

SECTION XIV.—LIST OF WORDS FOR EXERCISES IN COMPOSING (continued).

3. LE CORPS HUMAIN.—THE HUMAN BODY.

Artère, <i>f.</i> , artery.	Lèvre, <i>f.</i> , lip.
Barbe, <i>f.</i> , beard.	Membre, <i>m.</i> , limb.
Bouche, <i>f.</i> , mouth.	Menton, <i>m.</i> , chin.
Bras, <i>m.</i> , arm.	Moëlle, <i>f.</i> , marrow.
Cerveau, <i>f.</i> , brain.	Moustache, <i>f.</i> , moustache.
Chair, <i>f.</i> , flesh.	Muscle, <i>m.</i> , muscle.
Cils, <i>m. pl.</i> , eyelashes.	Nerf, <i>m.</i> , nerve.
Cœur, <i>m.</i> , heart.	Nez, <i>m.</i> , nose.
Corps, <i>m.</i> , body.	Ongle, <i>m.</i> , nail.
Côté, <i>m.</i> , side.	Orteil, <i>m.</i> , toe.
Côte, <i>f.</i> , rib.	Os, <i>m.</i> , bone.
Cou, <i>m.</i> , neck.	Palais, <i>m.</i> , palate.
Coude, <i>m.</i> , elbow.	Paupière, <i>f.</i> , eyelid.
Crâne, <i>m.</i> , skull.	Peau, <i>f.</i> , skin.
Cuisse, <i>f.</i> , thigh.	Pouce, <i>m.</i> , thumb.
Doigt, <i>m.</i> , finger.	Poumon, <i>m.</i> , lungs.
Dos, <i>m.</i> , back.	Pupille, <i>f.</i> , pupil of the eye.
Épau, <i>f.</i> , shoulder.	Rat, <i>f.</i> , spleen.
Épine (du dos), <i>f.</i> , spine.	Reins, <i>m. pl.</i> , loins.
Favoris, <i>m. pl.</i> , whiskers.	Sang, <i>m.</i> , blood.
Foie, <i>m.</i> , liver.	Sein, <i>m.</i> , bosom.
Front, <i>m.</i> , forehead.	Sourcil, <i>m. pl.</i> , eyebrows.
Gencives, <i>f. pl.</i> , gums.	Squelette, <i>m.</i> , skeleton.
Genou, <i>m.</i> , knee.	Talon, <i>m.</i> , heel.
Gorge, <i>f.</i> , throat.	Teint, <i>m.</i> , complexion.
Hanche, <i>f.</i> , hip.	Tempes, <i>f. pl.</i> , temples.
Jambe, <i>f.</i> , leg.	Trait, <i>m.</i> , feature.
Joue, <i>f.</i> , cheek.	Veine, <i>f.</i> , vein.
Langue, <i>f.</i> , tongue.	Visage, <i>m.</i> , face.

4. MALADIES, INFIRMITÉS, ETC.—MALADIES, INFIRMITIES, ETC.

Attaque, <i>f.</i> , attack, fit.	Fièvre scarlatine, <i>f.</i> , scarlet fever.
Baume, <i>m.</i> , balsam.	Goutte, <i>f.</i> , gout.
Bégaiement, <i>m.</i> , stammering.	Guérison, <i>f.</i> , cure.
Blessure, <i>f.</i> , wound.	Hydropisie, <i>f.</i> , dropsy.
Cécité, <i>f.</i> , blindness.	Indisposition, <i>f.</i> , indisposition.
Chancre, <i>m.</i> , cancer.	Louche, <i>adj.</i> , squinting.
Cicatrice, <i>f.</i> , scar.	Malaise, <i>m.</i> , indisposition.
Colique, <i>f.</i> , colic.	Mutisme, <i>m.</i> , dumbness.
Contusion, <i>f.</i> , bruise.	Onguent, <i>m.</i> , pomade, <i>f.</i> , salve.
Crampe, <i>f.</i> , cramp.	Ordonnance, <i>f.</i> , prescription.
Dislocation, <i>f.</i> , dislocation.	Petite-vérole, <i>f.</i> , small-pox.
Émétique, <i>m.</i> , emetic.	Pulmonie, <i>f.</i> , consumption.
Enflure, <i>f.</i> , swelling.	Remède, <i>m.</i> , remedy.
Enrouement, <i>m.</i> , hoarseness.	Rhume, <i>m.</i> , cold.
Entorse, <i>f.</i> , sprain.	Rougeole, <i>f.</i> , measles.
Épilepsie, <i>f.</i> , epilepsy.	Surdité, <i>f.</i> , deafness.
Évanouissement, <i>m.</i> , fainting.	Toux, <i>f.</i> , cough.
Fièvre, <i>f.</i> , fever.	Ulcère, <i>m.</i> , ulcer.
Fièvre nerveuse, <i>f.</i> , nervous fever.	Vertigo, <i>m.</i> , dizziness.

5. HABILLEMENTS.—ARTICLES OF DRESS.

Agrafe, <i>f.</i> , clasp.	Bretelles, <i>f. pl.</i> , braces.
Aiguille, <i>f.</i> , needle.	Brosse, <i>f.</i> , brush.
Aiguille à cheveux, <i>f.</i> , hair-pin.	Brosse-à-dents, <i>f.</i> , tooth-brush.
Bague, <i>f.</i> , ring.	Caleçon, <i>m.</i> , sing., drawers.
Bas, <i>m.</i> , stocking.	Ceinture, <i>f.</i> , sash, belt, band.
Basin, <i>m.</i> , dimity.	Chaussettes, <i>m. pl.</i> , socks.
Batiste, <i>f.</i> , cambric.	Cirage, <i>m.</i> , blacking.
Bijouterie, <i>f.</i> , jewellery.	Ciseaux, <i>m. pl.</i> , scissors.
Bonnet, <i>m.</i> , cap.	Coiffure, <i>f.</i> , head-dress.
Boucle, <i>f.</i> , buckle.	Collet, <i>m.</i> , collar.
Boucle, <i>f.</i> , lock of hair, curl.	Collier, <i>m.</i> , necklace.
Boucles d'oreilles, <i>f. pl.</i> , ear-rings.	Coton, <i>m.</i> , cotton.
Bourse, <i>f.</i> , purse.	Cravate, <i>f.</i> , cravat.
Bracelet, <i>m.</i> , bracelet.	Crêpe, <i>m.</i> , crape.

Diamant, <i>m.</i> , diamond.	Manche, <i>f.</i> , sleeve.
Dentelle, <i>f.</i> , lace.	Mouselline, <i>f.</i> , muslin.
Doubleure, <i>f.</i> , lining.	Pantalou, <i>m.</i> , sing., trousers.
Écrin, <i>m.</i> , casket, jewel-box.	Parapluie, <i>m.</i> , umbrella.
Épée, <i>f.</i> , sword.	Parasol, <i>m.</i> , parasol.
Éperons, <i>m. pl.</i> , spurs.	Peigne, <i>m.</i> , comb.
Épingle, <i>f.</i> , pin.	Pendants-d'oreilles, <i>m. pl.</i> , earrings.
Étui, <i>m.</i> , needle-case.	Perle, <i>f.</i> , pearl.
Éventail, <i>m.</i> , fan.	Poche, <i>f.</i> , pocket.
Flacon, <i>m.</i> , smelling-bottle.	Pomade, <i>f.</i> , pomatum.
Fourrure, <i>f.</i> , fur.	Redingote, <i>f.</i> , great-coat.
Frac, <i>m.</i> , dress coat.	Robe, <i>f.</i> , dress, robe.
Frange, <i>f.</i> , fringe.	Robe de chambre, <i>f.</i> , dressing-gown.
Garniture, <i>f.</i> , trimming.	Satin, <i>m.</i> , satin.
Gilet, <i>m.</i> , vest, waistcoat.	Soie, <i>f.</i> , silk.
Grenat, <i>m.</i> , garnet.	Tablier, <i>m.</i> , apron.
Guêtres, <i>f. pl.</i> , gaiters.	Taffetas, <i>m.</i> , taffeta.
Habit, <i>m.</i> , coat.	Velours, <i>m.</i> , velvet.
Ivoire, <i>f.</i> , ivory.	Veste, <i>f.</i> , jacket.
Linge, <i>m.</i> , linen.	Voile, <i>m.</i> , veil.
Lunettes, <i>f. pl.</i> , spectacles.	

SECTION XVI.—COMPARISON OF ADJECTIVES—ENCORE, ETC.

1. The superlative absolute is formed by placing *très*, *fort*, or *bien*, *very*, before the adjective [§ 14 (11)].

Ces chandeliers sont très-utiles, *These candlesticks are very useful.*
Notre tailleur est bien obligeant, *Our tailor is very obliging.*

2. The superlative relative is formed by adding the article *le*, *la*, *les*, to a comparative [§ 14 (9)].

Votre neveu est le plus savant de tous, *Your nephew is the most learned of all.*

3. *Encore* is used in French in the sense of *more*, *some more*, *any more*, *still*, used affirmatively and interrogatively, but not negatively.

Avez-vous encore du café ? *Have you any more coffee ?*
J'ai encore du café. *I have more (or some more) coffee.*
J'en ai encore. *I have some more, or some left.*

4. *Ne—plus* is used in the sense of *not any more*, and *no more*, or *none left*.

Je n'ai plus de livres, *I have no more books.*
Je n'ai plus de chocolat, *I have no chocolate left.*

5. *Ne—guère* means *but little*, *but few*.

Je n'ai guère d'amis, *I have but few friends.*
Je n'en ai guère, *I have but few—but little.*

6. The pronouns *moi*, *toi*, *lui*, *eux*, are used instead of the nominative pronouns *je*, *tu*, *il*, *ils*, after the *que* of a comparison, and when the verb is understood.

Vous êtes plus heureux que moi, *You are happier than I.*
Vous avez plus de mérite que lui, *You have more merit than he.*

RÉSUMÉ DE EXEMPLES.

Vous marchez plus vite que moi, <i>You are walking faster than I.</i>	Vous marchez plus vite que moi, <i>You are walking faster than I.</i>
Vous êtes plus heureux que moi, <i>You are happier than I.</i>	Vous êtes plus heureux que moi, <i>You are happier than I.</i>
Vous avez plus de mérite que lui, <i>You have more merit than he.</i>	Vous avez plus de mérite que lui, <i>You have more merit than he.</i>
Je n'ai plus de livres, <i>I have no more books.</i>	Je n'ai plus de livres, <i>I have no more books.</i>
Je n'ai plus de chocolat, <i>I have no chocolate left.</i>	Je n'ai plus de chocolat, <i>I have no chocolate left.</i>
Je n'ai guère d'amis, <i>I have but few friends.</i>	Je n'ai guère d'amis, <i>I have but few friends.</i>
Je n'en ai guère, <i>I have but few—but little.</i>	Je n'en ai guère, <i>I have but few—but little.</i>
Avez-vous encore du crédit, <i>Have you any more credit ?</i>	Avez-vous encore du crédit, <i>Have you any more credit ?</i>
Le maçon a-t-il encore des briques ? <i>Has the mason any more bricks ?</i>	Le maçon a-t-il encore des briques ? <i>Has the mason any more bricks ?</i>
Il n'en a plus, <i>He has no more—he has none left.</i>	Il n'en a plus, <i>He has no more—he has none left.</i>
Il n'a plus de briques, <i>He has no more bricks.</i>	Il n'a plus de briques, <i>He has no more bricks.</i>
Il n'en a guère, <i>He has but few.</i>	Il n'en a guère, <i>He has but few.</i>
Il n'en a plus guère, <i>He has but few left.</i>	Il n'en a plus guère, <i>He has but few left.</i>
Je n'ai guère de livres, <i>I have but few books.</i>	Je n'ai guère de livres, <i>I have but few books.</i>
Avez-vous plus de courage que lui ? <i>Are you more courageous (lit., have you more courage) than he ?</i>	Avez-vous plus de courage que lui ? <i>Are you more courageous (lit., have you more courage) than he ?</i>
Il a moins de courage que moi, <i>He is less courageous (lit., has less courage) than I.</i>	Il a moins de courage que moi, <i>He is less courageous (lit., has less courage) than I.</i>
Combien de piastres avez-vous encore ? <i>How many dollars have you still, or have you left ?</i>	Combien de piastres avez-vous encore ? <i>How many dollars have you still, or have you left ?</i>

VOCABULAIRE.

Correct, <i>-e</i> , correct.	Neveu, <i>m.</i> , nephew.	Savant, <i>-e</i> , learned.
Crédit, <i>m.</i> , credit.	Nièce, <i>f.</i> , niece.	Sœur, <i>f.</i> , sister.
Beaucoup, <i>much</i> .	Nouvelles, <i>f.</i> , news.	Tante, <i>f.</i> , aunt.
Boyer, <i>Boyer</i> .	Quel, <i>which</i> , <i>which one</i> .	Tous, <i>all</i> .
Dictionnaire, <i>m.</i> , dictionary.	Salade, <i>f.</i> , salad.	Ville, <i>f.</i> , town, city.

EXERCISE 27.

1. Votre dictionnaire est-il très-correct ? 2. Il est plus correct que celui de Boyer. 3. Votre dictionnaire est le plus correct de tous. 4. Quel est le meilleur de ces jardins ? 5. Celui-ci est

le meilleur de tous les jardins de la ville. 6. Avez-vous encore de l'argent? 7. Je n'ai plus d'argent, mais j'ai encore du crédit. 8. Avons-nous encore de la salade? 9. Nous n'en avons plus. 10. Nous n'avons plus de viande. 11. Qui en a encore? 12. Mes frères et mes sœurs en ont encore. 13. En avez-vous encore beaucoup? 14. Je n'en ai plus guère. 15. Votre tante a-t-elle plus de robes que votre nièce? 16. Elle n'en a pas beaucoup. 17. Votre neveu est-il plus savant que votre nièce? 18. Il n'est pas aussi savant qu'elle. 19. Elle est plus savante que lui. 20. Avez-vous encore froid? 21. Je n'ai plus froid, j'ai bien chaud. 22. N'avez-vous plus de nouvelles? 23. Je n'en ai plus. 24. En avez-vous beaucoup? 25. Je n'en ai guère.

EXERCISE 28.

1. Has your brother a very good dictionary? 2. His dictionary is not very correct. 3. Has your father more courage than he? 4. He has much more courage than your nephew. 5. Have your brothers credit? 6. They have but little credit, but they have money. 7. Is your aunt obliging? 8. My aunt is very obliging. 9. Have you still books, pens, and paper? 10. I have no more books, but I have still good pens and excellent English paper. 11. Who has still paper? 12. I have no more, but my brother has some more. 13. Have you any news, Sir? 14. No, Madam, I have none to-day. 15. Have you as much wood as my brother's son? 16. I have more than you or he. 17. Are you still wrong? 18. No, Sir, I am no longer (*plus*) wrong, I am right. 19. Are your sisters still hungry? 20. They are neither hungry nor thirsty, but they are still sleepy. 21. Is your niece as learned as he? 22. She is more learned than he and (*que*) his aunt. 23. Have you no news, Sir? 24. No, Madam, I have no more news. 25. Who has news? 26. I have no more. 27. Have you them all? 28. Yes, Sir, I have them all. 29. Has your aunt much of it left? 30. She has but little more of it. 31. Has your brother any more English horses? 32. He has no more. 33. He has two more. 34. Have you a handsome French shawl left? 35. I have no more French shawls, but I have an English one.

SECTION XVII.—ADVERBS OF QUANTITY, ETC.

1. The adverbs of quantity, combien, *how much, how many; trop, too much, too many; beaucoup, much, many; assez, enough; peu, little, few; guère, but little, few; and the word pas, meaning no, when coming before a noun or an adjective, are followed by the preposition de.*

Combien de fleurs avez-vous?	<i>How many flowers have you?</i>
J'ai beaucoup de fleurs,	<i>I have many flowers.</i>
Vous avez trop de loisir,	<i>You have too much leisure.</i>
Votre sœur a assez de temps,	<i>Your sister has time enough.</i>

2. The adverb bien, used in the sense of beaucoup (*much, many*), is followed by the preposition de, joined to or blended with the article le, la, les [Sect. IV.].

Vous avez bien de la complaisance,	<i>You have much kindness.</i>
Elle a bien des amis,	<i>She has many friends.</i>

3. Quelque chose, *something, anything* [Sect. V., VI.], and rien *nothing, not anything*, take *de* before an adjective.

Votre ami a quelque chose d'agréable,	<i>Your friend has something pleasant.</i>
Avez-vous quelque chose de bon?	<i>Have you anything good?</i>
Je n'ai rien de bon,	<i>I have nothing (not anything) good.</i>

4. Quel, m., quelle, f., quels, m. pl., quelles, f. pl., are used interrogatively for *which* or *what* before a noun.

Quelle serviette avez-vous?	<i>What or which napkin have you?</i>
Quelles bourses votre ami a-t-il?	<i>What purses has your friend?</i>

5. Que is used for *what* before a verb.

Qu'avez-vous?	<i>What is the matter with you?</i>
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6. Lequel, m., laquelle, f., lesquels, m. pl., lesquelles, f. pl., are used absolutely for the word *which*, not followed by a noun, and equivalent to *which one, which ones*.

Lequel votre fils a-t-il?	<i>Which (one) has your son?</i>
Lesquelles avons-nous?	<i>Which (ones) have we?</i>

7. Quelques is used before a plural noun for *a few, some*;

quelques uns, m., quelques unes, f., are used absolutely, with the same meaning. Plusieurs means *several*, and is invariable. Le Danois a-t-il quelques pommes? *Has the Dane a few apples?* Il en a quelques unes, *He has a few.* Il en a plusieurs, *He has several.*

RÉSUMÉ OF EXAMPLES.

Combien de poires avez-vous?	<i>How many pears have you?</i>
Nous avons beaucoup de poires.	<i>We have many pears.</i>
Nous en avons beaucoup.	<i>We have many (of them).</i>
Nous avons assez de cerises.	<i>We have cherries enough.</i>
Nous n'en avons pas assez.	<i>We have not enough (of them).</i>
Vous n'avez guère de pêches.	<i>You have but few peaches.</i>
Votre jardinier a bien des pêches.	<i>Your gardener has many peaches.</i>
N'avez-vous pas de pêches?	<i>Have you no peaches?</i>
J'ai beaucoup de pêches et d'abricots.	<i>I have many peaches and apricots.</i>
cots. [bon?]	
Le boucher a-t-il quelque chose de bon et de mauvais.	<i>Has the butcher anything good? He has something good and bad.</i>
Il n'a rien de bon.	<i>He has not anything (nothing) good.</i>
Quelles poires (f.) avez-vous?	<i>What or which pears have you?</i>
Nous avons celles de votre sœur.	<i>We have your sister's.</i>
Quel habit (m.) avez-vous?	<i>Which or what coat have you?</i>
Nous avons celui du tailleur.	<i>We have the tailor's.</i>
Qu'avez-vous de bon?	<i>What have you good?</i>
Lequel avez-vous?	<i>Which (one) have you?</i>
Lesquels votre frère a-t-il?	<i>Which (ones) has your brother?</i>

VOCABULARY.

Abricot, m., <i>apricot.</i>	Fleur, f., <i>flower.</i>	Pomme, f., <i>apple.</i>
Ananas, m., <i>pineapple.</i>	Légume, m., <i>vegetable.</i>	Pomme de terre, f., <i>potato.</i>
Beurre, m., <i>butter.</i>	Magasin, m., <i>warehouse.</i>	Prune, f., <i>plum.</i>
Cerise, f., <i>cherry.</i>	Oncle, <i>uncle.</i>	Sucre, m., <i>sugar.</i>
Épicier, m., <i>grocer.</i>	Poire, f., <i>pear.</i>	Thé, m., <i>tea.</i>
Etranger, -e, <i>foreign.</i>	Poivre, m., <i>pepper.</i>	
Jardin, m., <i>garden.</i>		

EXERCISE 29.

1. Combien de pommes de terre votre frère a-t-il? 2. Il n'en a pas beaucoup. 3. L'épicier a-t-il beaucoup de sucre dans son magasin? 4. Il n'en a guère, mais il a beaucoup de beurre et de poivre. 5. Votre jardinier a-t-il beaucoup de cerises? 6. Il a plus de cerises que de prunes. 7. Les prunes sont-elles meilleures que les cerises? 8. Les cerises sont meilleures que les prunes. 9. Avez-vous quelques poires mûres? 10. Nous en avons quelques unes, nous avons aussi beaucoup d'ananas et d'abricots. 11. Votre oncle a-t-il quelque chose de bon dans son jardin? 12. Il a quelque chose de bon et de beau. 13. Il a de beaux légumes et de belles fleurs. 14. Avez-vous des fleurs étrangères? 15. J'en ai quelques unes. 16. Lesquelles avez-vous? 17. J'ai celles de votre frère et celles de votre jardinier. 18. N'avez-vous pas aussi les miennes? 19. Non, Monsieur, je ne les ai pas. 20. Qui en a beaucoup? 21. Personne n'en a beaucoup. 22. J'en ai quelques unes. 23. Avez-vous assez de thé? 24. J'en ai assez. 25. J'en ai plus que lui.

EXERCISE 30.

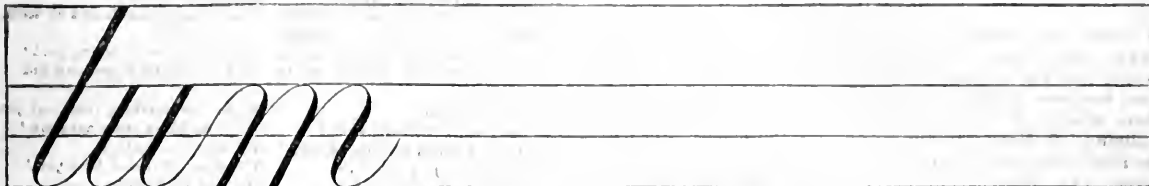
1. Has your gardener many vegetables? 2. Yes, Sir, he has many. 3. How many gardens has he? 4. He has several gardens and several houses. 5. Have you many books? 6. I have but few, but my friend has many. 7. What coat has your brother? 8. He has a good cloth coat. 9. Has your uncle many peaches? 10. He has but few peaches, but he has many cherries. 11. How many plums has the tailor? 12. The tailor has no plums, he has cloth and silk. 13. What silk has your friend the merchant? 14. He has a great deal (*beaucoup*) of silk, and a great deal of money. 15. Has the gardener anything good in (*dans*) his garden? 16. He has many pineapples. 17. Has he more vegetables than fruit? 18. He has more of these than of those. 19. Has your uncle many pears and cherries? 20. He has a few, and he has many apples and plums. 21. Have you a few? 22. I have still many, but my brother has no more. 23. Which peaches has he? 24. He has large (*grosses*) peaches. 25. Which (ones) have you? 26. I have the best peaches. 27. Has the merchant anything good in his warehouse? 28. He has nothing good in his warehouse, but he has something good in his garden. 29. How many potatoes has the foreigner? 30. He has not many. 31. Has he good vegetables? 32. He has good vegetables. 33. Is he right or wrong? 34. He is right, but you are wrong. 35. He has neither this book nor that, he has the bookseller's.

LESSONS IN PENMANSHIP.—VIII.

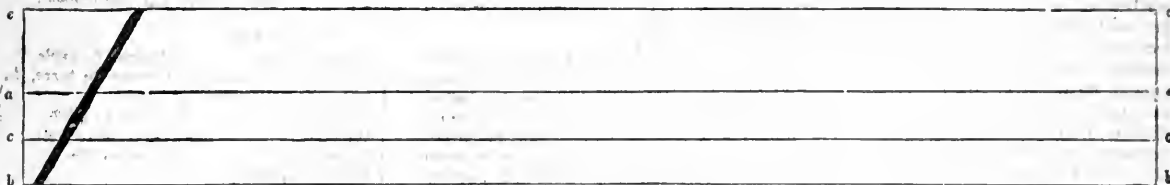
AFTER one more exercise in letters formed by combinations of the bottom-turn, top-turn, and top-and-bottom-turn, the learner, in Copy-slip No. 25, passes on to a new elementary stroke, the fourth in order of the simple forms of which the letters of the writing alphabet are compounded.

This new stroke is called the "straight stroke." It is a down-stroke of uniform breadth from top to bottom, formed by bringing the pen from the top line *ee* to the bottom line *bb*, with an equal pressure throughout. The chief difficulty in forming this stroke lies in lifting the pen smartly and quickly from the paper when it has been brought as far as the line *bb*, so that the termination

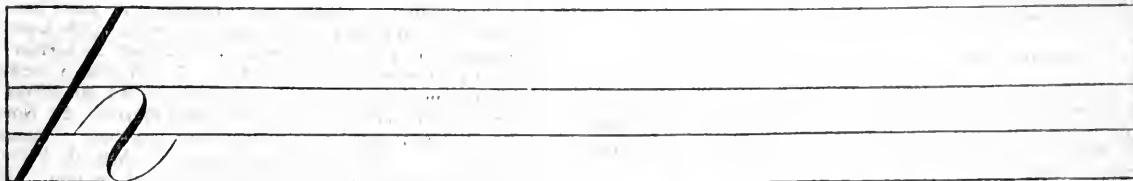
aa, bb; but, as there is not a single letter into whose composition a straight stroke of this length enters, it is obviously absurd, as well as almost useless, to oblige the pupil to commence his lessons by copying a stroke that he is never called upon to make afterwards in any copy that he may write. In our system of teaching the art of Penmanship, we cause the pupil to write the simplest and easiest letters first, and then proceed to those that are more difficult, in all cases teaching him first to write the elementary strokes of which each set of letters in its sequence is formed, and then to combine them, so as to form the letters themselves. This, therefore, will explain why we did not commence our lessons with the straight stroke, according to the usual practice, and why we now introduce this



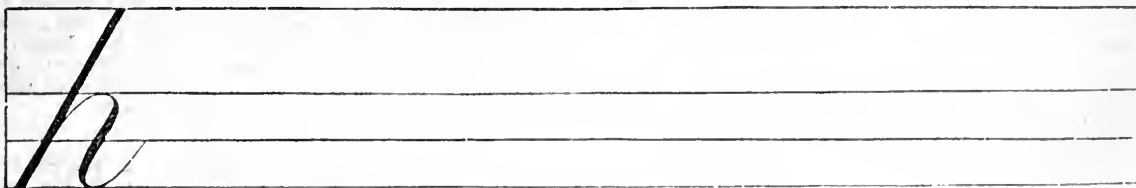
COPY-SLIP NO. 24.—COMBINATION OF THE LETTERS l, u, m.



COPY-SLIP NO. 25.—THE "STRAIGHT STROKE."



COPY-SLIP NO. 26.—THE "STRAIGHT STROKE" AND THE "TOP-AND-BOTTOM TURN."



COPY-SLIP NO. 27.—THE LETTER h.

of the stroke on that line may be as square and clearly defined in every respect as its commencement on the line *ee*. The learner has already had some practice in terminating a thick down-stroke on the line *bb*, in making the "hanger" or top-turn, and all letters into whose composition the top-turn enters. But these have been short strokes, and in making the letter l, the only letter that he has yet made that is equal in length to the straight stroke, he has been accustomed to lessen the pressure on the pen before he reaches the line *bb*, in order to finish the letter with a fine hair-stroke turned upwards towards the right. Any trifling difficulty, however, that he may experience in making the straight stroke at first will soon vanish, if when he has brought his pen down as far as the line *cc* he remember that he has only to finish the stroke as if he were making the simple top-turn, which must now be easy enough to him.

In learning to write, the pupil is generally taught, first of all, to make a straight stroke, no longer than that portion of the stroke in Copy-slip No. 25 which is contained between the lines

stroke as the fourth in order of the simple elementary strokes, and in the only form in which it is used in writing, instead of the short form usually given, in which shape, as we have observed, it is never afterwards used by the pupil.

In Copy-slip No. 26 the pupil proceeds to form the straight stroke and the top-and-bottom-turn in alternation, and in Copy-slip No. 27 he finds that these strokes, when joined together, form the letter h. The straight stroke enters into the composition of three letters—h, p, and k; but of these we confine ourselves to h and p for the present.

ESSAYS ON LIFE AND DUTY.—I.

INTRODUCTORY.

If we stand still for a moment in the great rush and hurry of this time, and look both around us on what is, and also backward as far as the eye can reach on what has been, we are struck at first sight with the vastness of the world's labour.

the immense bulk of that which was and is produced; and the thought is fascinated by the sense of that aggregate of human effort, and happiness, and suffering, which has lain striving and sleeping beneath the broad heavens since the birth of time. "And what," we ask ourselves, "is the motive, and what are the conditions of all this action and suffering?" Men move under the influences of fitful gusts and gales of passion; but also under the steady trade-winds of necessity, of self-interest, of ambition, of benevolence, of duty. Physical need is the most universal and the most imperious claimant upon man's time and sinew. It stares most of us in the face, and it stares some of us with cruel pertinacity. There is nothing more apparent than that God intended that our existence should depend upon our exertions; and with this naked fact—however rough, and hard, and humiliating it may seem—we must start in all our reasoning. The benefits of fortune make, indeed, an apparent exception to this rule. There is a class of men who do not find toil necessary to life, or even to its luxuries; but is it not apparent to all that a life without exertion—exertion systematic, continued, and directed to an object—is a life without happiness, and that idleness is not only useless, but practically evil?

But when we have got thus far, we have advanced but a small step, however necessary that step is. Man cannot live by bread alone. His first want is not his greatest; no, nor nearly so. What a different sight should we look upon as compared to that which is now in sense and memory before us of the world and man's work upon it, if his sole necessity here had been the food and clothes which keep life strong within him! We should not then see, as we do now, cities, and temples, and ships: power, and beauty, and thought grown into shapes of wood and stone upon the earth, and into culture of tree and flower, bird and beast, colour and sound, heat and force. We must look to other cravings, besides that of hunger, in man, to find the secret of that eternal twisting of the matter and spirit about him, the moulding of it into fresh forms, the digging, and the building, and the questioning. No hard necessity of food is laid upon him here, yet he toils as if all eternity waited upon his success. What a bustling, suffering, hoping creature it is! Let us look at him more closely. He is inquisitive—the pictures of his senses will not satisfy him. He is fond of power and possession—the dominion of his own body and birthplace will not satisfy him. He is fond of beauty and order—the flower and the wind will not satisfy him. He knows of right and wrong—obedience to his passions will not satisfy him. He knows of an unearthly power—and his own supremacy will not satisfy him. Of all these dissatisfactions and needs, that which is attendant on the moral faculties—the sense of right and wrong, and of responsibility—is the most curious and distinctive in man. Remove this, and it were better for him that he had but the hunger of the brute; the world is without form and void, and there is darkness upon the face of the deep.

Now, whatsoever different forms education may impose upon this sense of right and wrong in the minds of men; whatever they may, by length of time, persuade themselves about it; however it may be disregarded, violated, attended to—it is universal in all rational minds, and is as much a part of man's mental system as hunger is of his physical system. The laws of God as revealed to us in the Bible sanction, direct, and enforce it; the laws of society are the partial expression of it. Moreover, mankind in general acquiesce in a judicial system which punishes the transgressions of a man against his fellow, and most men fear a judicial system which shall take a like cognizance of the faults which are secret to ourselves. We have, therefore, come to another element in the great history of man's thought, and word, and work; or, rather, to two separate principles, closely akin—the moral faculty and the fear of God.

This is not the place for any metaphysical discussion as to the relations of these two; and we are concerned now with the former rather than the latter. That is, we wish to confine ourselves to the view of man as under the influence of certain principles which he finds to be part of his nature. Against these many things tempt him to rebel, but he feels that there is a warning voice which will not suffer him to do so in ignorance of coming retribution, and which tells him, without arguments, without passion, without partiality, that every principle thus violated is sure to avenge itself with a merciless reaction.

We hope in succeeding papers to point out the practical bearing upon life of these great moral principles in man, and

under such headings as "Truth," "Temperance," "Character," etc., to bring before our readers the united ideas of life and duty.

LESSONS IN GERMAN.—VII.

SECTION XV.—THE PLURAL NUMBER OF ARTICLES, NOUNS, ADJECTIVES, ETC.

In the plural the adjective, when not preceded by a declinable word (the personal pronouns excepted), is inflected according to

THE OLD DECLENSION.

N. Gute, good;	schöne, fine;	alt, old;	rotze, red;
Ö. Güter, of good;	schöner, of fine;	alter, of old;	rotzer, of red;
D. Guten, to good;	schönen, to fine;	alten, to old;	rotzen, to red;
N. Gute, good;	schöne, fine;	alt, old;	rotze, red.

1. The definite article, the demonstrative and possessive pronouns, have, in the plural, the same form for all genders, and are declined like adjectives of the Old Declension.

Adjectives, when preceded by the definite article, a demonstrative, possessive, or relative pronoun, end in all cases of the plural in *en*, and are of the New Declension.

DECLENSION OF THE DEFINITE ARTICLE, DEMONSTRATIVE AND POSSESSIVE PRONOUNS IN THE PLURAL.

N. Die, the;	these;	meine, my;
Ö. Der, of the;	dieser, of these;	meiner, of my;
D. Dem, to, or for the;	diesem, to, or for these;	meinem, to, or for my;
N. Die, the;	diese, these;	meine, my.

NEW DECLENSION OF ADJECTIVES IN THE PLURAL.

N. Sene guten, those good;	feine guten, his good;
Ö. Sener guten, of those good;	feiner guten, of his good;
D. Senen guten, to, or for those good;	feinen guten, to, or for his good;
N. Sene guten, those good;	feine guten, his good.

RULES FOR THE FORMATION OF THE PLURAL OF NOUNS.

Old Declension.

Rule 1. Masculine nouns ending in *el*, *en*, *er*, have the same form in the plural, as:—Der Maler, the painter; die Maler, the painters. Der Morgen, the morning; die Morgen, the mornings. Der Strudel, the whirlpool; die Strudel, the whirlpools.

The following masculine nouns take the Umlaut. (To take the „Umlaut“ means to change or modify the vowel; i.e., to change a into ä, e into ö, u into ü; the diphthong au is modified into äu.) Apfel, apple; Sammel, wether; Handel, trade; Wangel, want; Mantel, cloak; Nabel, navel; Nagel, nail; Sattel, saddle; Schnabel, beak; Vogel, bird; Faden, thread; Garten, garden; Graben, ditch; Hafen, harbour; Ofen, stove, oven; Schaden, injury; Acker, field; Bruder, brother; Hammer, hammer; Schwager, brother-in-law; Vater, father. As, also, the feminine nouns: Mutter, mother; Tochter, daughter.

Singular. N. Der Mantel.	Plural. die Mäntel.
Der Vogel.	die Vögel.
Der Bruder.	die Brüder.

Rule 2. Masculine nouns of other terminations add *e* (in a few words *er*), and assume the Umlaut, as:—Zahn, tooth; Zähne, teeth. Baum, tree; Bäume, trees. Rock, coat; Röcke, coats. Hut, hat; Hüte, hats. Thus also are declined the feminine nouns Angst, Art, etc.

The following do not assume the Umlaut: Aal, eel; Aar, eagle; Anker, anchor; Anwalt, attorney; Arm, arm; Dacht, wick; Dolch, dagger; Dorsch, haddock; Ehem, son-in-law; Gemahl, husband; Halm, stalk (Halmen when used in a collective sense); Hauch, breath; Herzog, duke; Hufe, hoof; Hund, dog; Kobold, hobgoblin; Laut, sound; Leichnam, corpse; Luchs, lynx; Lizard, lizard; Monat, moon; Monat, month; Mord, murder; Pfad, path; Salmon, salmon; Schaft, shaft; Schuh, shoe; Staat, starling; Stoff, material; Tag, day; Trunkenheit, drunkard; Unhold, monster; Viehfraß, glutton; Wiechepf, hoopoo; Zoll, inch (Zoll, *pl.* Zölle, custom, tax), as:—

Singular. Der Gemahl.	Plural. die Gemahle.
Der Mund.	die Munde.
Der Unhold.	die Unholde.

Rule 3. Neuter nouns ending in *e*, *el*, *en*, *er*, *den*, and *lein*, have the same form in the plural, as:—Das Mittel, the means; die Mittel, the means. Das Wasser, the water; die Wasser, the waters. Das Gebäude, the building; die Gebäude, the buildings.

Das Mädchen, the girl; die Mädchen, the girls. *Singular:* Das Männlein, the little man. *Plural:* Die Männlein, the little men.

Exception.—Kloster, cloister, takes the Umlaut.

Rule 4. Neuter nouns of other terminations add *e* (or *er*), as:—Jahr, year; Jahre, years. Schiff, ship; Schiffe, ships. Boot, boat; Boote (sometimes written *Böte*), boats. *Singular:* Das Bild, the image. *Plural:* Die Bilder, the images. Stof, raft, and Rohr, pipe, take the Umlaut.

New Declension.

Rule 5. Masculine nouns of the New Declension which end in *e*, or unaccented *el*, *er*, *at*, add *n* in the oblique cases of the singular, and retain this form in all cases of the plural, as:—Der Knabe, the boy; des Knaben, die Knaben. Der Ungar, the Hungarian; des Ungarn, die Ungarn. Der Bayer, the Bavarian; des Bayern, die Bayern. Herr has Herrn in the oblique cases of the singular, and Herren in all cases of the plural. There are some words ending in *ar* which take *en*: e.g., N. Der Barbar, the barbarian; G. Des Barbaren; *Plural:* Die Barbaren.

Rule 6. Masculine nouns of other terminations add *en*, as:—Der Graf, the count; des Grafen, die Grafen. Der Bär, the bear; des Bären, die Bären. Der Ochse, the ox; des Ochsen, die Ochsen.

Rule 7. Feminine nouns ending in *e*, *el*, *er*, form the plural by adding *n*, as:—Narbe, scar; Narben. Gabel, fork; Gabeln. Peter, pen; Peters.

Rule 8. Feminine nouns of other terminations add *en*, as:—Frau, woman; Frauen. Uhr, watch; Uhren. Nouns terminating in „*n*“ (which formerly used to be spelt „*inn*“) double the *n* in the plural, before they take „*en*“ as:—Die Freundin. *Plural:* Die Freundinnen. (See § XIV. 1.)

Rule 9. Nouns which in the nominative plural end in *n*, have all cases alike; those of other terminations add *n* in the dative, and have all other cases alike.

Note.—The masculine nouns *Uhn*, ancestor; *Doern*, thorn; *Glitter*, spangle; *Forst*, forest; *Gau*, province; *Gewatter*, godfather; *Ferber*, laurel; *Wast*, mast; *Nachbar*, neighbour; *Wan*, peacock; *See*, lake; *Sporn*, spur; *Staat*, state; *Stachel*, sting; *Strahl*, ray; *Strauß*, ostrich; *Wetter*, cousin; *Untertban*, subject; *Zierat* or *Zierath*, ornament; and the neuters *Auge*, eye; *Bett*, bed; *Ente*, end; *Hemd*, shirt; and *Ohr*, ear, form the singular according to the Old, and the plural according to the New Declension. *Stein* and *Bett* have also the forms *Steiner* and *Bette*; the masculine nouns *Fels*, rock; *Friete*, peace; *Sunne*, spark; *Gedante*, thought; *Glaube*, faith; *Haufe*, heap; *Name*, name; *Saame*, seed; *Schate*, in ury; *Wille*, will; follow the New Declension, and also take *s* in the genitive singular, as:—Der Fels, des Felsens, dem Felsen. They, however, often end in the nominative singular in *en*, and are regularly inflected according to the Old Declension, as:—Der Felsen; der Frieeten, &c. A few examples will explain the former part of this note:—

Sing. N. Der Dorn. G. Des Dornes. *Plur.* Die Dornen (also Dörner.)
N. Der Stachel. G. Des Stachels. Die Stacheln.

Der Schmerz, the pain, forms the genitive, and das Herz, the heart, the genitive and dative singular, in the same way, and both form the plural according to the New Declension.

OLD DECLENSION OF THE ADJECTIVE, PLURAL. (See Sect. XIV.)

- N. Gut-e (Wein-e), good (wines).
- G. Gut-er (Wein-e), of good (wines).
- D. Gut-en (Wein-en), to good (wines).
- A. Gut-e (Wein-e), good (wines).

DECLENSION OF THE ARTICLE AND ADJECTIVE IN THE PLURAL.

- N. Die guten (Hüt-e), the good (hats).
- G. Der guten (Hüt-e), of the good (hats).
- D. Den guten (Hüt-en), to the good (hats).
- A. Die guten (Hüt-e), the good (hats).

DECLENSION OF A POSSESSIVE PRONOUN AND AN ADJECTIVE IN THE PLURAL.

- N. Meine guten (Nägel), my good (nails).
- G. Meiner guten (Nägel), of my good (nails).
- D. Meinen guten (Nägel-n), to my good (nails).
- A. Meine guten (Nägel), my good (nails).

When several consecutive adjectives precede and qualify the same noun, they must, in termination, be all alike, as:—Er hat gutes, feines, blaues Tuch. Er hat das gute, feine, blaue Tuch. Sie haben

gute, neue, schöne Hüte. Sie haben die guten, neuen, schönen Hüte. (§ 34, 2.) The pupil's attention is directed to the changes which the adjectives undergo according as the article is absent or present, of which more will be said hereafter.

NEW DECLENSION OF NOUNS PLURAL.

- N. Die Ochse-n, the oxen; die Fürst-en, the princes;
- G. Der Ochse-n, of the oxen; der Fürst-en, of the princes;
- D. Den Ochse-n, to, for the oxen; den Fürst-en, to, for the princes;
- A. Die Ochse-n, the oxen; die Fürst-en, the princes.

CONJUGATION OF THE PRESENT TENSE OF „haben“ AND „sein“ IN THE PLURAL.

Wir haben, we have; wir sind, we are;
Ihr (§ 57. 6) habt, you have; ihr seid, you are;
Sie haben, they have; sie sind, they are.

VOCABULARY.

Aufgabe, f. exercise.	Kanzler, m. chancellor.	Pre'diger, m. preacher.
Baum, m. tree.	Kirche, f. church.	Ratte, f. rat.
Beide, both.	König, m. king.	Regenschirm, m. umbrella.
Birne, f. pear.	Lang, adj. long.	Reichthum, m. wealth, riches.
Blatt, n. leaf.	Lastig, adj. burdensome.	Reinlich, adj. neat, cleanly.
Den, for, because.	Liebtich, adj. lovel.	Reiteri', f. cavalry.
Ehrlich, adj. honest; honestly, adv.	Liebling, m. darling, favourite.	Schmackhaft, adj. palatable.
Sin'gerhut, m. thimble.	Löffel, m. spoon.	Sonnen'schirm, m. parasol.
Freude, f. joy, delight.	Louise, f. Louisa.	Stolz, adj. proud, haughty.
Fußwoll, n. infantry.	Malcr, m. painter.	Tochter, f. daughter.
Gabel, f. fork.	Malerci, f. (art of) painting.	Unwohl, adj. and adv. unwell.
Gast, m. guest.	Marktfrau, f. market-woman.	Volk, n. people.
Gelb, adj. yellow.	Mess'erschmied, m. cutler.	Zu (pr.), to.
Gemälde, n. painting, picture.	Musik'lehrer, m. music-teacher.	Zu (adv.), too.
Gleich, like, equal.	Nachbarin, f. neighbour.	
Hoch, adj. high (pre-dicative form).		
Höher, hehe, höher, high (attributive form).		
Kanzel, f. pulpit.		

RÉSUMÉ OF EXAMPLES.

Fehler sind unvermeidlich. Mistakes are unavoidable.
Sie suchen auf den Schiffen ihres Feindes Eär'tigung ihrer Rache unt ihres Hungers. They seek upon the ships of their enemy gratification (satiation) of their rage and of their hunger.
Dieses schöne Geschenk ist von meiner Schwester. This beautiful present is from my sister.
Dieses Haus, diese Wiesen, und jene Wein'gärten sind das Eigenthum eines reichen Kaufmannes. This house, these meadows, and those vineyards are the property of a rich merchant.

EXERCISE 20.

1. Diese neuen Tische sind groß.
2. Die weißen Hüte sind schön.
3. Diese Gabeln sind von Silber.
4. Haben Sie silberne oder goldene Messer und Löffel?
5. Wir haben silberne.
6. Die guten Knaben haben schöne Birnen.
7. Fleißige Schüler haben lange Aufgaben.
8. Diese alten Soldaten haben alte Bücher.
9. Der Messerschmied hat seine neue Messer.
10. Die Freuden dieses Mannes sind seine lieblichen Kinder.
11. Die Kanzeln in diesen Kirchen sind hoch.
12. Die Nichten der alten Dame sind fleißig.
13. Die Mädchen des Pretigers sind gute Kinder.
14. Die Hel'länder sind reinlich und ehrlich.
15. Diese Marktfrau hat die großen, reifen Birnen des Bauers.
16. Die großen, reifen Birnen dieser Marktfrau sind schmackhaft.
17. Hat diese Dame den Fingerhut Ihrer guten Freundin?
18. Nein, sie hat den Fingerhut Ihres guten Freundes.
19. Hat Fräulein Louise den neuen Sonnenschirm Ihrer guten Mutter?
20. Nein, sie hat den Regenschirm Ihres guten Vendors.
21. Hat die kleine Tochter dieser Dame einen Musiklehrer?
22. Nein, denn sie ist noch zu jung; aber ihre Schwester hat nicht nur einen Musiklehrer, sondern auch einen Lehrer der Malerci.
23. Wer hat die Bücher Ihres Bruders?
24. Die Schwester seiner Freundin hat die Bücher.
25. Hat die Tochter Ihres alten Nachbars die geknete Uhr meiner jungen Freundin?
26. Nein, sie hat die silberne Uhr ihrer Nachbarin.
27. Die Blätter dieser Bäume sind gelb, aber ihre Döf ist reif und gut.
28. Die Matten sind lästige Gäste.
29. Dieser alte Kaufmann hat große Reichthümer.
30. Diese Reiteri ist der Lieblich des Königs.
31. Der kleine Sohn des Kanzlers ist der Fleißig des Königs.
32. Diese Freundin des Malers hat sehr schöne Gemälde.

HISTORIC SKETCHES.—IV.

CHARLES I. WHEN THE COMMONS CRIED "PRIVILEGE."

THE 4th of January, 1641-2, was one of the most momentous days for England that ever dawned. Westminster Hall, which had been the scene of so many an important national drama, and which was yet to be the scene of many more, was the place in which the events that made this day momentous were enacted. The coronation and the fall of kings, the trial and condemnation of great subjects, the meeting of the first Parliament, the concession of great national boons, those walls had witnessed. The occasion about to be mentioned was, if inferior to these in point of pomp and circumstance, second to none of them in importance. The 4th of January, 1641, was the day on which the great question was practically tried, whether the King of England should or should not rule without the aid of his Parliament. In various forms, more or less outrageous, the question had been submitted before. Henry VIII. tried it, and so, with less pertinacity, did Elizabeth, and the Parliament had withstood them. It was hardly likely that what the men of 1530 and the men of 1601 had resisted, against the influence and power of the great Tudors, their descendants would accept in 1641 from the hands of Charles Stuart.

During the reign of James I.—1603 to 1625—the House of Commons had successfully striven to curb the royal power. Popular rights which had long lain dormant, and were likely to rust for want of use, had been revived, not without opposition. James I., the "British Solomon," or, as he was called by a wise man of his own day, "the wisest fool in Europe," clung with the tenacity of a leech to those attributes of royalty which a small-hearted man would most value, and which were not the less annoying because they were so petty. Not all petty, though; some of the claims which the Commons disallowed were important enough. They re-established on the firmest possible basis the principle, that the king has no right to levy, under any pretence whatever, a tax upon his subjects, without the consent of Parliament; they procured the abolition of an enormous abuse of the power to grant monopolies or patents; they asserted, in the most solemn manner, the inviolability of the persons of members of Parliament, unless in cases of felony; and they revived the power which, Hallam says, "had lain like a sword in the scabbard," unused since the reign of Henry VI., a period of 175 years, to impeach the king's ministers for bad conduct. They had impeached Lord Bacon and Lord Middlesex for their misdemeanours in office, and these noblemen, as in all cases where the House of Commons is the accuser, were tried by the House of Lords. They were heavily punished; but the effect of their punishment was salutary beyond the cases immediately concerned. Ministers feared the new edge of the old weapon of the Commons, and were cautious beyond what they had been; and so the arm of the king was paralysed down quite half its length. Some ministers there were in the next reign, that of Charles I., who neglected the warning, or thought themselves able to despise it, and they fell like the Earl of Strafford and like Laud, whose fall brought the king's head also to the block.

Having done so much, the Parliament—many of the leading spirits in James's Parliaments sat in the Parliaments of Charles I.—was not disposed, certainly, to recede. On the contrary, it was bent on yet further restraining the royal power, by putting checks on the Court of Star Chamber (an irregular tribunal, acting above and without the law of the land, and of late years much abused) and High Commission (an equally irregular and illegal tribunal for ecclesiastical causes), by all the constitutional means in their power. Unfortunately, the king was as much resolved to win conquests for the royal prerogative as the Commons were to win them from it. Without the ability, without the brutality of Henry VIII., before which many obstacles went down, Charles I. had all that monarch's greed of power, and even more exalted notions of the nature of the royal dignity. He rested his claims on the so-called "right divine of kings," to govern rightly or wrongly, according to their conscience, which had to give account to the King of kings, but under no circumstances to the people committed to its care. He lacked the ferocity which was half the battle to "bluff King Hal," and, linked with a certain amount of cruelty which he had in common with him, wore a timidity and inde-

cision which were fatal to success in his career as a tyrant. There were also stronger men opposed to him than resisted Henry VIII. The luckless king had come in evil times for him; but the people of England reaped the benefit of his misfortunes, and won many a fair privilege, which they left "as a rich legacy unto their issue."

Before Charles had been three years upon the throne, the Commons, who had during that time suffered very greatly in several particulars, presented for his signature the Petition of Right, a statute which was not intended to declare, as it did not declare, any new privilege, but merely set forth—for the purpose of having them confirmed—some rights which had been invaded, but of which the origin was as old as Magna Charta. The petition contained but four demands, which the king was required to grant, viz. :—

1. That no money should be levied in future, under any pretence whatever, by virtue of the king's prerogative.
2. That the committal to prison of Mr. Hampden and four others for refusing to pay an unlawful impost, should be recognised as illegal.
3. That soldiers should not be billeted on private persons.
4. That no man should henceforth be tried by martial law.

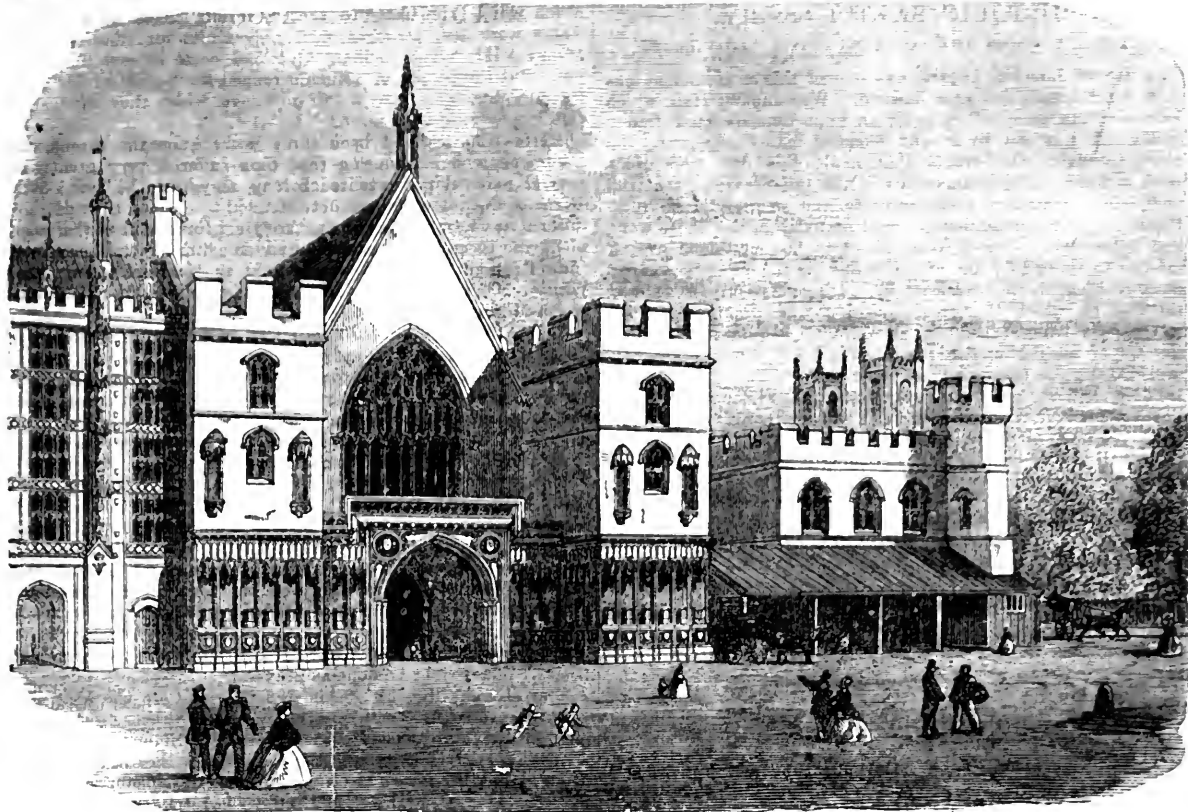
The petition was presented in 1628. Charles tried every expedient, every shift and turn, in the hope of avoiding the necessity of complying with it. When at length compelled to give some answer, he gave a most unusual and evasive one, which clearly showed his intention to ride rough-shod over the Act at the first opportunity. It was only on the peremptory refusal of the Commons to accept his qualified assent, and after much pressure had been brought to bear, that he agreed to give the royal assent in the usual way: "Soit droit faist comme est désiré." (Let right be done as prayed.)

Scarcely was the ink of his signature dry ere the king set about to evade the petition. He levied fresh taxes under new names; he imprisoned six members of Parliament for their conduct in the House; with the help of the Earl of Strafford, he attempted to govern the kingdom without a Parliament, and with the help of Archbishop Laud, to govern despotically the Church. Sentences the most severe and cruel were procured in the Star Chamber against those who resisted the Government, and in the High Commission Court against those who offended in matters ecclesiastical. So great was the oppression, both in Church and State, that many, unable any longer to endure it, sailed across the Atlantic, to seek in the New World a home and a soil in which freedom might flourish. Then came honourless wars, undertaken against the wish, and in favour of the enemies, of the nation; then came the troubles in Scotland, which quickly threw off the yoke Charles tried to lay upon it; there were the disputes respecting the king's favourite, Buckingham; there were the trials and executions of Strafford and Archbishop Laud; the Irish rebellion; the angry reception of the Grand Remonstrance; and finally, there was the attempt to arrest the five members of the House of Commons.

This last was the drop that filled the bucket, and made it overflow. Charles, indignant at the speech and behaviour of Lord Kimbolton (son of the Earl of Manchester), and five members of the Lower House (Sir Arthur Hazelrig, Messrs. Hollis, Hampden, Pym, and Strode), during the recent differences between the king and the Parliament, in an evil hour listened to the advice of Henrietta, his queen, and to the advice of Lord Digby and the courtiers. They urged him to show himself a king, advised him that no private gentleman would suffer himself to be addressed as he had been by the accused, and recommended the arrest of the members on a charge of high treason.

Orders were accordingly given, on 3rd of January, 1641, for the arrest of the persons named. Their houses were occupied, their studies sealed up, and their papers seized. A pursuivant went down to the House of Commons, and, in the king's name, demanded the surrender of the accused. He was, however, sent back without any definite answer; the House voted that what had been done by the royal officers was a breach of the privilege of Parliament; and the king, angry at the non-compliance with his demand, resolved to go next day in person to the House, and himself arrest the accused men.

Mr. Isaac D'Israeli says, "When Charles went down to the House to seize on the five leading members of the Opposition, the queen could not restrain her lively temper, and impatiently



EXTERIOR VIEW OF WESTMINSTER HALL.

babbed the plot, so that one of the ladies in attendance dispatched a hasty note to the parties, who, as the king entered the House, had just time to leave it." The lady in question was the Countess of Carlisle, who was on intimate terms with several of the accused. On receipt of her note, which was communicated to the House, a brief but excited debate took place. Some were for directing the accused to absent themselves, hoping thereby to avoid an unseemly quarrel; others were inclined to have them remain, and to make common cause with them in case of any violence being offered. While the debate was yet going on, the gentlemen most concerned being themselves undecided as to the best course to adopt, a friend of Mr. Fiennes, a member, came hurriedly, and told him that the king had already left Whitehall, at the head of 200 armed men, and was coming in the direction of the House. There was no time for further talk. Action must be taken forthwith. A motion was hurriedly passed, giving leave to the five members to absent themselves, and they quitted the House a few seconds only before the King entered it.

Up Westminster Hall—the place which was in a few years to witness his trial and condemnation—King Charles walked, followed by his ordinary retinue, and a force of soldiers variously estimated at two, three, and even five hundred men. "It struck such a fear and terror into all those that kept shops in the said Hall, or near the gate thereof, as they instantly shut up their shops, looking for nothing but bloodshed and desolation"—so wrote an eye-witness of the affair. Arrived in the Hall, the armed men formed a lane, stretching down the whole length of it; the king passed along, and going up the staircase out of the Hall went into the Commons' House, "where never king was (as they say) but once King Henry the Eighth."

Attended only by his nephew Rupert, the son of the Elector Palatine of the Rhine, the king entered the House, the door of which, however, was kept open; and through the open door were to be seen officers and soldiers armed with swords and pistols, while the Earl of Roxborough and a Captain Hide stood within the door, and leaned upon it.

The Speaker of the House, Lenthall, had been instructed to sit still, with the mace before him; but when the king entered and the whole House rose and uncovered their heads, Lenthall also rose and stood in front of the chair. Charles removed his hat, and bowed to either side of the House as he came up. "Mr. Speaker, I must for a time make bold with your chair," he said, as he approached Lenthall, who made way for him; though the king did not sit down in the chair, but stood on the step of it.

A deep silence reigned in the House, till the king, who had been occupied in looking round for the five members, said, breaking in upon the silence, "Gentlemen, I am sorry for this occasion of coming unto you. Yesterday I sent a sergent-at-arms upon a very important occasion, to apprehend some that, by my command, were accused of high treason; whereunto I did expect obedience, and not a message. And I must declare unto you here, that albeit no king that ever was in England shall be more careful of your privileges, to maintain them to the uttermost of his power, than I shall be, yet you must know that in cases of treason no person hath a privilege. And therefore I am come to know if any of these persons that were accused are here."

No one answered. Charles, after a pause, made a few more remarks, and then asked specifically for each of the accused. No one informing him, he turned to Speaker Lenthall, requiring to be told; but Lenthall, kneeling, humbly desired to be excused, saying: "I have neither eyes to see nor tongue to speak in this place but as the House is pleased to direct me, whose servant I am here; and I humbly beg your Majesty's pardon that I cannot give any other answer than this to what your Majesty is pleased to demand of me."

Baffled by the silence, and by the extreme courtesy evinced by the attitude of the House, the king went on to make some further remarks, with difficulty concealing, in the midst of his excitement, the natural infirmity of his speech. Not seeing those for whom he sought, he said, "Well, since I see all my birds are flown, I do expect from you that you will send them

unto me as soon as they return hither. . . . I will trouble you no more, but tell you I do expect, as soon as they come to the House, you will send them to me; otherwise, I must take my own course to find them."

With the same show of respect they had shown him when he came in, the assembled members waited on him as he again passed down their ranks. Bareheaded and in silence, they allowed him to get as far as the door; but ere that had closed upon him low mutterings of anger were raised, and the cry of "Privilege! Privilege!" mingled ominously with the conversation in which the king told his friends in the Hall of the result of his errand.

The five members were not arrested, though the king spared no pains to take them. By all means in his power he tried to get hold of them—by warrants, by proclamations, by personal application. No one would betray them; and it having been resolved to restore them to their seats in the Commons' House, the king feared the temper of which this resolution was the sign, and within a week of his foolish visit to Westminster to arrest the members he was a fugitive from London, deeming himself not safe from the violence his actions had aroused.

By his recent conduct, no more than consistent with his former conduct, he had thrown down a challenge to the nation. The House of Commons took it up. Mr. Forster well says: "It had become clear that the attempt upon the members could not be defeated, without a complete overthrow of the power of the king. He could not remain at Whitehall if they returned to Westminster. Charles raised the issue, the Commons accepted it, and so began our Great Civil War."

SYNOPSIS OF THE LIFE AND REIGN OF CHARLES I.

Charles I. was the second son of James I., by his Queen, Anne of Denmark. He was the twenty-fifth sovereign of England after the Norman Conquest, and the second of the Stuart dynasty.

Born at Dunfermline Nov. 19, 1600	Bat. of Newbury (1) Sept. 30, 1643
Began to Reign . . . Mar. 27, 1625	Bat. of Cropredy Br. June 6, 1644
Petition of Right presented . 1628	Bat. of Marston Moor July 2, 1644
Persecution of the Puritans . 1633	Bat. of Newbury (2) Oct. 27, 1644
Refusal of Hampden to pay ship-money 1634	Montrose raises forces for the King in Scotland . . . 1644
Hampden prosecuted . . . 1636	Execution of Archbishop Laud Jan. 10, 1645
Scottish Covenant against Episcopacy 1638	Conference at Uxbridge . . . 1645
The "Long Parliament" summoned 1640	Battle of Naseby . June 14, 1645
Impeachment of Laud and Strafford 1640	Charles I. retires to Scotland 1646
Execution of Strafford . . . 1641	Betrayed to the Parliament by the Scotch . . . Jan. 30, 1647
Impeachment of the Five Members demanded by Charles 1642	Imprisoned at Carisbrook Castle 1647
The "Troubles" commence . 1642	Cromwell, by the aid of the army, assumes supreme power, and controls the Parliament 1648
Royal Standard raised at Nottingham Aug. 25, 1642	The King brought to Whitehall 1648
Battle of Worcester Sept. 23, 1642	His Trial for Treason commences Jan. 20, 1649
Battle of Edge Hill Oct. 23, 1642	Beheaded at Whitehall Jan. 30, 1649
Bat. of Stratton Hts. May 16, 1643	
Death of Hampden June 19, 1643	
Battle of Lansdown July 5, 1643	

SOVEREIGNS CONTEMPORARY WITH CHARLES I.

Denmark, Kings of.	John II. (sometimes styled Casimir V.) . 1649	[This prince assumed the leadership of the Protestant League in 1630, and fell at Lutzen.
Christian IV. . 1588	Portugal, Kings of.	Interregnum . 1632-3
[This prince was for many years the head of the Protestant League against Ferdinand II. of Germany.]	John IV. . . . 1640	Christina III. . 1633
Frederick III. . 1648	[Portugal was annexed to Spain from 1580 to 1640.]	Turkey, Sultans of.
France, Kings of.	Rome, Popes of.	Mustapha I. (restored) . . . 1622
Louis XIII. . . 1610	Urban VIII. . . 1623	Amurath IV. . . 1623
Louis XIV. . . 1643	Innocent X. . . 1644	Ibrahim . . . 1640
Germany, Emperors of.	Russia, Czars of.	Mahomet IV. . 1649
Ferdinand II. . 1619	Michael Feodorovitch 1613	
Battle of Lutzen . 1632	Alexis 1645	United Provinces of the Netherlands, Stadtholders of.
Ferdinand III. . 1637	Spain, Kings of.	Frederick Henry 1625
Close of the Thirty Years War . . 1648	Philip IV. . . . 1621	William II. . . 1647
Poland, Kings of.	Sweden, Sovereigns of.	[This prince married Mary, eldest daughter of Charles I.]
Sigismund III. . 1587	Gustavus Adolphus 1611	
Ladislas IV. . . 1632		

READING AND ELOCUTION.—IV.

PUNCTUATION (continued).

V. THE SEMICOLON.

33. The Semicolon is formed by a period placed above a comma.

34. When you come to a semicolon in reading, you must in general make a pause twice as long as you would make at a comma.

35. Sometimes you must use the falling inflection of the voice when you come to a semicolon, and sometimes you must keep your voice suspended, as directed in the case of the comma. Whatever may be the length of the pause, let it be a total cessation of the voice.

Examples.

That God whom you see me daily worship; whom I daily call upon to bless both you and me, and all mankind; whose wondrous acts are recorded in those Scriptures which you constantly read; that God who created the heaven and the earth is your Father and Friend.

My son, as you have been used to look to me in all your actions, and have been afraid to do anything unless you first knew my will; so let it now be a rule of your life to look up to God in all your actions.

If I have seen any perish for want of clothing, or any poor without covering; if his loins have not been blessed me, and if he were not warmed with the fleece of my sheep; if I have lifted up my hand against the fatherless, when I saw my help in the gate; then let mine arm fall from my shoulder-blade, and mine arm be broken from the bone.

The stranger did not lodge in the street; but I opened my doors to the traveller.

If my land cry against me, or the furrows thereof complain; if I have eaten the fruits thereof without money, or have caused the owners thereof to lose their life; let thistles grow instead of wheat, and cockles instead of barley.

When the fair moon, refulgent lamp of night, o'er heaven's clear azure spreads her sacred light; when not a breath disturbs the deep serene, and not a cloud o'ercasts the solemn scene; around her throne the vivid planets roll, and stars unnumbered gild the glowing pole; o'er the dark trees a yellow verdure shed, and tip with silver every mountain's head; then shine the vales, the rocks in prospect rise, a flood of glory bursts from all the skies; the conscious swains, rejoicing in the sight, eye the blue vault, and bless the useful light.

When the battle was ended, the stranger disappeared; and no person knew whence he had come, nor whether he had gone.

The relief was so timely, so sudden, so unexpected, and so providential; the appearance and the retreat of him who furnished it were so unaccountable; his person was so dignified and commanding; his resolution so superior, and his interference so decisive, that the inhabitants believed him to be an angel, sent by Heaven for their preservation.

36. Sometimes you must use the falling inflection of the voice when you come to a semicolon, in reading.

Examples.

Let your dress be sober, clean, and modest; not to set off the beauty of your person, but to declare the sobriety of your mind; that your outward garb may resemble the inward plainness and simplicity of your heart.

In meat and drink, observe the rules of Christian temperance and sobriety; consider your body only as the servant and minister of your soul; and only so nourish it, as it may best perform an humble and obedient service.

Condescend to all the weaknesses and infirmities of your fellow-creatures; cover their frailties; love their excellences; encourage their virtues; relieve their wants; rejoice in their prosperity; compassionate their distress; receive their friendship; overlook their unkindness; forgive their malice; be a servant of servants; and condescend to do the lowest offices for the lowest of mankind.

Struck with the sight of so fine a tree, he hastened to his own, hoping to find as large a crop upon it; but, to his great surprise, he saw scarcely anything, except branches, covered with moss, and a few yellow leaves.

In sleep's serene oblivion laid, I've safely passed the silent night; again I see the breaking shade, again behold the morning light.

New-born, I bless the waking hour; once more, with awe, rejoice to be; my conscious soul resumes her power, and soars, my guardian God, to thee.

That deeper shade shall break away; that deeper sleep shall leave mine eyes; thy light shall give eternal day; thy love, the rapture of the skies.

In the sight of our law the African slave-trader is a pirate and a felon; and in the sight of heaven, an offender far beyond the ordinary depth of human guilt.

What hope of liberty is there remaining, if whatever is their pleasure, it is lawful for them to do; if what is lawful for them to do, they are able to do; if what they are able to do, they dare do; if what they dare do, they really execute; and what they execute, is in no way offensive to you?

It is not the use of the innocent amusements of life which is dangerous, but the abuse of them; it is not when they are occasionally, but when they are constantly pursued; when the love of amusement degenerates into a passion; and when, from being an occasional indulgence, it becomes an habitual desire.

The prevailing colour of the body of a tiger is a deep tawny, or orange yellow; the face, throat, and lower part of the belly are nearly white; and the whole is traversed by numerous long black stripes.

The horse, next to the Hottentot, is the favourite prey of the lion; and the elephant and camel are both highly relished; while the sheep, owing probably to its woolly fleece, is seldom molested.

The horse is quick-sighted; he can see things in the night which his rider cannot perceive; but when it is too dark for his sight, his sense of smelling is his guide.

37. The semicolon is sometimes used as a note of interrogation, and sometimes as an exclamation.

Examples.

Hasst thou not set at defiance my authority; violated the public peace, and passed thy life in injuring the persons and properties of thy fellow-subjects?

Oh, it was impious; it was unmanly; it was poor and pitiful!

Have not you too gone about the earth like an evil genius; blasting the fair fruits of peace and industry; plundering, ravaging, killing without law, without justice, merely to gratify an insatiable lust for dominion?

Art thou not, fatal vision, sensible to feeling as to sight? Or art thou but a dagger of the mind; a false creation, proceeding from the heat-oppressed brain?

By such apologies shall man insult his Creator; and shall he hope to flatter the ear of Omnipotence? Think you that such excuses will gain new importance in their ascent to the Majesty on high; and will you trust the interests of eternity in the hands of these superficial advocates?

And shall not the Christian blush to repine; the Christian, from before whom the veil is removed; to whose eyes are revealed the glories of heaven?

Why, for so many a year, has the poet and the philosopher wandered amidst the fragments of Athens or of Rome; and paused with strange and kindling feelings, amidst their broken columns, their mouldering temples, their deserted plains? It is because their day of glory is past; it is because their name is obscured; their power is departed; their influence is lost!

Where are they who taught these stones to grieve; where are the hands that hewed them; and the hearts that roared then?

Hope ye by these to avert oblivion's doom; in grief ambitious, and in ashes vain?

Can no support be offered; can no source of confidence be named?

Is this the man that made the earth to tremble; that shook the kingdoms; that made the world like a desert; that destroyed the cities?

Falsely luxurious, will not man awaken; and, springing from the bed of sloth, enjoy the cool, the fragrant, and the silent hour, to meditation due, and sacred song?

But who shall speak before the king when he is troubled; and who shall boast of knowledge when he is distressed by doubt?

Who would in such a gloomy state remain longer than nature craves; when every muse and every blooming pleasure wait without, to bless the wildly devious morning walk?

What a glorious monument of human invention, that has thus triumphed over wind and wave; has brought the ends of the earth in communion; has established an interchange of blessings, pouring into the sterile regions of the north all the luxuries of the south; diffused the light of knowledge and the charities of cultivated life; and has thus bound together those scattered portions of the human race, between which nature seems to have thrown an insurmountable barrier!

Who that bears a human bosom, hath not often felt how dear are all those ties which bind our race in gentleness together; and how sweet their force, let fortune's wayward hand the while be kind or cruel?

VI. THE COLON.

38. The Colon is composed of two periods, placed one above the other.

39. Sometimes the passage ending with a colon is to be read

with the voice suspended; but it should generally be read with the falling inflection of the voice.

40. In reading, be careful to let the pause of the colon be a total cessation of the voice, and three times longer than that indicated by a comma.

Examples.

The smile of gaiety is often assumed while the heart aches within; though folly may laugh, guilt will sting.

There is no mortal truly wise and restless at the same time: wisdom is the repose of the mind.

Nature felt her inability to extricate herself from the consequences of guilt: the gospel reveals the plan of Divine Interposition and aid.

Nature confessed some atonement to be necessary: the gospel discovers that the atonement is made.

Law and order are forgotten: violence and rapine are abroad; the golden cords of society are loosed.

The temples are profaned: the soldier's curse resounds in the house of God: the marble pavement is trampled by iron hoofs: horses neigh beside the altar.

Blue wreaths of smoke ascend through the trees, and betray the half-hidden cottage: the eye contemplates well-thatched ricks, and barns bursting with plenty: the peasant laughs at the approach of winter.

The necessaries of life are few, and industry secures them to every man: it is the elegancies of life that empty the purse: the superfluities of fashion, the gratification of pride, and the indulgence of luxury, make a man poor.

My dear children, I give you these trees: you see that they are in good condition. They will thrive as much by your care as they will decline by your negligence: their fruits will reward you in proportion to your labour.

A bee among the flowers in spring is one of the most cheerful objects that can be looked upon. Its life appears to be all enjoyment: so busy and so pleased; yet it is only a specimen of insect life, with which, by reason of the animal being half-domesticated, we happen to be better acquainted.

'Tis a picture in memory distinctly defined, with the strong and unpurishing colours of mind: a part of my being beyond my control, beheld on that cloud, and transcribed on my soul.

Yet such is the destiny of all on earth: so flourishes and fades majestic man.

Let those deplore their doom whose hopes still grovel in this dark sojourn: but lofty souls, who look beyond the tomb, can smile at fate, and wonder why they mourn.

If for my faded brow thy hand prepare some future wreath, let me the gift resign: transfer the rosy garland: let it bloom around the temples of that friend beloved, on whose maternal bosom, even now, I lay my aching head.

Do not flatter yourselves with the hope of perfect happiness: there is no such thing in the world.

But when old age has on your temples shed her silver frost, there's no returning sun: swift flies our summer, swift our autumn's fled, when youth, and spring, and golden joys are gone.

A divine legislator, uttering his voice from heaven; an almighty governor, stretching forth his arm to punish or reward: informing us of perpetual rest prepared hereafter for the righteous, and of indignation and wrath awaiting the wicked: these are the considerations which overawe the world, which support integrity, and check guilt.

It is not only in the sacred fane that homage should be paid to the Most High: there is a temple, one not made with hands, the vaulted firmament: far in the woods, almost beyond the sound of city-chime, at intervals heard through the breezeless air.

As we perceive the shadow to have moved along the dial, but did not perceive its moving; and it appears that the grass has grown, though nobody ever saw it grow: so the advances we make in knowledge, as they consist of such minute steps, are perceivable only by the distance gone over.

MECHANICS.—IV.

TWISTED POLYGON—FORCES APPLIED TO TWO POINTS—PARALLEL FORCES.

THE method given in the last lesson of finding the resultant of several forces holds good, whether they act all in the same plane, or some of them upwards or downwards from it in different directions. For example, five forces, represented by the lines OA , OB , OC , OD , OE , in Fig. 9, are thus applied to a point O of a body on the floor of a room: two of them, OA , OD , along the floor in two different directions; another, OB , pointing to a picture on the left wall; a fourth, OC , to the cross on the top of a steeple, seen through the open window; and the fifth and last, OE , obliquely downwards, pressing the body against

the floor. On constructing, in such a case, the polygon of forces, we should have the figure as represented in perspective below, one of whose sides, $O A$, is on the floor, while the others, $A R, R R_1, R_1 R_2$, and $R_2 R_3$, are in the air. A figure of this kind is termed a *twisted polygon*, as though its sides had been all originally in the same plane, but, by a twist, some of them had

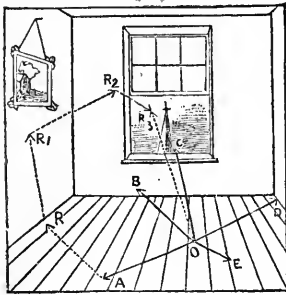


Fig. 9.

the "twisted polygon" has the educational value of giving the student mechanical ideas.

EXAMPLES FOR PRACTICE.

1. Three forces act on a point $O A$, equal to 3 pounds, $O B$ to 5, and $O C$ to 7. The second lies between the other two, making with $O A$ an angle of 30 degrees, and with $O C$ 45 degrees. Find the pounds in the resultant, and the angle it makes with the least force $O A$.
2. A roller of a hundred-weight is supported on an incline, the gradient of which is one foot in two, by a force which acts along its slope. Find the magnitude of this force and the pressure of the roller on the plane.
3. From two points on a ceiling, five feet apart, a sixty-pound weight is suspended by two strong cords, which meet at the point of suspension. The lengths of the cords are three and four feet respectively. Find the magnitudes of the forces by which they are strained.
4. Three weights of three, four, and five pounds are attached to three cords, which are knotted together at their other ends. The two cords bearing the lesser weights are thrown over two pulleys fastened at a distance of 10 feet from each other, and at the same height, into a wall, the greatest weight hanging between them. Find the position in which the cords and weights will settle into equilibrium.

You will observe that these problems are to be done by rule and compass, etc. We have not yet come to the more effective method of solving them by calculation. The geometric way, however, of drawing and measuring is the best for giving you accurate ideas of the subject, and therefore indispensable in the first stages. The lines you must carefully lay down by a ruler, and the angles by a circular protractor, keeping in mind, as to the latter, that in every *right angle* there are *ninety* degrees. The distances representing the forces you must take from an ordinary scale; and observe, as to this, that you need not make in every case your drawings so large that a *whole* inch be given to every pound of force. You may allow a quarter of an inch to each pound, or hundredweight, or ton, or even a tenth, if the numbers be large. All that is necessary is to keep the *proportion* of your figures right, whether they be on a large or a small scale, as is done in mapping or drawing plans of buildings. For the above examples a scale of a quarter of an inch for each pound will be quite sufficient. Perhaps for the third example tenths of an inch will best answer.

In the next lesson the answers to these problems will be given. I now proceed to

FORCES APPLIED TO TWO POINTS.

Three cases present themselves for consideration.

1. When the lines of direction of the two forces meet *within* the body.
2. When they meet *without*.
3. When the two forces are parallel to each other.

First Case.—This is easily disposed of. When two forces meet *within* a body, the point of meeting may be taken as the point of application of both forces, which can there be compounded into one; and the case thus becomes that of a *single force* applied to a *single point*.

Second Case.—Here also the two forces may be reduced to

one; but, as their directions meet outside the body, it is necessary to show that their effect is the same as though the point of meeting was a *real* point of application. This, in a future lesson, can be demonstrated by a *perfect* proof; but, in the meantime, the following considerations will satisfy you that it is true.

Let $A P$ and $B Q$ be the two forces applied to the points A and B (as in Fig. 10), and O the outside point in which their directions meet. Also, let $o r$ be the direction which their resultant would take were the body extended to o and the forces there applied. Suppose now that, in order to extend it, a round bar of iron of uniform thickness is firmly soldered to it, so as to include the line $o r$ within its substance. The body being thus extended, o may be considered a point of application of both forces, which we may conceive to be transferred to it by two thin but strong wires, $o A, o B$, the mass of which is so small that it may be neglected in comparison with that of the body. The forces $A P$ and $B Q$ then evidently become *one* force, acting along $o r$ on rod and body *together*, and producing the same effect on both as though they acted at A and B . But the effect taken separately of the resultant on $o r$, and therefore of $A P$ and $B Q$, is evidently the same—namely, a pressure along its length. Their effects, therefore, on the body itself taken separately must be the same; and o , although outside, may be considered a point of application. The two forces are reducible to one applied to the body at any point on the line $o r$ within the body.

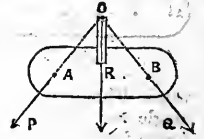


Fig. 10.

TWO PARALLEL FORCES.

Third Case.—The resultant single force can be determined in this case also by the parallelogram of forces, but the proof given by the greatest mechanician of antiquity—Archimedes of Syracuse—is, with a slight alteration, much preferable, on account of its simplicity. I shall first take two *equal* parallel forces, which act in the same direction. Let A and B (Fig. 11) be the points of application, and their directions those of the arrow-heads P and Q . Suppose, moreover, that in magnitude they are each one pound, or ounce, or ton—say, one pound. Now, in the first place, the resultant, whatever it be, must pass through the middle point of $A B$. The best reason I can give you for this is, that the resultant cannot, since the forces be equal, be nearer to one than to the other. If it were a tenth of an inch nearer to A , it should be also a tenth nearer to B .

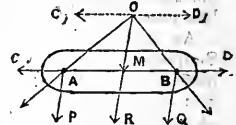


Fig. 11.

Now, in order to find its magnitude and direction, let us suppose that two other forces, $A C, B D$, each equal to a pound, are applied to the body along the line $A B$ in opposite directions. These being equal, and therefore of themselves balancing each other, can neither add to nor take from the effect of $A P$ and $B Q$, which may consequently be considered equivalent to the four forces $A P, B Q, A C, B D$. Let the two at A be now compounded into one, acting in some direction between them (I care not which), and let the same be done with the two at B . Now produce these resultant directions backwards, until they meet at o , and transfer the resultants themselves to that point. Now resolve them back into their original components, and you have two pounds, $o C_1$ and $o D_1$, acting against each other parallel to $A B$, and two separate pounds pulling from o downwards parallel to $A P$ and $B Q$. The two former cancel each other, and there remain two pounds acting parallel to $A P$. Hence we can say, that—

1. If two equal parallel forces act on a body in the same direction, their resultant is parallel to either, and bisects, or divides equally, the line joining their points of application.
2. The resultant is in magnitude equal to their sum, or to twice either force.

As an example to illustrate, take two equally strong horses pulling a carriage; two equal forces are applied to the splinter-bar, which give one force equal to double the strength of either horse acting at its middle point. When the carriage is backed, these forces are applied in the opposite direction directly to the centre through the pole.

We are now in a position to find the resultant of any two

parallel forces, the first step towards which is to determine the resultant of any number of equal ones applied to a body at equal distances along a line. The number may be either odd or even. We shall consider each separately. First, take odd; and let it be seven, as in Fig. 12. Now, supposing each to be one pound, if we take the middle one, which is evidently at the middle of the line A B, we find that there are three pounds on either side of it acting in pairs at equal distances from M. The resultant of the nearest pair gives, as proved above, two pounds at *x*; the next pair also give two, and so does the

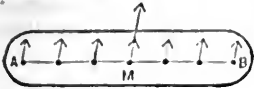


Fig. 12.

third. These make six pounds of resultant at *x*, which, with the single one already there, are seven pounds—the sum of all the forces for resultant. Were the number thirteen the conclusion would be the same. There would be six on either side of the middle one, and you would have a resultant of thirteen pounds; and the same holds good of any other odd number you select, be it large or small.

Now, suppose we have an even number of such forces, say six, as in Fig. 13, counting them from either end towards the middle, there will be no middle pound; and the middle of the line A B will be in the middle of the space between the middle pair of forces. What have we then? The inside pair gives two pounds at *x*, so does the next outside, and so the next; and there are evidently thus six pounds of resultant at the centre of A B. Take any other even number, and the result is the same; and thus, for both odd

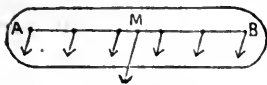


Fig. 13.

and even numbers, we arrive at this conclusion:—The resultant of any number of equal parallel forces acting on a body at equal distances along a line, is equal to their sum, and bisects the line joining the points of application of the extreme forces.

An instance of this is the working of a hand fire-engine. Suppose seven men at the lever on either side, that is, fourteen hands on each lever; supposing the men to be equally arranged and of equal strength, this makes fourteen equal forces applied at equal distances, the resultant of which is the muscular power of seven acting at the centre on either side.

Now we shall, without difficulty, find the resultant of two unequal parallel forces. As before, let A and B be their points of application, and let us first suppose that they act in the same direction. Measuring the forces by pounds, or ounces, or even grains, there are three cases which may occur. The number, say of pounds, in the forces may be both even, or both odd, or one odd and the other even. 1. We shall take "both even" first, and, for simplification sake, let them be six at A and four at B. Divide now the line A B into ten equal parts, that is, into as many parts as four and six together make. Extend also A B on either side, as represented (Fig 14) by the dotted lines, and measure off on the extensions any number of portions you please, each

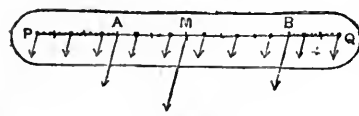


Fig. 14.

equal to one of the subdivisions of A B. Beginning at A, suppose you apply a pound force at the end of the first subdivision to the right, another pound at the end of the fifth, and so on until you come to B. You will find then that there will be a pound at the end of the first division from B. Put pounds now at the end of the first division from A on the dotted line, on the third, and on the fifth, and do the same on the dotted line from B, on the first and third. Count all the pounds you have; they are ten, five inside and five outside. Calling the points occupied by the extreme pounds *r* and *q*, the resultant of these ten, so distributed at equal distances, must pass through the middle, *x*, of *r* *q*, and be ten pounds, by the principle last established. But if we take separately the three outside and the three inside A, they make six pounds acting at A. Also the two pair on either side of B make four pounds at B. The ten pounds at *x* must therefore produce the same effect on the body as the six at A and the four at B, and therefore must be the resultant of these forces; that is to say, the resultant is the sum of the components.

But count now the number of subdivisions on either side, from *x* to A and B. There are four on the side of A and six on B's side—that is to say, the resultant cuts the line A B in the proportion of the numbers 4 and 6, with this peculiarity, however, that the smaller number is on the side of the greater force. This is what we might expect, for the resultant ought naturally to tend towards the greater, on account of its preponderance. When a line is cut in this way, the smaller portion being on the side of the greater number of pounds, it is said to be cut *inversely* as the two numbers—that is, in the *contrary* order.

2. Now let us take the case of two odd numbers; let them be 9 and 7. It is evident that if we put another 9 pounds at A, and 7 at B, the resultant of this second 9 and 7 should in every respect agree and coincide with that of the first, and that the resultant of the four should be the sum of two nines and two sevens. But the double 9 at A is 18 pounds, and the double 7 at B 14 pounds. The case, therefore, becomes one of even numbers, and the line A B, as proved above, must be cut by the resultant in the *inverse* proportion of 18 to 14. But to divide a line so that there may be 18 parts one side and 14 on the other becomes, by throwing every two of the subdivisions into one, the same thing as dividing it so that 9 may be on one side and 7 on the other. In this case then, also, A B is divided *inversely* as the forces.

3. When the numbers are one odd and the other even, say 4 and 7, the result is the same. By doubling each force you get 8 and 14 pounds, both even numbers; the line A B is divided by the resultant *inversely* as 14 to 8, which is the same as 7 to 4 *inversely* as the forces.

We have supposed in all these cases that the forces contained an exact round number of pounds; but what should we do if there were fractions of a pound in either or in both? I say, reduce the forces to ounces, and work by round numbers in ounces. If there were fractions of ounces, work in grains. You can thus secure round numbers, and the above proofs will hold good. But what are you to do if there are fractions of grains? Work them by tenths, or hundredth, or thousandth parts of grains, or by even far smaller fractions, and you will still have round numbers, and you can say that the resultant cuts A B *inversely* as these numbers, however great they be, and therefore *inversely* as the forces. To trouble you about smaller fractions would only get you into a cloud of metaphysics for no practical purpose.

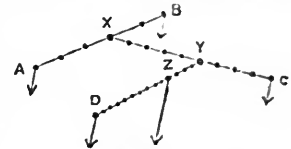


Fig. 15.

I have proved this important principle only for particular even numbers, 6 and 4, but you will find that the reasoning will be the same whatever be the even numbers you choose. The rule simply is to divide the line A B into as many equal parts as there are pounds in both forces, and then to distribute all the pounds at A in two batches on either side of that point, and to do the same at B with the pounds there acting, observing to place the pounds as you go from A or B in any direction, at the first, third, fifth, and so forth, points of division.

You are now in a position to find the resultant of three or more parallel forces acting, say, at the points A, B, C, D, as in Fig. 15. First join A with B, and cut it *inversely* as the forces which are there applied; next join the point *x* so found with C, and cut the joining line at *y* *inversely* as the sum of the two first forces to that at C; join this again with D, and cut it *inversely* as the three first forces to that of D; and so proceed until you have exhausted all the forces. The point *z* last found is that through which the resultant of all passes, and is called the *centre of parallel forces*.

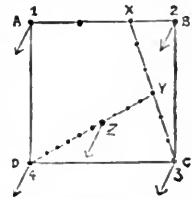


Fig. 16.

Suppose, for example, that the centre was required in the case of parallel forces of 1, 2, 3, and 4 pounds applied to the four corners of a square board, A, B, C, D (Fig. 16). First divide A B into three parts, and take two next to A and one to B. The point *x* so found is the parallel centre for these two forces. Join *x* now with C, and cut *x* C into six parts (the sum of 1, 2, and 3), and take three next to C and three to *x*. The centre *y*

so found, which evidently will be the middle of cx , is the centre of the three. Now join γ with D , and divide γD into ten parts (the sum of 1, 2, 3, and 4), and take four next γ and six next D . This last point, z , is the centre of all the given forces. Try your own hands now on the following Examples, and in the next lesson we shall have for subject the centre of gravity, which is a centre of parallel forces.

Examples.

1. Three equal parallel forces act at the corners of a triangle; find the centre through which their resultant passes.
2. A force of a pound is applied to one end of a beam, of three at the other, and of two at the middle; find the centre of these forces, they being parallel to each other.
3. A weight of one pound and three-quarters hangs from one end of a rod which is two feet in length, and of three and a-half from the other; find the magnitude of the resultant, and the centre of parallel forces.
4. A door is seven feet high and three feet wide, and the centres of its hinges are distant one foot from its ends. A force of twenty-three pounds is applied along its upper edge, pulling it off its hinges, and one of thirty-seven along the lower. Find the strains on the hinges.

LESSONS IN ARITHMETIC.—VIII.
GREATEST COMMON MEASURE.

1. A *composite* number, as already defined (see Lesson VI., Art. 2), is one which is produced by multiplying two or more numbers or *factors* together.

A *prime* number is one which cannot be produced by multiplying two or more numbers together; it cannot, therefore, be exactly divided by any *whole* number except unity and itself. Thus 1, 2, 3, 5, 17, 31, etc., are prime numbers, or *primes*, as they are sometimes called.

A *measure* of any given number is a number which will divide the given number exactly without a remainder. Thus, 3 is a measure of 9, 25 is a measure of 75.

A *common measure* of two or more numbers is a number which will divide each of them without a remainder. Thus, 2 is a common measure of 6, 8, 12, 18, 30, etc.

The *greatest common measure* of two or more numbers is the *greatest* number which will divide them all without a remainder. Thus, 9 is the greatest common measure (or, as it is sometimes written for shortness, the G. C. M.) of 18, 27, 36, and 45.

2. To find the greatest common measure of two given numbers.

RULE.—Divide the greater by the less, then the preceding divisor by the remainder, and so on, until there is no remainder. The last divisor will be the greatest common measure required.

EXAMPLE.—To find the greatest common measure of 532 and 1274. Arrange the process thus:—

$$\begin{array}{r}
 532 \overline{) 1274} \quad (2 \\
 \underline{1064} \\
 210 \overline{) 532} \quad (2 \\
 \underline{420} \\
 112 \overline{) 210} \quad (1 \\
 \underline{112} \\
 98 \overline{) 112} \quad (1 \\
 \underline{98} \\
 14 \overline{) 98} \quad (7 \\
 \underline{98} \\
 \dots
 \end{array}$$

Here, in accordance with the rule, we divide 1274 by 532, which gives a remainder 210; then 532 (the preceding divisor) by 210, giving a remainder 112; again 210 (the preceding divisor) by 112, which gives a remainder 98; then 112 (the preceding divisor) by 98, which leaves a remainder 14; and lastly, 98 by 14, which gives no remainder. 14, therefore, according to the rule, is the greatest common measure of 532 and 1274.

3. To find the greatest common measure of three or more given numbers.

RULE.—Find the greatest common measure of two of them; then find that of the common measure thus obtained and of the third; then that of this common measure and the fourth, and so on. The last obtained will be the greatest common measure of the given numbers.

EXAMPLE.—Find the greatest common measure of 204, 357, and 935.

First, we find the greatest common measure of 204 and 357 to be 51, by the rule given for two numbers.

$$\begin{array}{r}
 153 \overline{) 204} \quad (1 \\
 \underline{153} \\
 51 \overline{) 357} \quad (3 \\
 \underline{153} \\
 \dots
 \end{array}$$

Next, we find the greatest common measure of 51 and 935, which we see to be 17.

$$\begin{array}{r}
 51 \overline{) 935} \quad (18 \\
 \underline{51} \\
 425 \\
 \underline{408}
 \end{array}$$

Hence, according to the rule, 17 is the greatest common measure of 204, 357, and 935.

$$\begin{array}{r}
 17 \overline{) 51} \quad (3 \\
 \underline{51} \\
 \dots
 \end{array}$$

We do not give the *reasons* for the truth of the foregoing rules, as they cannot be satisfactorily established without the aid of algebra.

4. The above rules are infallible methods for finding the greatest common measure of two or more numbers. In practice, however, we can frequently dispense with these operations, and determine the greatest common measure by inspection, or by splitting up the numbers into their elementary or prime factors.

It is evident that if two or more numbers have a common measure at all, they must be *composite* numbers, *i.e.*, capable of being separated into factors. If any given numbers be separated into prime factors, the greatest common measure will evidently be the product of all the factors which are common to each of the given numbers.

Thus, 75, 135, and 300, when separated into their prime factors, are respectively

$$3 \times 5 \times 5, 3 \times 5 \times 9, \text{ and } 2 \times 2 \times 3 \times 5 \times 5$$

Now, the factors which are common to all of these are 3 and 5, and therefore 3×5 —that is, 15—is the greatest common measure of 75, 135, and 300.

5. We subjoin a

Rule for dividing a composite number into its prime factors.

Divide the given number by the smaller number, which will divide it without a remainder; then divide the quotient in the same way, and continue the operation until the quotient is unity. The divisors will be the prime factors of the given number.

The reason of the truth of the above rule may be thus explained:—

Every *division* of a number, where there is no remainder, resolves it into two factors—namely, the divisor and quotient. But in the above rule the divisors in each case are the *smallest* numbers which will divide the given number and the successive quotients without a remainder: hence they are all *prime* numbers, and the division is continued until the quotient is unity. Hence, clearly, the product of all these divisors (which are all primes) will be equal to the original number. In other words, these divisors are the prime factors of the given composite number.

EXAMPLE.—Resolve 16170 into its prime factors. Arrange the process thus:—

$$\begin{array}{r}
 2 \overline{) 16170} \\
 3 \overline{) 8085} \\
 5 \overline{) 2695} \\
 7 \overline{) 539} \\
 7 \overline{) 77} \\
 11 \overline{) 11} \\
 1
 \end{array}$$

Hence the prime factors of which 16170 is composed are 2, 3, 5, 7, 7, 11; or, $16170 = 2 \times 3 \times 5 \times 7 \times 7 \times 11$.

EXERCISE 19.

1. Find the greatest common measure of the following numbers:—

- | | |
|-------------------|-------------------------|
| 1. 285 and 405. | 5. 1879 and 2425. |
| 2. 532 and 1274. | 6. 75, 125, and 60. |
| 3. 888 and 2775. | 7. 183, 3996, and 106. |
| 4. 2145 and 3471. | 8. 672, 1440, and 3472. |

2. Resolve all the composite numbers from 9 to 108 into their prime factors.

3. Resolve into their prime factors 180, 420, 714, 836, 2898, 11492, 1728, 1492, 8032, 71640, 92352, 81660.

4. Find the greatest common measure of the following numbers by resolving them into factors:—

- | | |
|-------------------------------------|--------------------------|
| 1. 36, 60, and 108. | 2. 56, 84, 140, and 168. |
| 3. 5355, 6545, 17017, 36465, 91385. | |

5. Find the greatest common measure of the following numbers:—

- | | |
|-----------------------|------------------------|
| 1. 105 and 165. | 3. 140, 210, and 315. |
| 2. 108, 126, and 162. | 4. 24, 42, 54, and 60. |

6. Find all the divisors common to the following numbers:—

- | | |
|----------------------------|----------------------|
| 1. 15, 18, 24, and 36. | 4. 82, 118, and 146. |
| 2. 14, 28, 42, and 35. | 5. 42 and 66. |
| 3. 10, 35, 50, 75, and 60. | |

7. Resolve the following numbers into their prime factors:—

- | | |
|-------------------|----------------------|
| 1. 120 and 144. | 7. 1492 and 8032. |
| 2. 180 and 420. | 8. 4604 and 16806. |
| 3. 714 and 836. | 9. 71640 and 20780. |
| 4. 574 and 2898. | 10. 84570 and 65480. |
| 5. 11492 and 980. | 11. 92352 and 1660. |
| 6. 650 and 1728. | |

That our readers may have sufficient practice in multiplication and division, we give in this lesson upwards of one hundred examples in these rules. The operations should be contracted when practicable, and the correctness of every result should be tested by the methods given in our Lessons on Multiplication and Division.

EXERCISE 20.

1. Find the product 678954×72 , by multiplying by successive factors.
 2. Find in the same way the product 78530700×1250 .
 3. Find the product of the following by dividing by successive factors:—

- | | | |
|----------------------|------------------------|------------------------|
| 1. $16128 \div 24$. | 3. $91080 \div 72$. | 5. $142857 \div 112$. |
| 2. $25760 \div 56$. | 4. $123456 \div 168$. | |

4. Divide 9643 by 30, by 300, and by 3000.

5. Divide 3360000 by 17000.

6. Divide 123456789 by 290000.

7. Multiply and also divide:—

- | | | |
|-------------------|---------------------|--------------------|
| 1. 98734 by 5. | 4. 103561203 by 15. | 7. 25426 by 125. |
| 2. 53990201 by 5. | 5. 1125 by 75. | 8. 237135 by 75. |
| 3. 1256 by 15. | 6. 5096123 by 75. | 9. 3929764 by 125. |

8. Work the following examples in multiplication:—

- | | | |
|-----------------------------|------------------------------|--------------------------------|
| 1. 856783×999 . | 7. 39567×85 . | 13. 107206×496819 . |
| 2. 5378065×99999 . | 8. 3567×284 . | 14. 59634281×5432 . |
| 3. 34567×22 . | 9. 293621×546 . | 15. 62327453×90091 . |
| 4. 94230×38 . | 10. 149628×246 . | 16. 49532816×58678 . |
| 5. 210354×46 . | 11. 274032×9612 . | 17. 101299867×14059 . |
| 6. 149681×52 . | 12. 1429461×10612 . | 18. 637589931×98765 . |

9. Divide one thousand billions by 81 and 729.

10. Divide a thousand thousand millions by 111.

11. Divide a thousand millions of millions by 1111.

12. Divide 908070605040302010 by 654321.

13. Divide 4678179387300 by the following divisors, separately, 2100, 36500, 8760, 957000, 87700, 1360000, and 87000.

14. If the annual revenue of a nobleman be £37960, how much is that per day, the year being supposed to be exactly 365 days.

15. What is the nearest number to one thousand billions that can be divided by 11111 without a remainder?

16. How often could 43046721 be subtracted from 22876792454961, and at last leave no remainder?

17. How many times does 310314420 contain 39390?

18. What number is that which divided by 123456 would give a quotient of 826451, and a remainder of 70404?

19. Work the following examples in multiplication:—

- | | | |
|---------------------------|----------------------------|---------------------------------------|
| 1. 42034×63 . | 14. 50421×9669 . | 27. 5234×2435 . |
| 2. 50035×56 . | 15. 67243×96669 . | 28. 48743000×637 . |
| 3. 72156×1000 . | 16. 78563×98 . | 29. 31890429×85672 . |
| 4. 42000×40000 . | 17. 34054×639 . | 30. 80460000×2763 . |
| 5. 80000×25000 . | 18. 52156×756 . | 31. 2364793×8485672 . |
| 6. 2567345×17 . | 19. 41967×54486 . | 32. 1256702×999960 . |
| 7. 4300450×19 . | 20. 26397×24648 . | 33. $6846655 \times 91 \times 61$. |
| 8. 9803404×41 . | 21. 12900×14900 . | 34. $45967034 \times 17 \times 51$. |
| 9. 6710045×71 . | 22. 64172×42432 . | 35. $786031245 \times 81 \times 16$. |
| 10. 3456701×18 . | 23. 29815678×81 . | 36. 61800000×23000 . |
| 11. 7000541×91 . | 24. 85×65 . | 37. 12563000×4800000 . |
| 12. 4102034×99 . | 25. 256×256 . | 38. 91300233×1066000 . |
| 13. 42304×999 . | 26. 322×325 . | 39. 680040000×1000000 . |

20. Work the following examples:—

- | | | |
|------------------------|--------------------------|---------------------------|
| 1. $1188 \div 33$. | 9. $31256726 \div 15$. | 17. $3562189 \div 225$. |
| 2. $3128 \div 56$. | 10. $4297581 \div 45$. | 18. $685726 \div 32000$. |
| 3. $2516 \div 37$. | 11. $16733672 \div 35$. | 19. $723564 \div 175$. |
| 4. $7125 \div 95$. | 12. $3256355 \div 55$. | 20. $892565 \div 225$. |
| 5. $568240 \div 42$. | 13. $45672400 \div 25$. | 21. $456212 \div 275$. |
| 6. $785372 \div 63$. | 14. $6245634 \div 45$. | 22. $925673 \div 125$. |
| 7. $896736 \div 72$. | 15. $8245623 \div 125$. | 23. $763421 \div 175$. |
| 8. $67234568 \div 5$. | 16. $462156 \div 75$. | 24. $876240 \div 275$. |

21. How long would it take a vessel sailing 100 miles per day to circumnavigate the earth, whose circumference is 25000 miles?

22. The distance of the earth from the sun is 95000000 of miles: how long would it take a balloon, going at the rate of 100000 miles a year, to reach the sun?

23. Divide 46700000000 by 2500000000 .

LESSONS IN BOTANY.—IV.

SECTION VI.—LEAVES CONSIDERED AS TO THEIR FUNCTIONS.

ALTHOUGH leaves have a great variety of uses, yet the principal is that of respiration or breathing. In this manner they become the representatives of lungs in animal beings. But though plants breathe, the vegetable function of respiration in them is not to be considered as similar to that function in animals. On the contrary, it is directly the reverse: the very gas which animals expel from their lungs as useless or injurious, plants receive through the medium of their leaves, take out of it that which is suitable to their wants, then exhale the portion which is refuse to them, but which is necessary to the existence of animals. What a train of reflections does the contemplation of this beautiful provision call forth! Not only are vegetables useful in supplying us with food and timber, not only do they beautify the landscape with their waving branches and picturesque forms, but they are absolutely necessary to the existence of animal life as a means of purifying the atmosphere!

The breathing function of leaves is far too important to admit of being lightly passed over with these few remarks, yet a difficulty occurs in pursuing it further, inasmuch as to understand the precise theory of vegetable respiration the reader must be acquainted with certain facts in chemistry. Some readers, doubtless, are acquainted with these chemical facts, others are not; consequently, the best plan will be to present a slight outline of these facts at once.

To begin, then: did the reader ever set fire to a bit of stick or a little charcoal? No doubt he has. What does the reader think becomes of this stick or charcoal? Is it lost, destroyed? Oh no, there is no such thing as destruction in all nature; substances, even when they appear to be destroyed, only change their form. What, then, becomes of a piece of stick or a piece of charcoal when we burn either in the fire? Now, whenever philosophers desire to study the conditions of an experiment, and the choice of more than one set of conditions stands before them, they very properly take the simplest. We have here two sets of conditions; the burning of a stick is one, the burning of a piece of charcoal is the other. The latter being the simpler of the two, we will take it, and use it for our purposes; moreover, we

will assume the charcoal employed to be absolutely pure. We burn, then, an absolutely pure bit of charcoal in atmospheric air, and it totally disappears; nothing remains; not the smallest trace of ashes; all is gone. What, then, has become of the charcoal? This is not a chemical book, therefore we have not space to go into the matter in all its chemical relations. We must, therefore, content ourselves by saying that the charcoal, by burning, is converted into a gas termed the *carbonic acid gas*. This carbonic acid gas is quite invisible, therefore one might look for it in vain; but it has a smell and a taste, therefore we might be conscious of its existence, even though we had no means of catching it. But we have such means. If this gas comes in contact with lime, or potash, or soda, either of these substances lays hold of it, combines with it, or, if we may be pardoned the expression, *licks it up*. Therefore, by setting a little quicklime in places where carbonic acid gas exists, we may catch it just as readily as we can catch a mouse in a trap—ay, more readily, because a mouse may at least choose whether he go into the trap or stay out of it; but the carbonic acid gas has no such choice; if it comes in contact with the trap of lime, in it must go without fail. Now, what we want to come at is this. Although a piece of charcoal when burnt goes away in an invisible form, it nevertheless only makes a new acquaintance and puts on a mask. We can catch it, can unmask it, and get the charcoal out of it once more.

Carbonic acid gas is a poison, as, we dare say, most of our readers know; hence the danger of sitting near a pan of burning charcoal.

Proceeding with our chemical remarks, we must now go on to say that combustion is far from being the only source of carbonic acid gas: thus it is given off during fermentation, is given off from effervescent wines, such as champagne and sparkling moselle, is given off from ginger beer and soda water, and, what is far more to our purpose, is given off from the lungs of animals by the act of respiration. Indeed, the functions of animal digestion and respiration taken together may be considered as a sort of combustion, and are actually termed combustion by some authors. The similarity is indeed striking, as a little contemplation will serve to demonstrate. Thus, if we throw a lump of coal into a fire-place, heat is given out, and gaseous matter (chiefly carbonic acid) escapes. If we swallow a morsel of food, it is digested, heat is given out, and carbonic acid escapes. In the former case carbonic acid escapes by the chimney, in the latter case by the lungs. One chemical point yet remains to be explained before the student will be in a position to understand the functions of a vegetable leaf. The carbonic acid, of which we have been speaking, is a gaseous compound of charcoal, termed by chemists carbon and something; that something is oxygen, the vital principle of the air. Now, the bulk of vegetable bodies is made up of carbon, otherwise how could we get charcoal in the ordinary way? And this bulk, this carbon, is got out of the air. Yes, the largest tree, whatever its size, is for the most part formed of carbon, and all this carbon once existed in the gaseous form. Philosophers have made calculations, from which it appears that the total amount of carbonic acid thus floating about in the atmosphere amounts to the enormous quantity of many tons, and that tons of carbonic acid hover over each acre of ground, ready to give up its carbon to vegetables which require this substance. Before quitting this subject, we must not forget to direct the reader's attention to the beautiful provision by means of which the amount of carbon necessary to be got rid of from the animal economy is evolved in the particular form of gas. Even supposing no positive injury to result, yet just think how dirty and begrimed

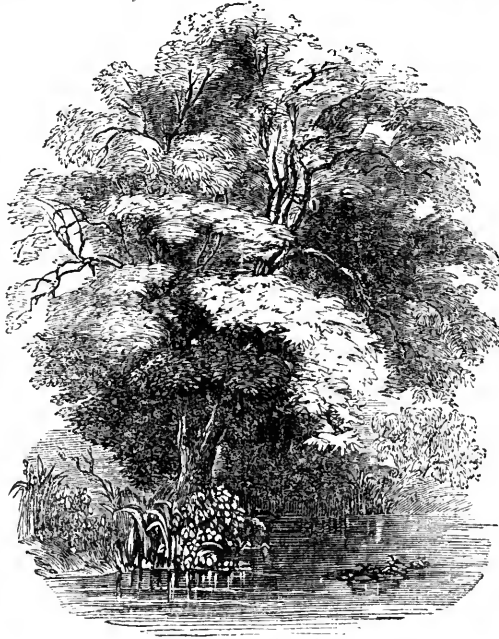
we should be if we were always puffing out charcoal dust with every expiration! We do not expire a small quantity either, no less than thirteen ounces of charcoal being evolved during twenty-four hours from each human individual. Had not some provision been adopted for enabling carbon to be thus evolved in a gaseous form, we should all have been blacker than chimney-sweeps. What a miserable state of things would this have been!

Respiration, then, is the chief function of leaves, but it is not the only function; they also serve as evaporative organs, by means of which the plant gets rid of excessive moisture; and in this respect, again, they present a striking analogy to animal lungs. Who amongst us is not aware that our breath contains moisture?

SECTION VII.—ON THE FORM AND MODIFICATIONS OF LEAVES.

Having described the general functions of leaves, we must now proceed to examine their forms, and to learn the terms by which those forms are designated, otherwise we should not be able to describe a plant in such a manner that a person would understand our description. As in many other parts of Botany, the student will here encounter some long names; they are very useful names, nevertheless, and require to be understood.

In the first place, taking a general review of the aspect of leaves, it will be evident to the reader that their form is exceedingly varied, as is also their manner of attachment to the stem, to say nothing of such characteristics as softness, hardness, thickness, thinness, and so forth. As regards their attachment to the vegetable, some leaves grow directly out of the stem, or, in figurative language, may be said to *sit upon* the stem. Such leaves are termed by botanists *sessile*, from the Latin word *sessum*, a part of the verb *sedeo*, to sit. Others are attached to the parent stem by a little stem of their own. Now, this leaf-stem, or foot-stalk of a leaf, botanists denominate a *petiole*, from the Latin *petiolus*, a little foot, and leaves thus supplied with a petiole are said to be *petiolate*. Again, some leaves are attached to the parent stem exactly opposite each other, consequently they are said



THE ASH.

from this circumstance to be *opposite* or *opposed*. Others are alternately attached, from which circumstance the denomination *alternate* is given to them. All these characteristics are very important, not only in enabling a botanist to describe the configuration of plants in the fewest possible words, but in enabling him at the same time to separate plants into natural groups and alliances.

Again, some leaves are single in themselves, as is the case with those of the apple-tree; whilst others are made up of several little leaflets, as we see, for example, in the ash. Hence arises the very natural distinction of leaves into *simple* and *compound*.

The forms which leaves assume are so very numerous, that botanists are accustomed to indicate them by the similarities which they manifest to natural objects. Some are like shields, for which reason they are termed *pelliform* (Latin, *pelta*, a shield); others are like hearts, whence they are termed *cordiform* or *cordate* (Latin, *cor*, *cordis*, a heart). Some resemble feathers, others are jagged like a saw, whence arise the denominations *penniform* (Latin, *penna*, a feather or wing), *serrate* or *serratifform* (Latin, *serra*, a saw), and so forth; but we shall give in our next lesson drawings of the chief varieties of leaves, from an inspection of which the various names respectively applied to them will be rendered more evident.

ANIMAL PHYSIOLOGY.—IV.

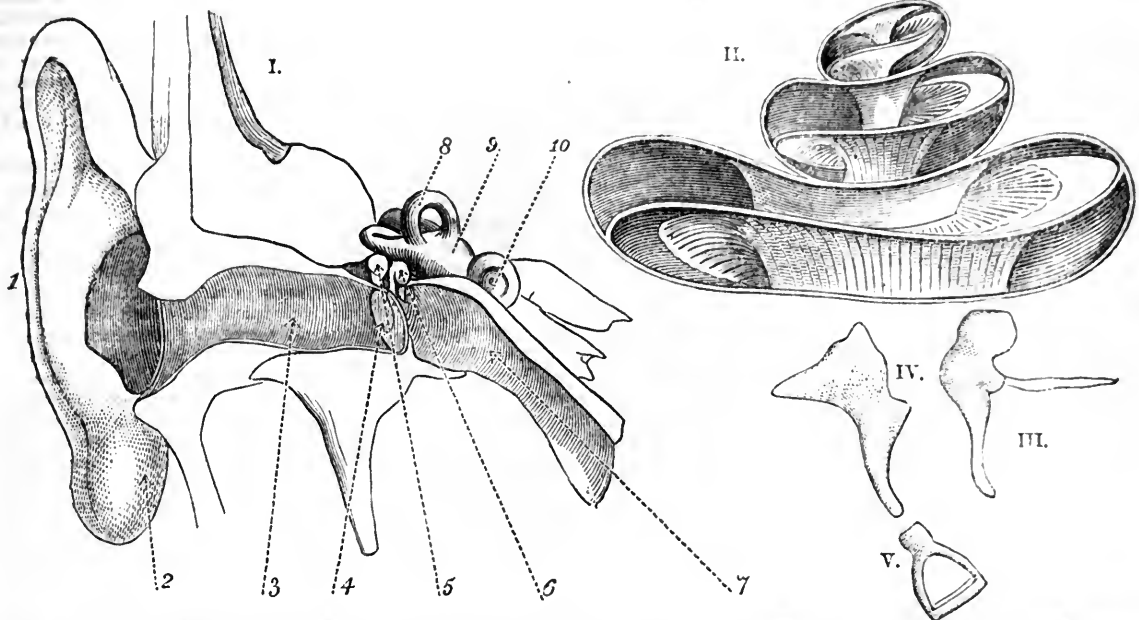
THE EAR.

A MAN who had been born blind, when asked what he supposed scarlet was like, replied, "Like the sound of a trumpet." The reply is startling, because it shows how dependent the mind is upon the senses for its ideas. No one who could both see and hear would ever think of comparing sound with light, or tone with colour.

But though the sensations conveyed to the brain by the eye-nerve and the ear-nerve are so different as to be incomparable, there is much resemblance between sound and light. They obey the same laws. Sound can be absorbed, reflected, and refracted at the surface of bodies, as we have seen light is; and, moreover, it is probable that both consist of rapid vibrations, or waves, succeeding one another at regular intervals, like the enlarging circles which follow one another and break upon the banks when a stone is thrown into the middle of a still pond, and disturbs the glassy surface of the water.

the cry of the partridge, and it be not repeated so often as to let us try experiments on it, by turning the head this way and that, it is very difficult to tell from whence the sound comes, even to the extent of a whole quadrant of the horizon. Upon this fact ventriloquism depends for its success. The idea of the direction of sound being inferential, and not much dependent upon the sense—being, in fact, owing to the operation of the mind, and not to that of the ear—the ventriloquist has only to direct the mind where to expect the sound, and then to make a sound of just such a pitch of intensity, and just such a tone, as the sound would have if it came from that quarter, to completely impose upon the ear of the listener as to the direction from which it comes.

But although the ear is at fault as regards direction, the accuracy of some of its other notifications is wonderful in the extreme. It can note not only the likeness and difference of musical sounds, but of their harmonies when many are sounded together, and a fine ear will detect an erring note when a thousand instruments are sounded. The recognition of slight



I. THE HUMAN EAR. II. SECTION SHOWING THE HOLLOW OF THE COCHLEA. III. MALLEUS. IV. INCUS. V. STAPES. Reference to Nos. in Fig. I.—1, pinna; 2, lobule; 3, tube; 4, tympanic membrane; 5, incus, or anvil; 6, malleus, or hammer; 7, eustachian tube; 8, semi-circular canals; 9, vestibule; 10, cochlea.—I, II, III, and IV. enlarged.

Though there are these points of similarity as to the essential nature and qualities of light and sound, there are also great differences. Light travels with a rapidity which, for all appreciable distances—that is, for all earthly objects—is instantaneous; while sound travels, relatively, very slowly, and, when common air carries it, it goes only 1,093 feet during each second of time. Again, while the vibrations of light are so rapid that it is impossible to know them to be vibrations but by reasoning upon its effects, the waves of sound may be often observed by the eye when they are propagated through, or originated from, a solid body, as when we see a cord or glass vessel respond to a musical note, or give out a sound when struck. Sound, too, is the vibration of the substances themselves—which substance we can feel, or see, or know by means of other senses—while light is supposed to be the vibration of some fluid which is imperceptible, or, in other words, has no weight, and of which we know nothing except by the eye.

The waves of sound, then, being coarser and more liable to interference than the waves of light, it follows that the ear cannot be so good an indicator of the direction of sound as the eye is of the direction of a luminous object. Indeed, the ear can of itself scarcely give us any idea of direction. If the sound be short and sharp, like the piercing shriek of the bat, or even

differences is truly wonderful when we consider that not only can the ear know when the same note is sounded by instruments of different kinds (though physicists are unable to tell us how there can be any difference, the number of vibrations in a second being the same, and the medium identical), but very slight differences in the same kind of instruments, such as whether there is one per cent. more or less of a metal in an alloy of which an organ-pipe is made, or of which a bell is cast, are observed so shrewdly, that these matters have to be attended to with the nicest care. A violin must not only be of a certain shape, but the wood of which it is composed must be of a certain age, to produce the best instrument; and these observed differences are carried to such a nicety that fiddles made in a certain part of Germany, in a certain year, are considered the best, and will command almost fabulous sums. Yet all this depends upon what is called *timbre*, a word which gives a name to a something which is entirely dependent on the delicacy of our sense of hearing, but which has not received any other explanation.

Though we cannot directly connect these niceties of sense with the intricacies of complication in the organ of hearing, these latter will be seen to be so numerous and peculiar when we describe the ear, that one is not surprised that much con-

nected with sound is unexplained, because there are so many structures connected with the organ which has been given us as the recipient and interpreter of sound, at the use of which we can hardly guess.

That which is usually called the ear is familiar to every one as the external semi-circular cartilage, closely invested with skin, and ending below in a soft lobe, which is sometimes the support of barbarous pendants. This structure, which, when well formed, has a beauty of its own that needs no supplement or advertisement, is but a remote appendage to the true ear. Though it in some sort collects sound, and protects the orifice which leads down towards, not to the true ear, it is non-essential, and can be dispensed with without much inconvenience; so that some of our poor ancestors, who found that they could not retain both good external ears and good consciences, like William Prynne in the time of Charles I. and the Star Chamber, suffered less real loss than might have been anticipated.

The external gristly ear is called the pinna, and though flattened as to its general surface, is somewhat folded into ridges and furrows, there being a rim round the outside and a channel within this, which deepens and widens as it runs first upward, along the back part, then downward along the fore part to a central crypt. From this crypt the passage becomes narrower as it runs forward and inward to the pit of the ear. Sound, no doubt, is conveyed along this canal in the same direction as we have described its course. If the pinna were quite flat, sound would rebound from it; but as it is so shaped, sound is caught and reflected round the canal from point to point, as it is reflected round the Whispering Gallery of St. Paul's, and finally delivered down the tube of the ear.

The tube is an inch and a half deep, and its innermost half enters one of the bones of the head, called the temporal bone, and in this bone all the other parts of the ear are enclosed and protected. At the bottom of the tube is an oval membrane stretched across the passage, and barring the entrance to all external objects. Behind this is a roundish, irregular cavity, filled with air. This stretched fibrous membrane bounding the air cavity, naturally suggests the idea of a drum, shaped like a kettle-drum; and hence the cavity is called the tympanum, from a Latin word meaning *drum*, and the parchment-like tissue the membrane of the drum. It differs, however, from a kettle-drum in that several orifices open into it, and it contains structures to be described presently.

On the further side of the drum is the true ear, completely encased in bone, except at two very small holes, which are closed with membrane. The larger and upper aperture is called the oval hole, and the smaller and lower the round hole. From the membrane of the tympanum to the membrane of the oval hole stretches a chain of bones, whose shape is best seen in the engraving. The outer one, next the parchment of the drum, is called the hammer. It has three processes, or projections, two of which are long; so that, rather than hammer, it might be called a woodentter's beetle. One of these processes, called the handle, is attached to the centre of the membrane, which it makes tight when pulled inward by a small muscle, and lax when another muscle acts on it.

The former operation is probably the action which we unconsciously cause when we consciously listen. The head of the hammer is applied to another bone called the anvil (*incus*). It has two processes, one for its suspension to the wall of the tympanic cavity, and the other to connect it with the third or stirrup-bone (*stapes*). This bone is more like the article it is named from than the others are, and the foot-part of the stirrup is applied to the oval membrane, which it nearly covers. These bones can move a little in relation to one another, and their actions are limited by small muscles, but they usually act together as if in one piece, playing round an axis which runs through the heads of the hammer and anvil, so that when the tympanic membrane is thrust in and out by vibration, the membrane of the oval hole is made to vibrate correspondingly. The round hole is open to the influence of sound conveyed through the air of the tympanum; but whether this be its function, or merely to allow the fluid of the internal ear to be more readily thrown into vibration in the passage it fills—in other words, whether it be a hole for the entrance or exit of vibrations—seems hard to tell.

The fore-part of the drum cavity is connected with the throat by a passage, which runs forward and downwards to open in the

gullet behind the nose and mouth. Through this passage the cavity is kept supplied with renewed air at the same pressure as the external air. The reader may be conscious of the existence of these passages to the ears from the throat by preventing the air from rushing out of the mouth and nose, while he forces it up from his lungs. The cavity of the drum will then be distended with air; hearing will be less perfect, by the unnatural tension of the membranes, and there is a slight singing in the ear. With a little practice, air may be conveyed through the mouth to the drum, without entering the lungs, and thus gases have been applied as remedies to diseases of the ear. But the exclusion of these from the lungs is difficult, and cannot be relied on. One of our greatest aurists, when pursuing his philanthropic and scientific investigations on the effect of chloroform and prussic acid applied thus, died, because he could not exclude the latter deadly poison from his lungs as he had supposed he could. The proper, or essential ear, consists of a chamber longer than broad, communicating on its upper and outer side with three semi-circular canals, and at its front inner end with a cavity shaped like a snail-shell.

The chamber is called the vestibule; this and the semi-circular canals are called together the labyrinth; and the hollow, like that of a snail-shell, the cochlea. They are all channelled out of the substance of the skull-bone before named as the temporal. The part of this bone which lodges them juts inwards, so as to lie at the base of the brain, and is so strong and thick as to be called the petrous or stony part of the bone. Accurately resembling the bony labyrinth in shape, but a little smaller in its dimensions, so as to allow a little liquid to lie between it and the bone, is a membranous labyrinth. That part of the membrane which is on the floor of the vestibule leaves its proximity to the bone at the entrance of the cochlea, and forms a horizontal stage across the widest part of the spiral passage, and so mounts round the three whorls of the spire, dividing it into two parts; so that, if we may imagine a small insect exploring these regions, it could mount to the apex of the spire by either of two spiral staircases, the roof of the lower one being the floor of the upper. These circular staircases only communicate with one another at the point of the shell. The lower one at its foot communicates with the tympanum by the round hole, while the vestibule communicates with the chain of bones by the oval hole. Hence, if our imaginary insect could gain access to the cochlea through the membrane of the round hole, it must first mount to the top of the lower staircase, and then descend all the way down the upper one, before it could explore the labyrinth.

All the cavities are filled with fluid, by whose agency the vibrations are conveyed along its walls; and in these walls, especially at certain parts, are distributed the nerve-fibres of the nerve of hearing. It would seem, however, as though the vibrations of the liquid are not enough to impress the nerve, and there are found small, hard structures wherever the nerve-threads are most thickly placed, and at two places in the floor of the vestibule are found collections of small, hard, marble stones, held in a mesh of fibres; so that, as the waves sweep by in the liquid, these are made to strike and rebound against the nerves. The spiral sheet of membrane which divides the cochlea receives the nerves from a main nerve which runs up the central pillar, and it has in its substance fibrous bars, which radiate outwards at regular intervals, like the key-notes of a piano, and, like these, each is supposed to receive and transmit to the nerve at its root a separate note. Thus the spiral sheet of the cochlea is supposed to be able to appreciate difference in tone, and the labyrinth differences in the amount of sound. The nerves from all parts are collected into one bundle, but, as is usual with nerves wherever they may be found, the strands remain distinct.

To assist the reader in his conception of the ear, we may compare it to a house of business. The pinna is the house-front; the tube is the porch; the drum-membrane the front door (closed); the drum is the hall; a few steps, the ossicles, lead to an office, round which are convenient counters, closets, and passages, at which clerks enter business transactions; while, directly communicating with this large office, cognisant of all proceedings, but reserving to himself any special business, sits the general manager, who has also a door direct to the hall; whilst, at the back of the premises, telegraph wires run to the London agent.

LESSONS IN FRENCH.—IX.

SECTION I.—FRENCH PRONUNCIATION (continued).

IV. NAME AND SOUND OF THE CONSONANTS.

50. **F, f.**—In the commencement and body of words, this letter is usually pronounced as the letter *f* in the English word *for*. It is sometimes sounded also in the end of words. There are several exceptions, however, which are best found in the French dictionary. In the French word *neuf*, which means *nine*, the *f* is silent when it precedes a word commencing with a consonant, thus:—*neuf lis*, *nine lilies*, is pronounced as if printed *neu lis*.

But the striking peculiarity of this letter consists in the fact that it receives the sound of the letter *v*, as in the English word *cow*, before another word commencing with a vowel or *h* mute, and is joined with this word in pronunciation, as if it were its first letter, namely:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Neuf animaux	Neuf animo	Nine animals.
Neuf enfans	Neuf enfau	Nine children.
Neuf hommes	Neuf omu	Nine men.

51. **G, g.**—Before the vowels *a*, *o*, and *u*, and the consonants *d*, *h*, *l*, *m*, and *r* in the commencement of French words, *g* has the hard sound of the letter *g* in the English word *got*, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Gâteau	Gah-to	A cake.	Globe	Glob	Globe.
Gosier	Go-zey	Throat.	Augment	Og-manh	Increase.
Aigu	Ay-gh	Acute.	Grappe	Grap	Cluster.

The *g* final of the word *bourg*, a small town, takes the sound of the English *k*. This word is pronounced *boork*. Names of towns ending in *bourg* drop the final *g*, that is, the *g* is silent, as:—

Augsbourg pronounced	Ogz-boor.
Cobourg	Ko-boor, etc. etc.

In the following French words, the initial *g* has the sound of the letter *k* in the English word *keel*, namely:—

Gangrène	as if printed	Kaugrène.
Gangreneur	„	Kaugreneur.
Gaugrené	„	Kaugrené.
Gangreneu	„	Kaugreneu.
Gangreneux	„	Kaugreneux.

No rule can be given for this peculiarity in pronunciation, except the rule of custom. It is believed the above five words are the only ones in the French language concerning which this peculiar pronunciation obtains.

Before the vowels *e*, *i*, and *w*, the letter *g* has the soft sound of the letters *zh*, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Âgé	Ah-zhay	Aged.	Gigot	Zhe-go	Leg of mutton.
Congé	Konh-zhay	Holiday.			
Gilet	Jeel-ay	Waistcoat.	Gymnase	Zheem-nahz	Gymnasium.

G final, before a vowel or an *h* mute, takes the sound of the English *k*, and is connected with the following word in pronunciation, as if it belonged to that word, namely:—

Rang honorable as if printed	Rauk onorabl.
Sang et eau	Sauk et o.
Sang humain	Sauk humain.

G final, before a word commencing with a consonant or an aspirated *h*, is in most French words silent, namely:—

Rang noble is pronounced Rauh nobl'.

Double *g* has the sound of only a single *g*, except before the vowels *e* and *i*, in which case the first *g* is hard, like *g* in the English word *go*, and the second *g* has a soft sound represented by the two letters *zh*, namely:—

Suggérer is pronounced Su-zhay-ray, etc. etc.

SECTION XIV.—LIST OF WORDS FOR EXERCISES IN COMPOSITION (continued).

6. LA VILLE, LA MAISON, ETC.—TOWN, HOUSE, ETC.

Antichambre, <i>f.</i> , antechamber.	Brique, <i>f.</i> , brick.
Ardoise, <i>f.</i> , slate.	Capitale, <i>f.</i> , capital city, metropolis.
Arsenal, <i>m.</i> , arsenal.	Carillon, <i>m.</i> , chime of bells.
Banc, <i>m.</i> , bench, seat.	Caserne, <i>f.</i> , barrack.
Barrière, <i>f.</i> , gate.	Cave, <i>f.</i> , cellar.
Bibliothèque, <i>f.</i> , library.	Chambre, <i>f.</i> , chamber, room.
Bourg, <i>m.</i> , borough, small town.	Chambre à coucher, <i>f.</i> , bedroom.
Bourse, <i>f.</i> , exchange.	Chapelle, <i>f.</i> , chapel.

Château, <i>m.</i> , country house, villa.	Paroisse, <i>f.</i> , parish.
Chaumière, <i>f.</i> , hut, cottage.	Pavé, <i>m.</i> , pavement.
Chaux, <i>f.</i> , lime.	Pépinière, <i>f.</i> , nursery of trees.
Cheminée, <i>f.</i> , chimney.	Persienne, <i>f.</i> , blind, open shutters.
Cimetière, <i>m.</i> , burying-ground, churchyard.	Plafond, <i>m.</i> , ceiling.
Cloche, <i>f.</i> , bell (large), church-bell, etc.	Planche, <i>f.</i> , board.
Clocher, <i>m.</i> , church-steeple.	Plancher, <i>m.</i> , floor.
Clochette, <i>f.</i> , small bell.	Poêle, <i>m.</i> , stove.
Cloître, <i>m.</i> , cloister.	Pomp., <i>f.</i> , pump.
Cour, <i>f.</i> , yard, court.	Port., <i>m.</i> , bridge.
Couvent, <i>m.</i> , convent.	Porte, <i>f.</i> , door, gate.
Cuisine, <i>f.</i> , kitchen.	Poste, <i>f.</i> , post, post-office.
Douane, <i>f.</i> , custom-house.	Poutre, <i>f.</i> , beam.
Ecurie, <i>f.</i> , stable.	Prairie, <i>f.</i> , Pré, <i>m.</i> , meadow.
Environs, <i>m.</i> pl., environs, neighbourhood.	Prison, <i>f.</i> , prison.
Escalier, <i>m.</i> , stairs.	Puits, <i>m.</i> , well.
Étage, <i>m.</i> , story, floor.	Quartier, <i>m.</i> , quarter.
Faubourg, <i>m.</i> , suburb.	Rampe (d'escalier), balustrade of a staircase.
Ferme, <i>f.</i> , farm.	Rez-de-chaussée, <i>m.</i> , ground floor.
Fontaine, <i>f.</i> , fountain, well.	Sacristie, <i>f.</i> , vestry.
Four, <i>m.</i> , oven.	Salle, <i>f.</i> , parlour, sitting-room.
Gouttière, <i>f.</i> , gutter.	Salon, <i>m.</i> , drawing-room, hall.
Grand chemin, } <i>m.</i> , highway.	Serre, <i>f.</i> , conservatory.
Grand route, } <i>m.</i> , highway.	Serre-chaude, <i>f.</i> , hot-house.
Grange, <i>f.</i> , barn.	Serrure, <i>f.</i> , lock.
Gre nier, <i>m.</i> , garret.	Sonnette, <i>f.</i> , bell.
Haie, <i>f.</i> , hedge.	Théâtre, <i>m.</i> , theatre.
Hameau, <i>m.</i> , hamlet.	Toit, <i>m.</i> , roof.
Hôpital, <i>m.</i> , hospital.	Tour, <i>f.</i> , tower.
Hôtel-de-ville, town house, city house, guildhall, city hall, town hall.	Tuile, <i>f.</i> , tile.
Meuble, <i>m.</i> , piece of furniture.	Verger, <i>m.</i> , orchard.
Meubles, <i>m.</i> pl., furniture.	Verron, <i>m.</i> , bolt.
Monnaie, <i>f.</i> , mint.	Vestibule, <i>m.</i> , hall, entry.
Mortier, <i>m.</i> , mortar.	Vigne, <i>f.</i> , vignoble, <i>m.</i> , vineyard.
Mur, <i>m.</i> , muraille, <i>f.</i> , wall.	Village, <i>m.</i> , village.
Palais, <i>m.</i> , palace.	Volct, <i>m.</i> , window-shutter.
	Voute, <i>f.</i> , vault.

7. MEUBLES.—FURNITURE.

Allumette, <i>f.</i> , match.	Lit de plume, <i>m.</i> , feather-bed.
Allumette chimique, <i>f.</i> , friction-match.	Lumière, <i>f.</i> , light.
Amadou, <i>m.</i> , tinder.	Lustre, <i>m.</i> , sconce.
Armoire, <i>f.</i> , cupboard.	Marchepied, <i>m.</i> , footstool.
Baril, <i>m.</i> , cask, barrel.	Monchettes, <i>f.</i> pl., snuffers.
Bassin, <i>m.</i> , bowl, wash-bowl.	Mortier, <i>m.</i> , mortar.
Bassinoire, <i>f.</i> , warming-pan.	Moutardier, <i>m.</i> , mustard-pot.
Berceau, <i>m.</i> , cradle.	Nappe, <i>f.</i> , tablecloth.
Boite-à-fusil, <i>f.</i> , tinder-box.	Oreiller, <i>m.</i> , pillow.
Bougie, <i>f.</i> , taper.	Panier, <i>m.</i> , basket.
Bouilloire, <i>f.</i> , kettle.	Paravent, <i>m.</i> , screen.
Briquet, <i>m.</i> , fire-steel.	Peinture, <i>f.</i> , painting, picture.
Cadre, <i>m.</i> , frame.	Pelle, <i>f.</i> , shovel.
Candélabre, <i>m.</i> , chandelier.	Pierro à fusil, <i>f.</i> , flint.
Casserole, <i>f.</i> , saucepan.	Pincettes, <i>f.</i> pl., tongs.
Cassette, <i>f.</i> , box, casket.	Poêle, <i>f.</i> , frying-pan.
Chandelle, <i>f.</i> , candle.	Poivrière, <i>f.</i> , pepper-box.
Charbon de bois, <i>m.</i> , charcoal.	Pot, <i>m.</i> , kettle.
Charbon de terre, <i>m.</i> , pit-coal.	Pupitre, <i>m.</i> , desk.
Chaudière, <i>f.</i> , boiler.	Salière, <i>f.</i> , salt-cellar.
Coffre, <i>m.</i> , chest.	Savon, <i>m.</i> , soap.
Commode, <i>f.</i> , chest of drawers.	Seau, <i>m.</i> , pail.
Corbeille, <i>f.</i> , basket.	Serviette, <i>f.</i> , napkin.
Crible, <i>m.</i> , sieve.	Sofa, <i>m.</i> , sofa.
Cruche, <i>f.</i> , pitcher.	Soufflet, <i>m.</i> , bellows.
Cuvier, <i>m.</i> , tub.	Soupière, <i>f.</i> , soup-tureen.
Drap, <i>m.</i> , sheet.	Sucrier, <i>m.</i> , sugar-dish.
Écumoire, <i>f.</i> , skimmer.	Tableau, <i>m.</i> , picture.
Eutoinoir, <i>m.</i> , funnel.	Tablette, <i>f.</i> , shelf.
Essuie-main, <i>m.</i> , towel.	Tapis, <i>m.</i> , carpet.
Fer à repasser, <i>m.</i> , iron.	Thière, <i>f.</i> , a tea-pot.
Fourgon, <i>m.</i> , poker.	Tire-bouchon, <i>m.</i> , cork-screw.
Foyer, <i>m.</i> , hearth.	Tiroir, <i>m.</i> , drawer.
Lampe, <i>f.</i> , lamp.	Traversin, <i>m.</i> , bolster.
Lanterne, <i>f.</i> , lantern.	Ustensiles de cuisine, <i>m.</i> pl., kitchen utensils.
Lit, <i>m.</i> , bed.	Verre, <i>m.</i> , glass.

8. PLATS, ETC.—DISHES, ETC.

Bœuf, <i>m.</i> , beef.	Mouton, <i>m.</i> , mutton.
Bouilli, <i>m.</i> , boiled beef, boiled meat.	Œuf, <i>m.</i> , egg.
Bouillon, <i>m.</i> , broth.	Omelette, <i>f.</i> , omelet.
Confitures, <i>f.</i> pl., preserves.	Porc, <i>m.</i> , pork.
Côtelette, <i>f.</i> , cutlet.	Rafraichissem-nts, <i>m.</i> pl., refreshments.
Gâteau, <i>m.</i> , cake.	Rôti, <i>m.</i> , roast meat.
Gigot de mouton, <i>m.</i> , leg of mutton.	Saucisse, <i>f.</i> , sausage.
Jambou, <i>m.</i> , ham.	

Soupe, f., *soup*.
 Soupe maigre, f., *vegetable soup*.
 Tarte, f., *tart*.

Veau, m., *veal*.
 Vermicelle, m., *vermicelli*.
 Volaille, f., *fowl*.

9. LEGUMES, GRAIN, ETC.—VEGETABLES, GRAIN, ETC.

Ail, m. pl., *onion* or *garlic*.
 Asperge, f., *asparagus*.
 Avoine, f., *oats*.
 Betterave, f., *beet*.
 Blé, m., *wheat*.
 Carotte, f., *carrot*.
 Céleri, m., *celery*.
 Champignon, m., *mushroom*.
 Chou, m., *cabbage*.
 Choufleur, m., *cauliflower*.
 Concombre, m., *cucumber*.
 Cresson, m., *cress*.
 Epinards, m. pl., *spinage*.
 Fève, f., *bean*.
 Grain, m., *kernel*.
 Herbe, f., *herb*.
 Lentille, f., *lentil*.
 Mais, m., *maize*.

Millet, m., *millet*.
 Navet, m., *turnip*.
 Oignon, m., *onion*.
 Orge, f., *barley*.
 Oseille, f., *sorrel*.
 Parnass, m., *parsnip*.
 Persil, f., *parsley*.
 Plante, f., *plant*.
 Poireau, m., *leek*.
 Pois, m., *pea*.
 Racine, f., *root*.
 Radis, m., *turnip-radish*.
 Rave, f., *radish*.
 Riz, m., *rice*.
 Sauge, f., *sage*.
 Seigle, m., *rye*.
 Thym, m., *thyme*.
 Truffe, f., *truffle*.

10. FLEURS, ETC.—FLOWERS, ETC.

Auricule, f., *auricula*.
 Chardon, m., *thistle*.
 Chèvre-feuille, m., *honeysuckle*.
 Giroflée, f., *gillyflower*.
 Jasmin, m., *jessamine*.
 Lis, m., *lily*.
 Marguerite, f., *daisy*.
 Mauvaise herbe, f., *weed*.
 Myrte, m., *myrtle*.
 Gillet, m., *pink*.

Ortie, f., *nettle*.
 Pavot, m., *poppy*.
 Pensée, f., *forget-me-not*.
 Pied d'alonette, m., *larkspur*.
 Primevère, f., *covslip*.
 Renoncule, f., *ranunculus*.
 Rose, f., *rose*.
 Tournesol, m., *sunflower*.
 Tulipe, f., *tulip*.
 Violette, f., *violet*.

SECTION XVIII.—THE RELATIVE PRONOUN.—CARDINAL AND ORDINAL NUMBERS, ETC.

1. The relative pronoun, *que*, *whom*, *which*, *that*, and the conjunction *que*, *that*, are never omitted in French, and must be repeated before every verb depending on them [§ 109].

Les crayons que j'ai sont meilleurs que ceux que vous avez, *The pencils (which) I have are better than those (which) you have.*

2. Ne que the verb, and *que* after it, are used in the sense of *only*, *but*.

Je n'ai qu'un ami, *I have but one friend.*

3. L'un et l'autre means *both*; les uns et les autres, *these and those*, the latter and the former.

Vous avez l'un et l'autre, *You have both.*

4. CARDINAL AND ORDINAL NUMBERS [§ 22, 23].

CARDINAL	
Un, m., one, f.,	One.
Deux,	Two.
Trois,	Three.
Quatre,	Four.
Cinq,	Five.
Six,	Six.
Sept,	Seven.
Huit,	Eight.
Neuf,	Nine.
Dix,	Ten.
Onze,	Eleven.
Douze,	Twelve.
Troize,	Thirteen.
Quatorze,	Fourteen.
Quinze,	Fifteen.
Seize,	Sixteen.
Dix-sept,	Seventeen.
Dix-huit,	Eighteen.
Dix-neuf,	Nineteen.
Vingt,	Twenty.

ORDINAL	
Premier, m., -e, f.,	First.
Second, m., -e, f.,	Second.
Deuxième,	Second.
Troisième,	Third.
Quatrième,	Fourth.
Cinquième,	Fifth.
Sixième,	Sixth.
Septième,	Seventh.
Huitième,	Eighth.
Neuvième,	Ninth.
Dixième,	Tenth.
Onzième,	Eleventh.
Dozième,	Twelfth.
Troisième,	Thirteenth.
Quatorzième,	Fourteenth.
Quinzième,	Fifteenth.
Seizième,	Sixteenth.
Dix-septième,	Seventeenth.
Dix-huitième,	Eighteenth.
Dix-neuvième,	Nineteenth.
Vingtième,	Twentieth.

5. The cardinal numbers are used in French for the day of the month, except the *first*, for which the ordinal number *premier* is substituted:—
 Le dix Août, le cinq Juillet, *The tenth of August, the fifth of July.*
 Le premier du mois prochain, *The first of next month.*

6. The verb *avoir*, to have, is used actively [§ 26 (1)] for the day of the month. The verb *être* may also be used:—
 Quel jour du mois avons-nous? *What day of the month have we?*
 Nous avons le vingt, *We have the twentieth.*
 C'est aujourd'hui le dix, *To-day is the tenth.*

7. Before the word *onze*, the article *le* or *la* is not elided [§ 146]:—

Nous avons le onze de Décembre, *We have (it is) the eleventh of December.*

RÉSUMÉ OF EXAMPLES.

L'ouvrier a-t-il les outils que vous avez?	<i>Has the workman the tools which you have?</i>
Les maisons que j'ai sont-elles aussi bonnes que celles que vous avez?	<i>Are the houses which I have as good as those which you have?</i>
Combien de francs avez-vous?	<i>How many francs have you?</i>
Je n'ai que dix francs, mais mon frère en a plus de vingt.	<i>I have only ten francs, but my brother has more than twenty (of them).</i>
Avons-nous le quinze du mois?	<i>Is it (have we) the fifteenth day of the month?</i>
Non, Monsieur, nous n'avons que le onze.	<i>No, Sir, it is (we have) only the eleventh.</i>
Lequel de ces deux volumes avez-vous?	<i>Which of those two volumes have you?</i>
J'ai l'un et l'autre.	<i>I have both.</i>
Avez-vous la première place ou la deuxième?	<i>Have you the first or the second place?</i>
J'ai la première et mon frère a la deuxième.	<i>I have the first, and my brother has the second.</i>

VOCABULARY.

Aujourd'hui, to-day.	Février, m., February.	Euvres, f., works.
Cannelle, f., cinnamon.	Franc, m., franc.	Outil, m., tool.
Centime, m., centime, the hundredth part of a franc.	Histoire, f., history.	Ouvrage, m., work.
Combien, how much, how many.	Italien, m., Italian.	Place, f., place.
Cravate, f., cravat.	Kilogramme, m., kilogramme, about two pounds.	Quart, m., quarter.
Demi, half.	Menusier, m., joiner.	Septembre, m., September.
	Mousseline, f., muslin.	Volume, m., volume.

EXERCISE 31.

1. Le cheval que vous avez est-il bon? 2. Il est meilleur que celui que vous avez et celui de notre ami. 3. Combien d'enfants avez-vous? 4. Je n'en ai qu'un, mais l'Italien en a plus que moi. 5. Avons-nous le dix Septembre? 6. Non, Monsieur, nous avons le neuf Février. 7. Avez-vous ma cravate de soie ou ma cravate de mousseline? 8. J'ai l'une et l'autre. 9. Avez-vous huit kilogrammes de canelle? 10. Non, Monsieur, je n'en ai qu'un demi-kilogramme. 11. Combien de francs avez-vous, Monsieur? 12. Je n'ai qu'un demi-franc, mais mon ami a un franc et demi. 13. Votre sœur a-t-elle vingt-cinq centimes? 14. Oui, Monsieur, elle a un quart de franc. 15. N'avons-nous pas le premier Août? 16. Non, Monsieur, nous avons le six Septembre. 17. Est-ce aujourd'hui le dix? 18. Non, Monsieur, c'est le onze. 19. Votre frère a-t-il la première place? 20. Non, Monsieur, il a la dixième. 21. Votre menuisier a-t-il beaucoup d'outils? 22. Oui, Monsieur, il en a beaucoup. 23. Cet ouvrage a-t-il dix volumes? 24. Non, Monsieur, il n'en a que neuf. 25. J'ai le sixième volume des œuvres de Molière et le premier volume de "L'Histoire de France" de Michelet.

EXERCISE 32.

1. Is that cinnamon good? 2. That cinnamon is better than yours and your brother's. (R. 1.) 3. What day of the month is it to-day? 4. It is the sixth. 5. Has your father twenty francs? 6. No, Sir, he has only six francs fifty centimes. 7. How many volumes has your work? 8. It has many, it has fifteen. 9. Has the joiner read (he) the second volume of Michelet's "History of France?" 10. Yes, Sir, he has read the second volume (of it). 11. Has your friend Molière's works? 12. He has only two volumes of them. 13. Have you my cloth coat or my velvet coat? 14. We have both. 15. We have this and that. 16. How much cinnamon have you? 17. We have two kilogrammes. 18. How many centimes has the merchant? 19. He has twenty-six. 20. Have you the third or the fourth place? 21. I have neither the third nor the fourth, I have the tenth. 22. Are you not ashamed to-day? 23. No, Sir, I am not ashamed, but I am afraid. 24. Have you a quarter of a franc? 25. No, Sir, but I have a half franc. 26. Is it (have we) the sixth of July? 27. No, Sir, it is (we have) the fourth of March. 28. Has your uncle six children? 29. No, Sir, he has only one. 30. Have you ten kilogrammes of meat? 31. I have only five kilogrammes. 32. Is the butcher's meat good? 33. It (elle) is not very good. 34. How many kilogrammes have you (of it)? 35. I have only two, but my brother has four.

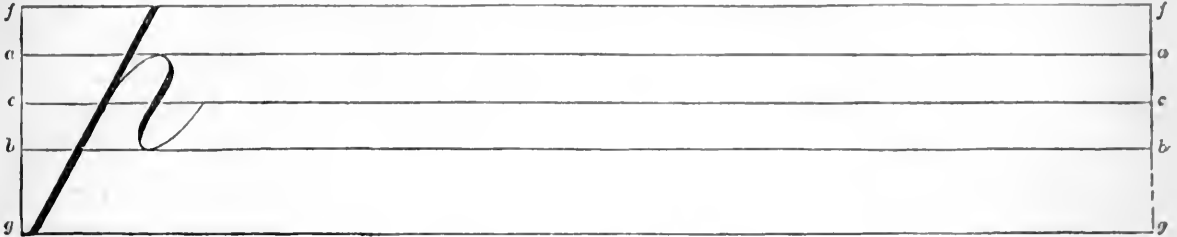
LESSONS IN PENMANSHIP.—IX.

The letter **p** is the first letter that the learner has met with that extends below the line *b b*, and it will be necessary here to say something about its proportions, as they are given in Copy-slips Nos. 28, 30, and 31:

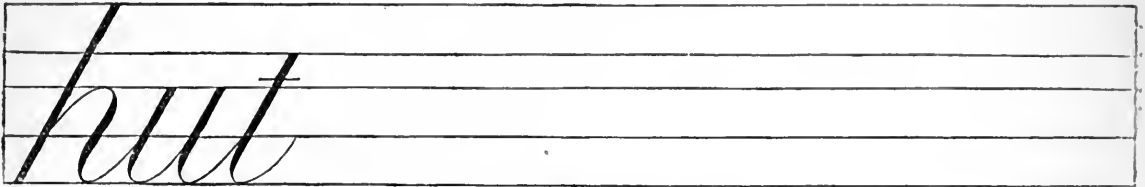
It will be remembered that in "large text," the distance between the lines *a a*, *b b*, that contain what we have called the body of the letter, is, or ought to be, exactly half an inch; and as the line *c c* is midway between the lines *a a*, *b b*, the distance

On inspecting any copy-slip that has the letter **l** in it, it will be found that the letter **p** extends as far below the line *b b* as the letter **l** extends above the line *a a*. That portion of the letter **p** which extends above the line *a a* is longer by one-sixteenth of an inch than the distance to which the letter **l** extends above the same line, or the distance between the top of the bottom-turn of the letter **i** and the dot above it, as may be seen by examining Copy-slips Nos. 30 and 31.

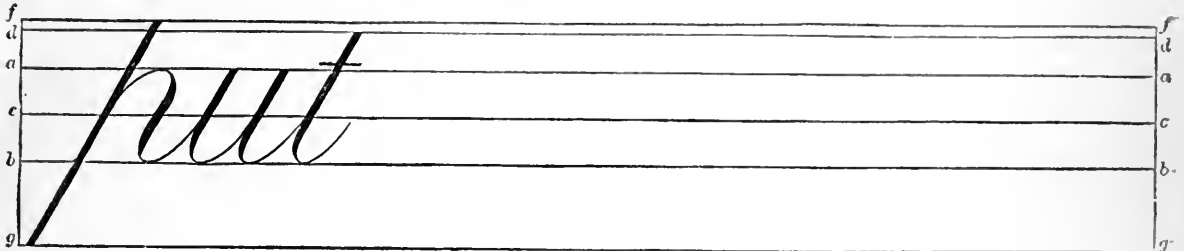
We have been thus particular in dwelling upon the distances to which letters such as **t**, **l**, **h**, **p** should extend above *a a*, or



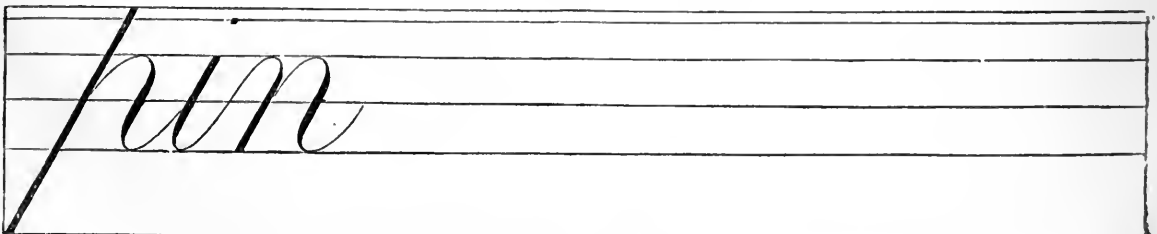
COPY-SLIP NO. 28.—THE LETTER **p**.



COPY-SLIP NO. 29.—THE WORD **hut**.



COPY-SLIP NO. 30.—THE WORD **put**.



COPY-SLIP NO. 31.—THE WORD **pin**.

between each of these lines and the central line, *c c*, is a quarter of an inch. Now the distance between *a a* and the line *f f*, at which the long straight stroke of the letter **p** is commenced, is also a quarter of an inch, and is equal to the distance between *a a* and *c c*, or between *b b* and *c c*. The distance between *b b* and *g g*, the line at which the long straight stroke terminates, is rather less than half an inch, or, to speak in exact terms, just seven-sixteenths of an inch; that is to say, if an inch were divided into sixteen equal parts, the distance between *b b* and *g g* is equal to seven of them, while the distances *f a*, *a c*, *c b*, on the straight line *f g*, are each equal to four-sixteenths of an inch, which is merely another expression for a quarter of an inch, as our learners will find when they have got on far enough in Arithmetic to be working at Vulgar Fractions.

below *b b*, in order to induce the learner to pay strict attention to the relative proportions of his letters. The importance of this will be seen by any one who is curious enough to extend these letters to a greater or less length above *a a*, or below *b b*, than is allotted for their extension in our Copy-slips. The general appearance of handwriting that would otherwise be good, is often completely spoiled by a want of proper proportion in the heads, loops, and tails of the letters. Those who wish to be distinguished for writing a plain and legible hand, must aim at the neatness and beauty of the writing that is found in old deeds, and books copied by the monks who lived before the time of Caxton. The letters of these famous penmen are as regular in their proportions and as sharply and delicately defined as if they had been carefully printed from well-cut type.

LESSONS IN ARITHMETIC.—IX.

LEAST COMMON MULTIPLE.

1. ONE number is called a *multiple* of another when it can be divided by the latter without a remainder.

Thus, a *measure* and a *multiple* are the converse of each other. If a number divides another without remainder, it is said to be a *measure* of it, and the latter number is said to be a *multiple* of the first.

A *common multiple* of two or more numbers is a number which can be divided by each of them without a remainder. It will clearly be a *composite* number, of which each of the given numbers must be a factor, for it could not otherwise be divided by them.

The same numbers may clearly have an infinite number of common multiples, for any one common multiple having been found, another may be obtained by multiplying it by any number.

The continued product of two or more numbers will always give a common multiple of those numbers.

The *least common multiple* of two or more numbers is the least number which can be divided by each of them without a remainder.

Thus, 70 is the least common multiple of 2, 5, and 35.

2. The least common multiple of two or more numbers is evidently composed of the continued product of all the different prime factors which compose the given numbers, each one being repeated as often as the greatest number of times it occurs in any one of the numbers. For if it did not contain all the prime factors of any one of the numbers, it could not be divided by that number.

On the other hand, if any prime factor were employed more times than it is repeated in any one of the given numbers, it would not be the least common multiple.

For the sake of brevity the words "least common multiple" are sometimes written L. C. M.

3. EXAMPLE.—Find the L. C. M. of 12, 126, and 735. These are respectively equal to

$$2 \times 2 \times 3, \quad 2 \times 3 \times 3 \times 7, \quad 3 \times 5 \times 7 \times 7.$$

Now 2, 3, 5, 7 are all the different prime factors which occur in any of the numbers; and the greatest number of times which 2 occurs is twice—namely, in the first; the greatest number which 3 occurs is twice—namely, in the second; 5 only occurs once—namely, in the third; and the greatest number of times which 7 occurs is twice—namely, in the third. Hence the L. C. M. required will be—

$$2 \times 2 \times 3 \times 3 \times 5 \times 7 \times 7; \text{ that is, } 8820.$$

4. The process, then, of finding the least common multiple of two or more numbers is reduced to that of splitting up the numbers into their prime factors.

This may be effected, however, by a more convenient method of arrangement than splitting each number separately into factors would be, for which we give the following

Rule for finding the least common multiple of two or more numbers.

Write down the numbers in a straight line apart from each other. Divide by the least number which is a measure of two or more of them, and set down the quotients and the undivided numbers in a line below. Take again the least number which is a measure of two or more of these numbers last set down, and perform the same operation as before. Continue it until there are no two numbers which can be divided by any number greater than unity. The continued product of all the divisors, and the numbers set down in the last line, will be the least common multiple required.

5. EXAMPLE.—To find the L. C. M. of 12, 42, 72, and 84.

The process will be sufficiently understood from the following working:—

2)	12, 42, 72, 84
2)	6, 21, 36, 42
3)	3, 21, 18, 21
7)	1, 7, 6, 7
	1, 1, 6, 1

Hence the L. C. M. is $6 \times 7 \times 3 \times 2 \times 2$; that is 504.

This method of arrangement evidently gives the greatest number of times which each prime factor occurs in any one of the given numbers. Thus 2 occurs three times in 72, 3 occurs twice in 72, and 7 occurs only once—viz., in 42 and 84.

EXERCISE 21.

1. Find the least common multiple of the following numbers:—

- | | |
|---|---|
| 1. 15 and 45.
2. 63 and 18.
3. 6, 9, and 15.
4. 8, 16, 18, and 24.
5. 9, 15, 12, 6, and 5.
6. 5, 10, 8, 18, and 15.
7. 24, 16, 18, and 20.
8. 36, 25, 60, 72, and 35.
9. 27, 54, 81, 14, and 63.
10. 72, 120, 180, 24, and 36.
11. 375, 850, 3400, and 5085.
12. 7, 11, 13, and 5. | 13. 1, 2, 3, 4, 5, 6, 7, 8, and 9.
14. 657, 350, 876, 1095, 2190, and 5795.
15. 42, 12, 84, and 72.
16. 9, 12, 72, 36, and 144.
17. 8, 12, 20, 24, and 25.
18. 63, 12, 84, and 7.
19. 54, 81, 63, and 14.
20. 75, 120, and 300.
21. 96, 144, and 720.
22. 256, 512, and 1728.
23. 375, 850, and 3400. |
|---|---|

LESSONS IN GERMAN.—VIII.

SECTION XVI.—USE OF THE DEFINITE ARTICLE; PROPER NAMES, ETC. ETC.

The plural of Mann is Männer; except in compounds, where it is generally Leute (§ XV. Note), as Landmann, countryman; Landleute, country-people. Zimmermann, carpenter; Zimmerleute, carpenters. Hauptmann, captain; Hauptleute, captains. Kaufmann, merchant; Kaufleute, merchants.

Self corresponds mainly to our word *people*. Unlike this, however, it has different forms for the two numbers, as:—Die Franken sind ein lebhaftes Volk; the French are a lively people. Die Fürsten schwelgen, und das Volk leidet; the princes revel, and the people suffer. Alle Völker auf Erden, 1 Moses xviii. 18; all the nations of the earth, Genesis xviii. 18.

The word *one*, as a pronoun, is, in English, often inserted after an adjective, to avoid the repetition of the noun; in German, however, the adjective in such a case stands alone, as:—Er hat einen guten Hut, und ich habe einen schlechten; he has a good hat, and I have a bad (one). Ich habe gute Hüte, und er hat schlechte; I have good hats, and he has bad (ones). Er hat guten Wein, und ich habe schlechten; he has good wine, and I have bad (wine).

The adjective and participle preceded by an article are often used substantively, as well in the singular as in the plural, as:—Der Zufriedene (Sect. IX. 2) ist glücklich; the contented (man) is happy. Die Zufriedene ist glücklich; the contented (woman) is happy. Die Zufriedenen sind glücklich; the contented are happy. Ein Zufriedener (Sect. X.) ist glücklich; a contented (man) is happy. Der Sterbende, die Sterbende; the dying (man), the dying (woman). Die Lebenden; the living.

1. Adjectives in German are often, by means of the definite article, converted into abstract nouns, as:—Er verehrt das Schöne; he adores the beautiful.

2. The use of the definite article before nouns, taken in a general sense, is much more frequent than in English, as:—Der Tiger ist flink; the tiger is agile. Der Diamant ist ein Edelstein; the diamond is a precious stone. Das Gold ist ein edles Metall; (the) gold is a precious metal. Die Luft ist ein Element; the air is an element. Das Wasser ist ein Element; (the) water is an element. Die Seele ist unsterblich; the soul is immortal. Der Mensch ist sterblich; (the) man is mortal. Die Faulheit ist ein Laster; (the) idleness is a vice.

The plural is used in the same manner, as:—Die Tiger sind flink; (the) tigers are agile.

3. The definite article is sometimes used instead of the possessive pronouns, as:—Er hat ein Buch in der Hand; he has a book in the (his) hand. Das Kind ist bei dem Vater; the child is with the (its) father.

4. Proper names and titles are often preceded by the definite article, as:—Wo ist der Heinrich? where is (the) Henry? Der Kaiser Heinrich, the Emperor Henry. Der König Heinrich; (the) King Henry.

The definite article likewise commonly precedes the adjective qualifying a proper name, as:—Die schöne Helene; the beautiful Helen. Der arme Richard; (the) poor Richard.

The article is also generally used before the word *Schule*, *Kirche*, *Markt*, *Mühle*, &c., as:—Er ist in der Schule; he is (in) at (the) school. Er ist in der Kirche; he is (in) at (the) church. Er ist auf

dem Markt; he is at the market. Er ist in der Mühle; he is in the mill. Er geht nach der Mühle; he is going to (the) mill.

5. The word Herr, when placed before a proper name, answers to our Mr., as:—Ist Herr N. hier? is Mr. N. here? Frau in the like position signifies Mrs., as:—Wo ist Frau N.? where is Mrs. N.? Fräulein, thus placed, answers to our word Miss, as:—Fräulein N. ist hier; Miss N. is here. Guten Morgen, Herr N., Frau N., Fräulein N.; good morning, Mr. N., Mrs. N., Miss N. Instead of Frau the French Madam is often used, as:—Madam N.; Mrs. N.

In address, when the name is omitted, the possessive pronoun precedes the words Herr and Fräulein, as:—Guten Morgen, mein Herr, mein Fräulein; good morning, Sir, Miss.

In the plural the form of address is: Meine Herren! Gentlemen! Meine Damen! Ladies! Meine Fräulein! Young ladies!

The word Fräulein, when connected with the name, is used like its corresponding word in English, as:—Sind die Fräulein N. zu Hause? Are the Misses N. at home?

In ceremonious address the word Herr is prefixed to titles, as:—Herr Präsident; Mr. President. Herr Sprecher; Mr. Speaker. Herr Pastor; (Mr.) Pastor. Herr Oberst; (Mr.) Colonel. Herr Professor; (Mr.) Professor. Herr Lehrer; (Mr.) Teacher. Herr Ritter; Sir Knight.

Herr, preceded by the definite article, is applied to these titles as well in the third person as in the second, as:—Wo ist der Herr Präsident? Where is the (Mr.) President? Wissen Sie, wo der Herr Oberst ist? Do you know where the (Mr.) Colonel is?

Obs.—The words in parentheses are the literal translations of the German; they are given that the pupil may clearly perceive the different modes of expression of the two languages. Peculiarities of this kind are called "the idiom of a language," and the differences "differences of idiom."

The word Frau is prefixed to titles or appellations of women, as:—Frau Gämmerin; Lady Patroness. Frau Wittbin; Lady Abbess. Frau Gemahlin; Lady Consort.

These words are also prefixed to designations of relationship, as:—Wo ist Ihr Herr Vater? Where is your (Mr.) father? Sein Herr Bruder ist hier. His (Mr.) brother is here. Ist Ihre Frau Mutter zu Hause? Is your (Mrs.) mother at home? Ihre Fräulein Schwester war da. Your (Miss) sister was there.

VOCABULARY.

Abend, m. evening.	Gestern, yesterday.	Schauen, to view.
Arbeiten, to work.	Hant'werker, m. mechanic.	Scheuen, to shun.
Bekauern, to pity.	Herr, m. Mr., Sir, Lord.	Schlecht, adj. bad, base.
Beneiden, to envy.	Herrätin, f. wife of a counsellor of the court (Sect. VIII. 1.).	Schreiner, m. joiner.
Bergmann, m. miner.	Lehrer, f. wife of a counsellor of the court (Sect. VIII. 1.).	Schritt, m. step, stride.
Bettler, m. beggar.	Lächerlich, adj. ludicrous, ridiculous.	Sehen, to see, perceive.
Concert, n. concert.	Pastor, n. vice.	Theater, n. theatre.
Damengesellschaft, f. society of ladies. (See Sect. VIII. 1.)	Madam, f. Mrs., madam.*	Tiefe, f. depth.
Der, there, yonder.	Maurer, m. mason.	Trauer, f. mourning, sorrow.
Ebenfalls, likewise.	Minister, m. minister.	Tugendhaft, virtuous.
Erde, f. earth.	Mit, with.	Un'gelehrt, unlearned, illiterate.
Erhaben, sublime.	Morgen, m. morning.	Un'glücklich, unhappy, unfortunate.
Frau, f. Mrs., woman, wife.	Muster, n. sample.	Verdienen, to earn, deserve.
Gelehrt, adj. learned.	Munter, adj. lively.	Viel, adj. and adv. much, many.
Gemahlin, f. consort, wife.	Nützlich, adj. useful.	Wünschen, to wish, desire.
Gesant'nin, f. ambassador.	Professor, m. professor.	
Glücklich, adj. happy, fortunate.		

RÉSUMÉ OF EXAMPLES.

Die Hüttenleute haben schwere Arbeiten.	The furnace-men have severe labour.
Die meisten Völker Asiens haben noch Götzen.	(The) most nations of Asia have still idols.
Der Vater hat einen schwarzen Hut, und der Sohn einen weißen.	The father has a black hat, and the son a white (one).
Das Schöne ist lieblich, aber nur das Gute achtungswürdig.	The beautiful is lovely, but only the good (is) worthy of respect.

* Madam is the same as the French Madame (my lady), but never spelt with the e as is the French word.

Der Herr Gesant'nte ist so eben mit seiner Frau Gemahlin abgereist. The (Mr.) Ambassador, with his lady consort, has just now departed.

Nehmen Sie auf dem Sopha Platz, meine Damen, meine Fräulein, oder meine Herren. Take (you) seats upon the sofa, if you please, (my) ladies, (my) young ladies, or (my) gentlemen.

Frau N., ihre Fräulein Tochter, und ihr Herr Sohn sind in Ihrem Zimmer. Mrs. N., her (Miss) daughter, and her (Mr.) son are in your room.

EXERCISE 21.

1. Die Zimmerleute, Schreiner, Schneider, und Maurer sind Hantwerker.
2. Die Bergleute arbeiten in der Tiefe der Erde.
3. Die Engländer sind ein reiches Volk.
4. Fleißige Hantwerker verdienen in America viel Geld.
5. Der Reichthum hat einen guten Nach, und der Bettler einen schlechten.
6. Der Augenbahrer schaut das Kaiser.
7. Der Glücklich betrauert ten Unglücklichen.
8. Die Ungelehrte beneidet die Gelehrte.
9. Das Gelehrte ist nicht immer das Nützliche.
10. Herr N. ist in dem Zimmer.
11. Frau N. ist in dem Theater.
12. Ich gehe mit Ihnen, mein Herr.
13. Ich wünsche Ihnen einen guten Morgen, mein Fräulein.
14. Ich war gestern in einer Tamengesellschaft.
15. Frau N. ist sehr munter.
16. Ich sehe die Frau Gesant'nin nicht.
17. Der Herr Minister ist ebenfalls dort.
18. Die Frau Herrätin hat Trauer.
19. Guten Abend, Herr Professor.
20. Wo ist Ihre Frau Gemahlin, Ihr Herr Sohn, und Ihre Fräulein Tochter?
21. Sie sind in dem Concert.
22. Dem (§ 4. 2) Erbhabem zum Kaiserlichen ist nur ein Schritt.
23. Der Reichthum hat zwei Häuser, drei Knechte, vier Pferde, zwölf Schen, und achtzig Schafe.
24. Dieser Jäger hat fünf Hunde, und jener hat acht.

EXERCISE 22.

1. The Germans are a diligent people.
2. My father knows [kennt] a learned professor, but an unfortunate (one).
3. The unlearned [Ungelehrt] avoids the learned.
4. The dying (man) has a book [Buch] in his hand.
5. He adores the beautiful and the sublime.
6. Gold is a precious metal, silver is likewise, but copper [Kupfer] and iron are [sind] not.
7. Have you seen poor Henry and little Helen?
8. Your friend, the captain,† was in the theatre.
9. I see the colonel yonder in the garden.
10. Good morning, president.
11. Is your mother at [zu] home [Hause]?
12. Good [guten] evening [Abend], Sir; where is your sister and your brother?

LESSONS IN DRAWING.—V.

We cannot urge too strongly on our pupils the necessity of going to work carefully and deliberately. Consider well what you have to do before you begin. Endeavour to make no line or touch that is not to the purpose. If you cannot satisfy yourself on the first trial, be not disappointed, but try again, and again. Recall to mind the errors you made in the first attempts, which you should keep by you, that you may often refer to them. In your next trial you will do better. You will have advanced a certain step, and onward will be your progress, as surely as you persevere. Never fatigue yourself over your drawing. The moment you work without a will it should be laid aside.

And now—and this is a point of the greatest importance to the learner—we must further urge on those who are working with us by means of these lessons, to endeavour to acquire a good position when drawing. In Fig. 35 the proper position of the paper on which you are drawing, and the copy which you are endeavouring to imitate, is clearly shown. Your paper should be placed before you on a desk, with a slight inclination of about two or three inches in a foot, or on a flat and perfectly level piece of board, to which it may be secured by flat-headed drawing-pins, and which may be supported at the proper inclination on a book or a piece of wood, as at b. The drawing which you are copying should be supported as at a, by a light easel or frame with a leg, fastened by a hinge to the upper part of it, by which the inclination of the frame may be regulated at pleasure.

The position in which you sit should be perfectly easy, and in no way painful to the chest. There is no necessity for lean-

* Drei, two; drei, three; vier, four; zwölf, twelve; achtzig, eighty; fünf, five; acht, eight.

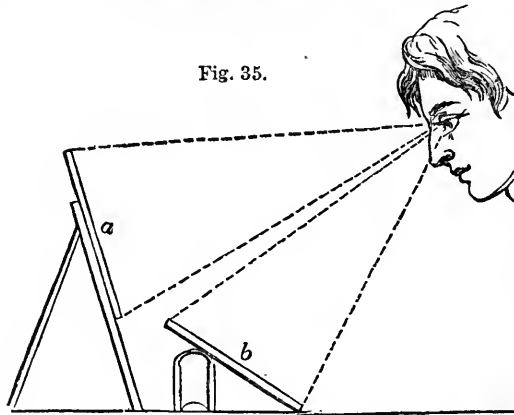
† Remember that in German "the captain" must be rendered "the Mr. Captain," etc.

ing over your work in an ungraceful or painful attitude. The eye should be as nearly as possible directly opposite the centre of your drawing, and the inclination of your paper and copy should be such that a line passing from your eye to either paper or copy, when you are at work, should pass through the centre of the copy at *a* in Fig. 35, or the centre of the drawing at *b*, as nearly as possible at right angles to their respective planes.

It is unnecessary to give directions as to the manner of holding your pencil. Your own judgment must direct you in a great measure as to that. It matters little, so that you feel the instrument fit your fingers easily. If proper attention has been bestowed upon the primary instructions that we have given, you have already learned the importance of depending not solely on your fingers, but also on the action of the wrist and arm. The hand should not be suffered to rest upon the paper upon which you are drawing, if it can be avoided, but have a spare piece to lay under it while you are at work. It will serve another purpose—to try the points of your pencils upon, or the points of your pens, crayons, and brushes when you are sufficiently advanced to draw with pen and ink, or to paint in water-colours. Begin at once to preserve your drawings in a portfolio. Even when you have failed in many attempts you should keep them by you. Destroy nothing that you do, and you will soon learn to do nothing that you would desire to destroy. Preserve order in the disposition of all your materials: much time and vexation may be saved by

longer whilst we make a few remarks upon some of the peculiarities of Angular Perspective. No doubt it is much more difficult to understand than parallel perspective, arising from the great variety of positions in which objects may be placed, for if the lines are, on the one hand, ever so slightly out of the perpendicular from the picture plane, or, on the other, in the least degree vary from the parallel to the picture plane, the treatment necessarily comes under the rules of Angular Perspective.

Fig. 35.



Let us try to make this clear by the help of Figs. 36 and 37.

Fig. 36 is a case of parallel perspective (see p. 72, Fig. 27a). Fig. 37 has its sides *a b* and *e f* slightly removed from the perpendicular *c d*, and the sides *a e* and *b f* in the same proportion removed from the line *e g*, parallel to *P P*; consequently it presents the angle at *e* to the picture plane. (We shall presently be under the necessity of seeking a little help from Geometrical Perspective, in order to make ourselves more clearly understood.) There is another peculiarity in connection with this relating to the position of the vanishing points; we request

the pupil to look at Fig. 38: he will observe that the angle of the building, *a b*, is nearest the eye, whilst the side *a b c d* retires one way to *V P 1*, and the side *a b e f* retires another way to *V P 2*. Now, when he sees this he will probably say, "Yes, these sides certainly do retire as so stated, but I should like to be informed why these two vanishing points are placed where they are. Is there any rule for so placing them? or is it

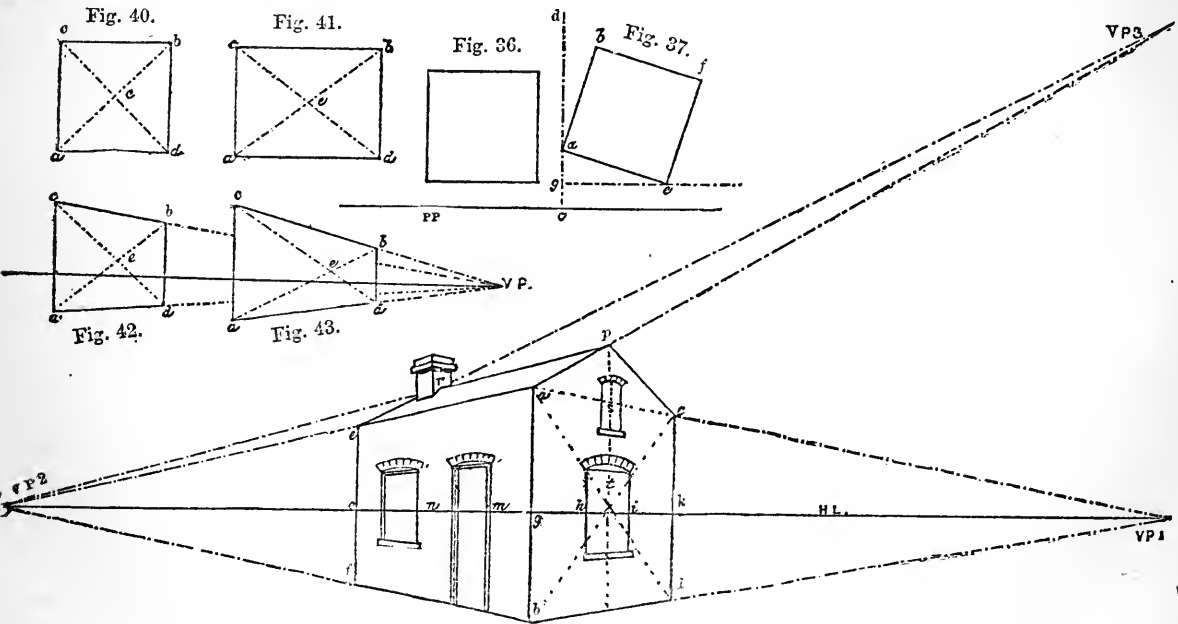


Fig. 38

it; and, above all things, remember that what is worth doing, is worth doing well.

We propose now to give some instructions in Angular Perspective; we use this term when the object presents an angle, and not a side, to the picture plane, that is, when the angle is nearest us and all the sides retire; this occurs especially when all rectangular forms, such as buildings, boxes, and things of a similar shape and character, are so arranged. (See p. 72, Fig. 27b.) Before we proceed to explain the method of drawing objects so placed before us, we must detain the pupil a little

merely a matter of choice?—in short, can I place them anywhere I please?" These are very fair questions, and we will endeavour to answer them. Of course, the house (Fig. 38) must have a ground-plan, which will be placed with regard to the picture plane as it is shown in Fig. 39, the angle towards us, and the sides retiring. Now let us suppose we are standing at *s p* (station point), from which place we are to make our drawing; from this place we determine our vanishing points, and the distance these vanishing points are apart will determine whether we are near or at a greater distance from the object. Then to

determine our vanishing points, we must give the following geometrical rule:—"Draw a line from the station point, parallel to the ground plan as far as the plane of the picture, from which draw a perpendicular line to the horizontal line (line of sight); this will give the vanishing point." Let us look at Fig. 39, we shall find that the line *a b* is drawn from *s p 1* to the picture plane, parallel to one of the retiring lines of the ground plan, *c d*, which gives *v p 1*; also *a e* is drawn parallel to *f c*, the other retiring line of the ground plan which gives us *v p 2*. But if the station point had been further off, as at *s p 2*, the line *a b* would have been from *s p 2* to *h*; therefore at *h* would then be found *v p 1*; so on the other side the *v p 2* would have been at *i*. Suppose the station point were placed at *s p 3*, then the vanishing points would be nearer each other. So it will be seen, the further the vanishing points are apart, the further we are from the object; and the nearer we are to the object the nearer together are the vanishing points. Our object,

points: for instance, let him trace out the lines *a e* and *b f* in Fig. 38, they will meet at *v p 2*; and the lines on the other side, *a c* and *b d*, will meet at *v p 1*. In an engraving, the vanishing points for all horizontal retiring lines may be found in this way, and they will determine also the line of sight which runs through these points. If he discover that these horizontal retiring lines do not meet in the same point, it will be because they are not parallel retiring lines; that is, the objects themselves are not placed in a parallel position with each other. This leads to another observation connected with this last remark; if there are fifty retiring lines, and all parallel, there will be only one vanishing point for them all; but if amongst these fifty there are not two parallel, there will be fifty vanishing points. As the pupil, we hope, will clearly comprehend this interesting feature in perspective drawing, he may apply the rule when he has an engraving before him. We know that the rectangular tops and bottoms of windows and doors are horizontal, and

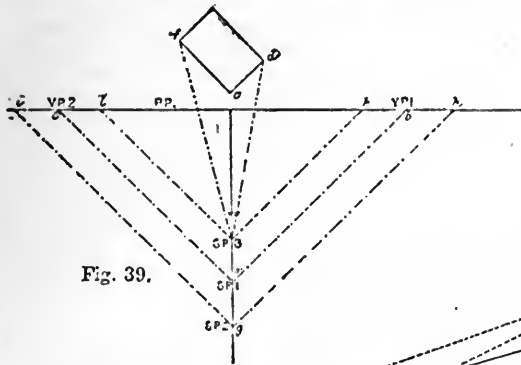


Fig. 39.

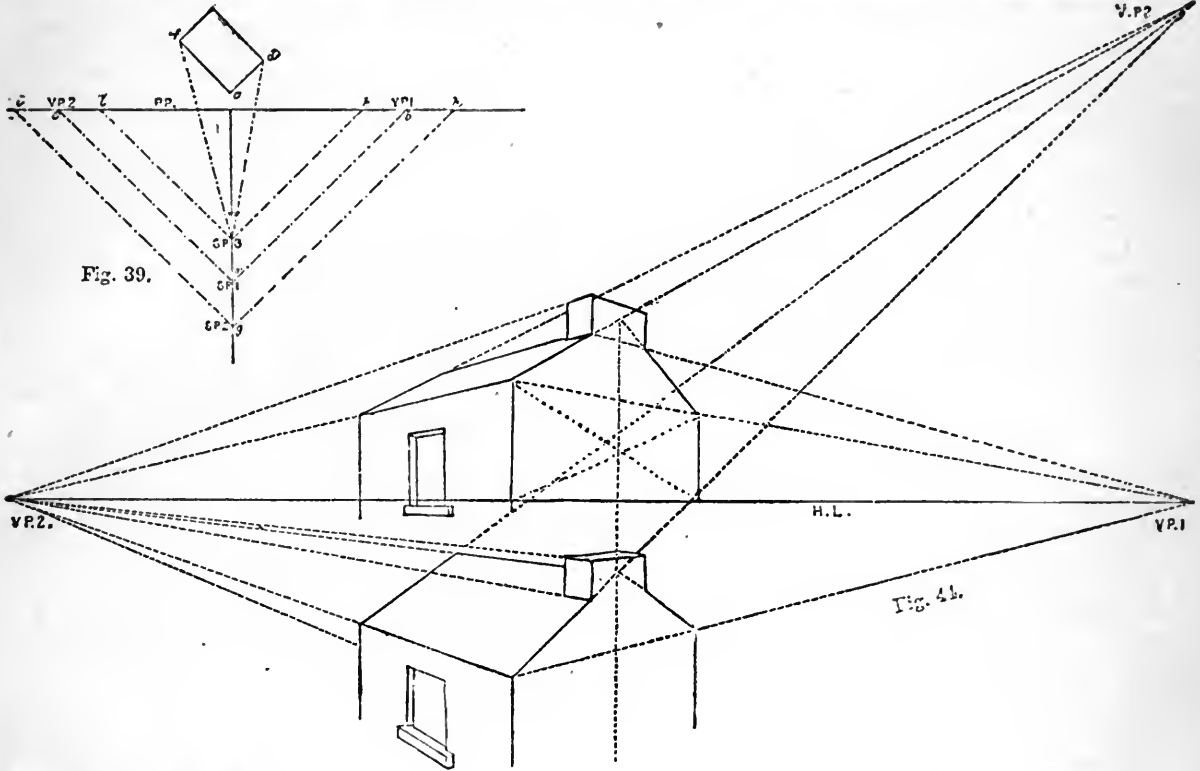


Fig. 41.

then, in giving this little explanation, is to account for placing the vanishing points. To carry this rule out by producing a drawing of the elevation of the house from the ground plan, will be considered hereafter.

By this explanation we only undertake to satisfy our pupils that we can make a correct drawing of the building if the vanishing point was at *h*, *b*, or *k*; only observe, that if we approached too near, the angle of sight, *m*, would be too large, so much so as probably to become as great, or greater than 60°. (See p. 72.) While writing these remarks on Angular Perspective, we found that it was absolutely necessary to give these geometrical reasons for the positions of the vanishing points, because as many lines in a picture retire and vanish elsewhere than at the point of sight, we felt bound to give these reasons, which need not cause the pupil to imagine there is anything to discourage him, as the mode of finding them in a picture, as well as when drawing from Nature, is very simple. Here, then, the pupil may ask, "If I have a drawing before me to copy, in which the vanishing points are not marked, how shall I find them?" Let us suppose the copy is an engraving (and the vanishing points are never shown in engravings), let him trace out the retiring lines in the picture—we think there can be no difficulty in recognising them—these lines traced out will give the vanishing

parallel with the eaves and horizontal ridges of roofs, the courses of the bricks, etc. Let him trace out as many of these lines as he can, if he understands they are intended, as in the object itself, to go off in the same direction, and he will find them meet at the same vanishing point, and soon discover whether the engraving is correct or not in the grammar. The uneducated eye may not detect small faults in the general appearance of the engraving, and thousands of drawings and paintings by really clever artists pass muster, and are admired, although they may be full of mistakes; just as in speaking, the grammatical errors habitually made by uneducated men are not even known to be such among themselves, but an educated man will notice them, although he may not remark upon them. After the pupil has discovered the vanishing point for the horizontal retiring lines in the engraving, he will then have found the position of the line of sight; then, in making his drawing, he must begin by placing this *v p* on his paper, and proceed by marking in the nearest line to the vanishing point, and so on, line after line, as we have before said. We know from experience the great advantage of this method, and have frequently remarked the rapid progress that has been made by those who have feared that drawing was an art too difficult for them to attain.

The method of drawing Fig. 38 will be as follows:—Draw the

horizontal line, or line of sight, *H L*; upon it mark the position of *g*, being the point nearest the eye, and most easily determined, and *h i k* to the right, and *v p 1*; then from *g* again to the left mark *m n o*, etc., and lastly, *v p 2*. Where there are more lines crossing the *H L*, it is advisable to mark them in also in their order. The subject we have before us is a very simple one, but it is enough to explain the process of copying it. Mark *a* from *g*, and *b* from *g*, and draw the line *agb*. From *a* draw the retiring lines *a c* and *b d* to *v p 1*, also *a e* and *b f* to *v p 2*; through *o* draw *ef*, and through *k* draw *cd*. As *m n*, the width of the door, is already arranged, it will be easy to draw it; the top of the door retiring to *v p 2*, as well as the top of the window on the left of it. The ridge of the roof is over the centre of the building, it is over the centre of the line *a c* in the object, but not in the drawing; as the line *a c* retires (the pupil will have observed that as objects retire they occupy less room on the paper; that he may understand this, let him turn back, and examine the examples we have given in parallel perspective), *s* is the centre of *a c* in perspective. If we wish to find the centre of a square (Fig. 40), or rectangle (Fig. 41), draw the diagonals *a b* and *c d*; *e* will be the centre; so in perspective, as shown in Figs. 42 and 43. This has been done in Fig. 33, giving *t* as the perspective of the centre of the end of the house. Draw the perpendicular *t p*, join *p a* and *p c*, draw *p r* to *v p 2*, produce *a p* to *v p 3* (see Fig. 33, page 105), and *e r* towards the same point; this will complete the roof. In the remainder we trust the pupil will find no difficulty. Fig. 44 represents two views of the same kind of subject; one when it is above the eye (*H L*), and the other when it is below the eye. The pupil has probably remarked before this, when considering the position of the line of sight, or horizontal line (*H L*), that the eye looks up to or underneath all objects, or the parts of an object placed above this line, and looks down upon these objects when placed below this line. This figure will be its own interpreter: as the method of drawing it has been already given, the dotted lines will be a sufficient guide in its execution.

LESSONS IN ENGLISH.—V.

SAXON ELEMENT OF THE ENGLISH LANGUAGE.

HAVING shown how the constituents of the English language enter into and form simple propositions, I might now speak of sentences in relation to the laws of their constitution, and exhibit the manner in which simple sentences may be expanded into compound sentences, and how compound sentences may be reduced to simple ones. But there is much, very much, to be learnt respecting the subject-matter already set forth. For instance, every separate part of speech has to be more minutely investigated. Besides, there are general facts which more or less bear on all the constituent elements of speech. These facts must be set forth, and this investigation must be gone through, before we treat of the formation of compound sentences, because in proceeding in this way I shall conduct the learner onward by easier steps.

Before, then, we formally set about building the house, it may be desirable to consider the materials which we shall have to employ, in order that we may become familiar with their qualities and character. Let us then take what is commonly called "The Lord's Prayer," and look a little closely into the words of which it is made up.

Our Father which art in heaven, hallowed be thy name. Thy kingdom come. Thy will be done in earth, as it is in heaven. Give us this day our daily bread. And forgive us our debts, as we forgive our debtors. And lead us not into temptation; but deliver us from evil. For thine is the kingdom, and the power, and the glory, for ever. Amen.—Matt. vi. 9—13.

Now at the first glance I see that here there are words of diverse origin. *Heaven* I recognise as of Saxon birth; *Father* I know to be a Latin word slightly altered; and *amen* is a Hebrew term in English letters. Hence, I am led to see that if I would know my mother-tongue I must study it in relation to the diverse materials which enter into its composition.

You are not yet sufficiently advanced to assign each word in the preceding quotation to the family to which it belongs in the great community of languages. I must, therefore, be satisfied at present with a somewhat rough division of these words into the three classes already indicated—namely, words of Saxon

origin, words of Latin origin, and words derived from other sources. In all, there are in the Lord's Prayer sixty-six words. Of these sixty-six only eight are from sources that are not Saxon. More than seven-eighths of the words in the Lord's Prayer come from the Saxon. You may now judge to what extent the Saxon prevails in the English tongue. Of the eight words that are not Saxon, six are from the Latin, one from the French, and one from the Hebrew, as seen in this view:—

Latin.—Name, debts, debtors, temptation, deliver, glory.

French.—Power.

Hebrew.—Amen.

The one French word might be added to the Latin line, for *deliver*, though it comes into the English directly from the French, is Latin by extraction.

This analysis, however, shows that the materials of the English language may be arranged into two great classes; namely, the Saxon and the Latin. These classes have reference to the origin of the words.

Another view may direct our attention to the condition in which the words are. Some of the words are very short, others are somewhat long. *Our* has only three letters; *kingdom* has seven; and *temptation* has ten letters. *Our* is a word of one syllable; *kingdom* is a word of two syllables; and *temptation* is a word of three syllables. Observing that all the words are Saxon, except the eight specified above, you will see that the Saxon words for the most part are short words, and words of one syllable. Of words, however, having more than one syllable, two kinds must be noticed. Take, as an instance, *father* and *kingdom*. Now *father*, though consisting of two syllables, is a simple word; while *kingdom* is a compound word. Hence arises another division. Words, whether of Saxon or of Latin origin, are either—1, *simple*; or 2, *compound*.

	Simple.	Compound.
Saxon	Earth.	Forgive.
Latin	Name.	Deliver.

The two compound words here presented, from the Lord's Prayer, may be resolved into their elements thus: *forgive* is made up of *for* and *give*, in German *vergeben*; *deliver* comes originally from *de*, *down from*, and *liber*, *free*. Now observe, I do not put down the import of the component parts of *forgive*, for they are known. Words of Saxon origin are known to every Englishman. But I do assign their signification to the terms which combine to make up *deliver*, since those terms awaken no corresponding state of mind in the mere English student: and consequently their equivalents in terms of Saxon origin must be given. In the progress of these lessons you will be led to study the constituent elements of all our compound words. Here I wish to dwell on the fact, that the vocabulary of the English language consists generally of words derived—1, from the Saxon; 2, from the Latin.

In order to possess a full and exact acquaintance with the Saxon treasure of our language, you must study that language historically; you must study it in its literature; and you must study the Anglo-Saxon in its productions, and in the laws of its structure. Apart from so prolonged a labour, you may here learn something on the subject, and at any rate acquire information which, in general, will enable you to distinguish and recognise words which come from a Saxon source. I lay before you some results of the investigations made by the learned on this subject.

The English language consists of about 33,000 words. Of these, about 28,000, or nearly five-eighths, are of Anglo-Saxon origin. The majority of the rest are Latin and Greek; of which the former has the larger share. If we look not merely to the number of words, but to their kind, as well as to the share that Anglo-Saxon has had in the formation of our language, we shall see how important is this element of the English tongue.

1. English grammar is almost exclusively occupied with what is of Anglo-Saxon origin. Our chief peculiarities of structure and of idiom are essentially Anglo-Saxon, while almost all the classes of words which it is the office of grammar to investigate, are derived from that language. What few inflections we have are all Anglo-Saxon. The English genitive, the general modes of forming the plural of nouns, and the terminations by which we express the comparative and superlative of adjectives, *er* and *est*; the inflections of the pronouns; of the second and third persons, present and imperfect of the verbs; of the preterites and participles of the verbs, whether regular or irregular; and

the most frequent termination of our adverbs (*ly*), are all Anglo-Saxon. The nouns, too, derived from Latin and Greek, receive the Anglo-Saxon terminations of the genitive and the plural; while the preterites and participles of verbs derived from the same sources, take the Anglo-Saxon inflections. As to the parts of speech, those which occur most frequently and are individually of most importance, are almost exclusively Saxon. Such are our articles and definitives generally, as *a, an, the, this, that, these, those, many, few, some, one, none*; the adjectives whose comparatives and superlatives are irregularly formed, and which in every language are amongst the most ancient, comprehensive in meaning, and extensively used; the separate words *more* and *most* by which we as often express the forms of comparison as by distinct terminations; all our pronouns, personal, possessive, relative, and interrogative; nearly every one of our so-called irregular verbs, including all "the auxiliaries" *have, be, shall, will, may, can, must*; all the adverbs most frequently employed; and the prepositions and conjunctions almost without exception.

2. The names of the greater part of the objects of sense—in other words, the terms which occur most frequently in discourse, or which recall the most vivid conceptions—are Anglo-Saxon. Thus, for example, the names of the most striking objects in visible nature, of the chief agencies at work there, and of the changes which pass over it, are Anglo-Saxon. This language has given names to the heavenly bodies, *sun, moon, stars*; to three out of the four elements, *earth, fire, water*; three out of the four seasons, *spring, summer, winter*; the natural divisions of time, as *day, night, morning, evening, twilight, noon, midday, midnight, sunrise, sunset*; some of which are amongst the most poetical terms we have. To the same language we are indebted for the names of *light, heat, cold, frost, rain, snow, hail, sleet, thunder, lightning*; as well as of almost all those objects which form the component parts of the beautiful in external scenery, as *sea and land, hill and dale, wood and stream*. The same may be said of all those productions of the animal and vegetable kingdoms which form the most frequent subjects of observation or discourse, or which are invested with the most pleasing and poetic associations: of the constituent parts or visible qualities of organised or unorganised beings, especially of the members of the human body and of the larger animals. Anglo-Saxon has also furnished us with that numerous and always vivid class of words, which denote the cries, postures, and motions of animated existence. These are amongst the most energetic that any language can supply: for the same reason that words expressive of individual objects are always stronger than general terms. It is a sound and universal maxim of rhetoric, that the more abstract the term is, the less vivid; the more special, the more vivid is the impression. Now, almost all the words which are expressive of these specialities of posture and bodily action, are the purest Saxon; such as, *to sit, stand, lie, run, walk, leap, stagger, slip, slide, stride, glide, yawn, gape, wink, thrust, fly, swim, creep, crawl, spring, spurn*. If all this be true, we need not be surprised at the fact that, in the descriptions of external Nature, whether by prose writers or by poets, the most energetic and graphic terms are almost universally Anglo-Saxon. It is a little matter of wonder that in those simple narratives in which genius and wisdom attempt the most difficult of all tasks—that of teaching philosophy without the forms of it, and of exhibiting general truths in facts and examples, leaving the inferences to be drawn by the instinctive sagacity of human nature—the terms are often, almost without exception, Anglo-Saxon. It is thus with the narratives of the Old Testament—the history of Joseph, for instance—and with the parables of the New Testament, perhaps the only compositions in the world that can be translated without losing much in the process, and which, into whatever language translated, at once assume a most idiomatic dress. The same remark holds good to a certain extent of "Robinson Crusoe," "The Vicar of Wakefield," and other works in which the bulk of the words are pure Anglo-Saxon.

3. It is from this language we derive the words which are expressive of the earliest and dearest connections, and the strongest and most powerful feelings of our nature; and which are, consequently, invested with our oldest and most complicated associations; their very sound is often a spell for the orator and the poet to conjure withal. It is this language which has given us our names for *husband, wife, brother, sister, son, daughter, child, home, kindred, friends*. It is this also which has fur-

nished us with the greater part of those metonymies and other figurative expressions, by which we represent to the imagination, and that in a simple word, the reciprocal duties and enjoyments of hospitality, friendship, or love. Such are *hearth, roof, fireside*. The chief emotions, too, of which we are susceptible, are expressed in the same language, as *love, hope, fear, sorrow, shame*; and what is of more consequence to the orator and the poet, as well as in common life, the outward signs by which emotion is indicated, are almost all Anglo-Saxon; such are *tear, smile, blush, laugh, weep, sigh, groan*.

4. Most of those objects about which the practical reason of man is employed in common life, receive their names from the Anglo-Saxon. It is the language for the most part of business, of the counting-house, the shop, the market, the street, the farm.

5. Anglo-Saxon, also, are nearly all our national proverbs, in which, it is truly said, so much of the practical wisdom of a nation resides, and which constitute the manual or *code-mecum* ("go with me;" that is, the pocket-book, or note-book) of "hob-nailed philosophy."

6. A large proportion (and that always the strongest) of the language of *invective, humour, satire, and colloquial pleasantries*, is Anglo-Saxon; also all the terms and phrases by which we most energetically express *anger, contempt, and indignation*.

VII. It may be stated, as a general truth, that while our most abstract and general terms are derived from the Latin, those which denote the special varieties of objects, qualities, and words of action, are derived from the Anglo-Saxon. Thus, *move* and *motion*, very general terms, are of Latin origin; but those terms which express nice varieties of bodily action, are Anglo-Saxon. *Sound* is perhaps Latin, though it may be Anglo-Saxon; but *buzz, hum, clash, hiss, rattle*, etc., are Anglo-Saxon. *Colour* is Latin; but *white, black, green, yellow, blue, red, brown*, are Anglo-Saxon. *Crime* is Latin; but *murder, theft, robbery, lie, steal*, are Anglo-Saxon. *Member* and *organ*, as applied to the body, are Latin and Greek; but *car, eye, hand, foot, lip, mouth, teeth, hair, finger, nostril*, are Anglo-Saxon. *Animal* is Latin; but *man, cow, sheep, calf, cat*, are Anglo-Saxon. *Number* is immediately French, remotely Latin; but all our cardinal and ordinal numbers are Anglo-Saxon.

With these facts before us we need not wonder that the orator and the poet are recommended to cultivate assiduously the Anglo-Saxon portion of the language. "The common people," it is said, "cannot understand words which are of classical origin." And this is a good reason for the advice. But it is not the only reason. The great object of the orator and the poet is to make their meaning felt; to stimulate the imagination, and thence excite emotion. They therefore seek the most special terms they can find. Again, the terms which *cæteris paribus* (two Latin words meaning "other things being equal") most vividly recall the objects or feelings they represent, are those which have been earliest, longest, and most frequently used, which are consequently covered with the strongest associations, the sign and the thing signified having become so inseparably blended that the one is never suggested without the other. And thus it is that of two synonymes (words having nearly the same meaning) derived respectively from Latin and the Anglo-Saxon, both equally well understood, the one shall impart the most vivid, and the other the most tame conception of the meaning. It is precisely for the same reason that the feelings with which we read beautiful passages in foreign poets are so faint and languid, compared with those which are excited by parallel passages in Shakspeare, Milton, or Burns.

When our readers meet with any word that they do not understand in the course of a lesson, it will be good practice for them to write it down at once and turn to an English dictionary for its meaning. If possible, the dictionary used should be an "Etymological Dictionary," that is, one which shows the sources, whether Latin, Greek, French, or otherwise, from which English words are derived. We append an example of the plan that may be adopted in tabulating words that are difficult to understand at first sight in the following, which are selected from this page:—

WORD.	MEANING.	DERIVATION.
Comprehensive.	Extensive, full.	Latin, <i>com</i> , with; <i>prehensus</i> , caught, or laid hold of.
Graphic.	Describing clearly.	Greek, <i>graphō</i> , I write.
Stimulate.	Rouse, excite.	Greek, <i>stizō</i> , I prick or goad.
Narrative.	Tale, story.	Latin, <i>narrō</i> , I relate.

LESSONS IN GEOGRAPHY.—V.

THE GEOGRAPHICAL DISCOVERIES OF THE SIXTEENTH AND SEVENTEENTH CENTURIES.

THE new information gained by the Old World through the discovery of America, and the voyage of Vasco de Gama, required a long period for its proper regulation and systematic arrangement. The ignorance which still prevailed among the ablest navigators and geographers, at the end of the fifteenth century, was such that when Christopher Columbus, in his third voyage, discovered the mainland of America, the violence of the billows, and the agitation of the sea at the mouth of the Orinoco, led him to believe that he was in the highest part of the globe, and consequently in the regions of Paradise! But the discovery of the New World revived and re-invigorated the desire for voyages to the north, and set them on a better footing. It appears, indeed, that previous to his grand discovery, Columbus had himself performed a voyage in the northern seas, and had even visited Iceland. This voyage, according to a note of the event found in his own handwriting, took place in 1467.

John and Sebastian Cabot, who were employed in the expedition by Henry VII. of England, discovered Labrador, as we have shown in our last lesson, and are said to have visited the island of Newfoundland, and sailed along a considerable extent of the coast of North America. France, desirous of having her share of the spoil, fitted out an expedition under Jacques Cartier, who sailed from Dieppe in 1534; discovered Canada, and took possession of it in the name of his government. The grand object of these voyages in the northern seas, was the discovery of a north-west passage to India. The question of a communication between the two great oceans at the north, occupied the minds of geographers and navigators at that period, as much as it has done in the present century. How singular that this infatuation has so much occupied the public mind! Even on the supposition that such a passage really existed, and had been actually discovered, and put in evidence by the reappearance of Franklin in Europe from the East, of what use would such a frightful and dangerous passage be to the mercantile interests of the world? Surely it would still be better to pursue the ordinary route to India, either by sea or land, than to run the danger and risk of losing ships, property, and men, by sailing through floating mountains of ice, unknown rocks, and uninhabited and inhospitable coasts.

The voyage of Willoughby in 1553, although it ended in a sad shipwreck on the eastern coast of Lapland, added to geographical knowledge, by the discovery of Nova Zembla. Frobisher, under Queen Elizabeth, was more fortunate; his three voyages, performed between 1576 and 1578, ended in some discoveries, among which was the strait which bears his name, situated between Hudson Strait and Cumberland Sound. John Davis, in the same reign, in his exploratory voyages performed in 1585, 1586, and 1587, threw a clearer light on the geography of the circumpolar regions of the north. In 1596 the Dutch discovered Spitzbergen; and eleven years afterwards it was re-discovered by Hudson, who made four voyages, from 1607 to 1611, in order to find the passage to India either across the pole itself or to the north-west. In the fourth, he discovered the bay which bears his name. In the following year Thomas Button, penetrating into this northern Mediterranean Sea, reached the mouth of the river Nelson. William Baffin enjoyed still greater success. In his second exploratory voyage, in 1616, he successively discovered and gave name to the following places in the arctic regions:—Cape Dudley Digges, in latitude 76° 35' N.; Wolstenholme Bay; the Bay of Whales, in latitude 77° 30' N.; Hakluyt Island; Smith Bay, so called from Sir Thomas Smith, in latitude 78° N.; the Carey Islands, and Lancaster Sound. In this expedition, he explored the bay

which has immortalised his name, and determined the geographical position of a great number of points.

During the sixteenth century, while discoveries were multiplied and expeditions became fruitful and productive, geographical science still remained in its infantile state, and as yet received little advantage from their progress. Light was breaking in upon all sides, but this science was immersed in darkness. A glance at the curious maps which preceded the glorious era of the Reformation, will show how profound was the ignorance of the geographers of that period. Our readers will find a good specimen of one of these maps in the fac-simile of the map of Africa belonging to the pilot of Christopher Columbus. In such maps of the world, the principal cities are denoted by little houses or churches roughly sketched; Jerusalem occupies the centre of the globe; the supposed site of Paradise is surrounded with an impenetrable enclosure of verdant foliage; and the geographical illustrations are the most whimsical that can be imagined. The winds are represented by fabulous divinities, as sitting all round the world upon leathern bottles, whose sides they are pressing to force out the air; Western Africa is made to terminate at Cape Nun, then at Cape Bojador; the celebrated statue of the Canaries is seen flourishing his club at the top of a high tower; the coasts of the adjacent continent



SHIPS OF COLUMBUS.
From an old Print.

are lengthened in proportion to the discoveries of the Portuguese; Abyssinia figures with its monarch Prester John, having on his head a brilliant mitre; the other kingdoms of Africa are denoted by their kings in costumes, enriched with gold and silver embroidery; this continent, so long unknown, is represented as peopled with strange animals and black men; there are groups of giraffes and elephants; Portuguese camps are indicated by coloured tents; and light cavalry, splendidly caparisoned, are making the tour of this mysterious continent. In short, these specimens of cartographical art are the faithful expression of the science of the Middle Ages. The pilot's map, already alluded to, will furnish the reader with examples of the preceding details.

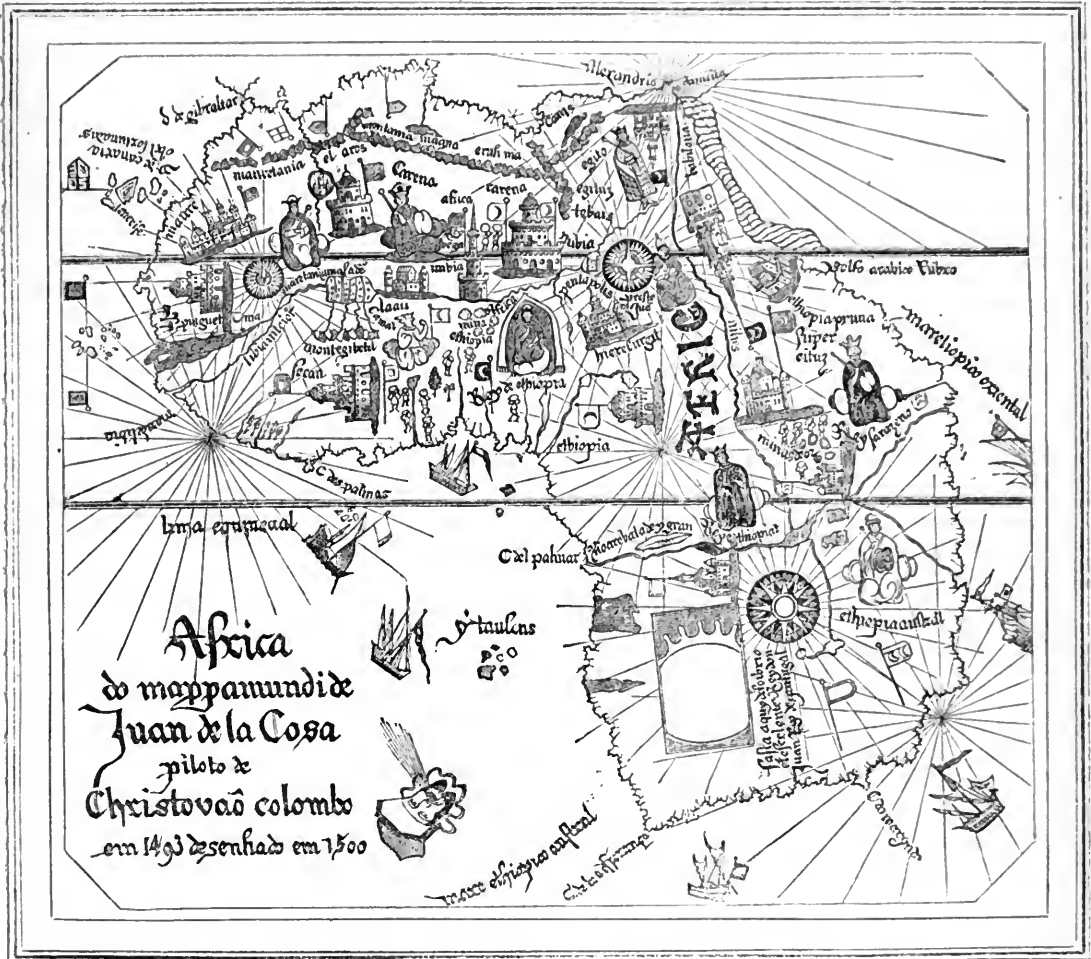
The period preceding the Reformation was the era of legendary and popular tales, and geography had its fabulous age as well as its antiquity; only the fantastic notions of the Middle Ages were less marked by ingenuity and variety. Prester John has been mentioned. This was one of their most widely-spread myths. The name of this personage first appeared about the middle of the twelfth century. It was the general and popular belief that there existed a pontifical prince called John, who governed vast countries situated beyond Armenia and Persia. It was asserted that he professed that form of Christianity called Nestorianism. Ere long he was transported to Abyssinia, where he ruled during three or four centuries! He was as rich as he was powerful, and as formidable to his enemies as he was dear to his subjects. In Asia or in Africa there was always a formidable monarch, dwelling in a world of prodigies, over which he reigned as omnipotent master!

The vain tradition of El Dorado, or the Land of Gold, was no less believed at the period under review. This fiction, which travelled to America under the name which has given celebrity to it, in the first half of the sixteenth century, was applied to a country that previously existed only in the imagination of the inhabitants of Europe. Although its true name is lost, it was at last placed in the New World, in the country of Santa Fé, in those regions of South America watered by the mighty streams of the Amazons, and which were scarcely known to Europeans. The name El Dorado sufficiently indicates the nature of the imaginary country to which it was applied. It was the country of riches; there were to be seen cities glittering with gold; there, so common was this metal, that it was used even in the most common household utensils. How unfortunate for ages were the adventurers in search of this golden dream! How many victims have been deceived by this dangerous tradition!

Is this El Dorado to be at last realised in our own day? Are California and Australia to give actual existence to the fables of the Middle Ages? Modern appliances are great; chemistry and geology have done wonders; and human industry has encountered what at the beginning of the present century were deemed impossibilities. But let us not be too sanguine now as to the realities of our colonial possessions. Even gold itself may become a drug; and how sad that state of society would be when this most precious of metals, having made all equally rich, would fail to purchase that human labour from which our comforts flow!

There has been also the fable of the kingdom of Paititi, a sort of counterpart of El Dorado, another garden of the

memory of the Devonshire knight, Sir Walter Raleigh, who introduced the potato and tobacco into England in the reign of Queen Elizabeth. Raleigh was one of her most favourite courtiers, and took an active part in the destruction of the Spanish Armada in 1588. From this time until the death of Elizabeth he was employed in various expeditions against the Spaniards, and in 1595 he sailed to Guiana, and destroyed the capital of Trinidad. The island of Trinidad lies like a huge breakwater across the mouth of the Gulf of Para, and in the south-west corner of this Gulf is the Bay of Guanipa, into which flows the river of the Red Cross, the stream that bounds the western side of the great delta of the Orinoco. Leaving his vessel in the Bay of Guanipa, Raleigh made his way in a canoe up this river



FAC-SIMILE OF A MAP OF AFRICA WHICH BELONGED TO JUAN DE LA COSA, THE PILOT OF CHRISTOPHER COLUMBUS.

Hesperides, where inexhaustible treasures awaited the happy mortal sufficiently well instructed to follow the track. This kingdom or empire was supposed to be situated in the fertile plains of the Maranon, and to have been founded by the Incas of Peru, whose descendants knew how to conceal them from the view of the Spaniards by powerful enchantments! By degrees this myth was embellished with a thousand wonders, and the Catholic missionaries themselves contributed not a little to propagate the conviction that this imaginary kingdom was a reality. This state of things continued even in the second half of the seventeenth century. The close of the Middle Ages, therefore, had its mythical or fabulous geography, notwithstanding the real and ultimate progress made by the voyages of discovery. True science had not yet made its appearance.

The name "El Dorado" is intimately associated with the

as far as the main channel of the Orinoco, and at last reached the point where it is joined by the river Caroni. In the angle formed by the east bank of the Caroni and the south bank of the Orinoco, at the extremity of the Mountains of Emerica, a mountain range stretching from east to west, from British Guiana into the interior, lies a hilly tract of country, now the Venezuelan province of Arima, and here Sir Walter Raleigh placed his "Land of Gold," and declared that gold mines existed there in which more wealth lay buried than in any other part of the world. In 1615 he sailed to Guiana once more, in an expedition to reach these mines. The expedition was a failure; he returned home to meet his fate; and men said that the mines and their contents existed only in Raleigh's imagination. But subsequent discoveries have proved that Raleigh was right in saying that there was gold in Guiana, if not in such immense quantities as he supposed, for, at the present time, in the pro-

vine of Arromaia, the very spot where Raleigh placed his "El Dorado," not far from the town of Puerto, on the Orinoco, is a colony of 10,000 Germans, who are chiefly employed in digging gold, and who send large quantities yearly to Para, on the coast, for exportation to Europe.

The fifteenth century having closed with the two greatest geographical events of modern times, the discovery of the New World, and the circumnavigation of the African continent, the sixteenth century beheld the extension and success of European enterprise in distant seas. The Pacific Ocean, which Magellan had opened up to the fleets of Christendom, was navigated and explored by daring mariners. Soarez discovered the Maldivo Islands; another Portuguese, the Moluccas or Spice Islands; Villalobos, a group now supposed to make part of the Philippino Islands; Juan Fernandez, the small island that bears his name, and celebrated as the foundation of the history of "Robinson Crusoe." To the latter, also, has been ascribed the discovery of New Zealand. In 1567 Alvaro de Mendana first landed on the Solomon Isles, the Isle of Santa Cruz, and others. Nearly thirty years later the same navigator discovered the Marquesas Islands, and the archipelago which was afterwards called by Carteret Queen Charlotte's Islands. Francis Drake, the Dutchman Van Noort; Quiros, who discovered Tahiti, and the Archipelago of the New Hebrides (the Great Cyclades of Bougainville); Torres, who discovered New Guinea, and the strait which separates this large island from Australia—all began to clear up the navigation of the Pacific Ocean. In the interval, Sebald de Weert, fellow-navigator with Van Noort, had recognised the Malouines, or Falkland Islands, discovered by John Davis. Two of his countrymen, Lemaire and Schouten, discovered, in 1615, part of the island of Tierra del Fuego, and Cape Horn, which forms the southern extremity of the American continent. A new passage was thenceforward open to navigators bound for the Pacific Ocean, who were desirous of avoiding the difficulties and storms which were to be dreaded in the Strait of Magellan. The honour of having first landed on New Holland, now called Australia, is generally attributed to Dirk Hartog, who attached to the part of this continent, which he had discovered, the name of the vessel he commanded, by calling it *Endracht's Land*. Zeachen, in 1618; Edels, in 1619; De Nuyts, in 1627; and after these De Witt, Carpenter, and Pelsart completed this grand discovery.

It is not positively known whether the Spanish and the Portuguese had not visited the coasts of Australia nearly a century before the Dutch, as two cartographical documents of that date would lead us to believe. Neither is it more certain that the Portuguese Menezes and the Spaniard Saavedra had discovered New Guinea, the one in 1527, and the other in the following year. The memorable voyage of Abel Tasman produced rapid and striking progress in the geography of Oceania, or Australasia and Polynesia. This able navigator, sailing from Batavia in 1642, discovered Van Diemen's Land, now called, after its discoverer, Tasmania. The circumnavigation of Australia was then completed, and the assurance was gained that this continent did not extend indefinitely towards the south pole. Shortly after, the expedition landed on New Zealand; then it discovered the Friendly Islands, and that of Tongataboo. Lastly, after a successful expedition of nine months, at the end of which it visited New Guinea, and discovered several islands to the north of it and of the island of New Britain, the Dutch refitted their vessels in the port of Batavia, the capital of Java. It was only in 1665 that the name of *Nova Hollandia*, or New Holland, was given to the western part of Australia by a decree of the States-General of the parent country.

LESSONS IN LATIN.—V.

NOUNS—CONCORD OF SUBSTANTIVE AND ADJECTIVE—CASES OF NOUNS—CASE-ENDINGS.

By the statements and explanations given in our last lesson, you are taught that in both nouns and adjectives, *case, number, and gender* are in Latin indicated by divers terminations. It is an easy inference that if a change is made to turn a *singular* noun into a *plural* form, a corresponding change must be made in the adjective which accompanies it; that is to say, if the noun is *plural*, the adjective must be *plural*; if the noun is *singular*, the adjective must be *singular*: thus, *bonus puer* becomes in the

plural *boni pueri*. In the ordinary phraseology of Latin grammars, this correspondence in form between the noun and the adjective is called *concord*. Here you are to consider the *first concord* to require that the noun and adjective should agree in number, that is, both must in form be either *singular* or *plural*, and not one *singular* while the other is *plural*. A *second concord* requires the noun and the adjective to be in the same *gender*, so that if you have to say *good bridegroom*, you use the words, *bonus sponsus*, but if you wish to speak of a *good bride*, you change the *us* into *a*, and say *bona sponsa*. A *third concord* is found in agreement in *case* between the adjective and noun, so that if the noun is in the *nominative* case, the adjective must be in the *nominative* case; if the noun is in the *objective* or *accusative* case, in the same case must the adjective be. Putting these three instances of *concord* or agreement together, we say that—

Adjectives must agree with their substantives in GENDER, NUMBER, and CASE.

This general statement we call a *rule*; and all such general statements or rules you should commit to memory. *Case*, you see, is denoted by a change at the end of a noun or adjective. In our English nouns we have something of a similar nature. In the words, *father's book*, *father's* is in what is called the *possessive* case. The condition of the noun is called the *possessive* case, because possession is thereby signified. But why is it called *case*? *Case* is a Latin term, signifying *fall*. And as the different terminations are *gone down* successively, as you will shortly learn by experience—*gone down* or *declined* one after the other, on the part of the boys who learnt grammar in the schools—so were those terminations called *cases*, or successive *falls*, that is, *falls of the voice*. The cases then in Latin are the changes which the noun undergoes conformably to *variations* in the meaning. Thus, as in English *father* becomes *father's* when used with book, as *father's book*, so in Latin, *pater* (*father*) becomes *patris*, when used in dependence on *liber*, book. Notice that I say, "when used in dependence;" for the *possessive* (or *genitive*) case denotes connection or dependence. In *father's book*, the form *father's* is necessitated by the dependence of the word on *book*. Such dependence is denoted in the diction of Latin grammars by the word *government*: thus, we should say that *patris* was governed in the genitive case by the word *liber*. Here again arises a general statement or rule; namely, that—

One noun governs another in the genitive case.

This rule simply means that of two nouns which are connected with each other by a relation of dependence, the noun which is dependent on the other noun must be put in the *genitive* (or *possessive*) case.

In Latin there are *six* cases: 1, the *nominative*; 2, the *genitive*; 3, the *dative*; 4, the *accusative*; 5, the *vocative*; 6, the *ablative*. These *six* cases are different *forms* of the noun, whereby are indicated differences of meaning. The *nominative* corresponds to the *subject*, and the *accusative* corresponds to the *object*, of a proposition. You may find the *nominative* by asking the question *who?* or *what?* You may find the *accusative* by asking the question *whom?* or *what?* You may ascertain the *genitive* by asking the question *whose?* You may ascertain the *dative* by asking the question *whom?* or *for what?* You may ascertain the *ablative* by asking the question *by whom?* or *by what?* The *vocative* is preceded by the interjection *O!* as *O father!* and is employed in addresses or invocations. In strictness of speech the *nominative* can hardly be termed a case, because as the nouns are commonly given in dictionaries, it seems to have no *fall* or *case*. The *nominative*, however, is a case, for it is not the *primitive* state of the noun. The *primitive* state of the noun, as the *primitive* state of the verb, is found in the *stem*. Thus, the stem or form on which the cases of *pater* are formed is *patr*: by inserting *e*, the stem *patr* becomes *pater*, the *nominative* case.

Requesting you to call these changes in the terminations of nouns and adjectives *case-endings*, I add that these *case-endings* are to be termed the Latin *signs of the cases*. For these Latin signs there are corresponding English signs; the English signs give (in part) the meaning of the Latin signs. Thus, *of* is the English sign and meaning of the Latin genitive *i*; *to* or *for* is the English sign and meaning of the Latin dative *o*; *by*, *with*, or *from*, is the English sign and meaning of the ablative *o*. Now as in Latin the *o* of the dative is not in form distinguished

from the *o* of the ablative case, some difficulty arises in reading Latin. This difficulty grows less by practice, and eventually disappears, for the sense points out in each instance whether the dative or the ablative case is the case intended by the author. Something similar exists in English; for since, as I have shown you previously, the nominative and the objective, or the subject and the object, are in our nouns the *same in form*, we learn only by the sense which of the two is meant. With us, however, there is no difficulty, because the sense is determined by the position, for in English, in general, the subject *precedes*, the object *follows*, the verb. Inasmuch, however, as the subject in English undergoes no change in becoming the object, and inasmuch as no preposition goes before either subject or object, so have we no natural English sign for the Latin *nominative* or the Latin *accusative*, and consequently are forced to indicate the former by the word *subject*, and the latter by the word *object*. Finally, the English sign of the *vocative* is *O*; the corresponding Latin sign is in some nouns *e*, in others the form in the *vocative* is the *same* as the form in the *nominative*. Having given these explanations, I place under your eye at once the *case-endings* of a noun in Latin, with the corresponding English signs:—

Cases.	LATIN CASE-ENDINGS.	ENGLISH SIGNS.	LATIN CASE-ENDINGS.	ENGLISH SIGNS.
	Singular.	(subject)	Plural.	(subject)
Nominative	us	(subject)	i	(subject)
Genitive	i	of	orum	of
Dative	o	to or for	is	to or for
Accusative	um	(object)	os	(object)
Vocative	e	O	i	O
Ablative	o	by, with, or from	is	by, with, or from.

You thus see that in Latin the *case-endings* of the singular are different from the *case-endings* of the plural. You also see that the English signs are the same in both *singular* and *plural*. For the sake of comparison, we commonly use a contraction for the names of the cases; thus, *N.* or *Nom.* for *nominative*, *G.* or *Gen.* for *genitive*, and so on with the rest. The *case-endings* which I have just set before you are not the *case-endings* of all the Latin nouns. I have given these because they are the most distinct. Others, however, must not be omitted. I will exhibit them to you first in succession, and then the whole combined in one view. In order to do so, I must set before you what are called the *declensions*. The *declensions*, or *methods* in which the *falls* of the *cases* take place, are *five* in number. To express the same thing differently, in order to assist you in understanding what I mean, I add that all the Latin nouns have by grammarians been arranged into *five classes*. In this classification regard has been had to the termination of the *genitive case singular*. Thus, in the *first declension* the *genitive case* of the *singular number* ends in *a* diphthong, pronounced like our *ee*; in the *second declension* the *genitive* ends in *i*; in the *third*, in *is*; in the *fourth*, in *us*; in the *fifth*, in *ei*, pronounced *e-i*. These endings are termed the signs of the *declensions*, and may be thus presented:—

Declensions	1st	2nd	3rd	4th	5th
Signs	a	i	is	us	ei

The sign of the *fourth declension* has a circumflex accent (Λ) over it, in order to distinguish it from other cases, namely, the *nominative us*, and the *accusative us*. In the same way, over the *ablative case* of the first declension, we put a circumflex accent thus, \hat{a} , as in *femina*—*by, with, or from a female*—in order to distinguish the *ablative case* or form from the *nominative femina*, a female. You may here be informed that adjectives are for the most part declined—that is, form their cases—in the same manner as the nouns which correspond with them in form; for instance, *bonus*, ending in *us*, is declined like *dominus*, which also ends in *us*; and *bona*, ending in *a*, is declined like *femina*, which also ends in *a*.

A preliminary remark must be made respecting the *article*. The Latin language is *without an article*. Neither the definite article *the*, nor the indefinite article *an*, is found in Latin. Consequently, we cannot from the form tell whether *femina* should be translated *female*, a female, or *the female*. In this particular there is, in construing or translating from the Latin, no other guide than the sense as it may be gathered from the general import of the sentence or the narrative: and you will also now be aware that *female*, a female, and *the female*, are equally to be put into Latin by *femina*.

OUR HOLIDAY.

GYMNASTICS.—III.

JUMPING AND LEAPING.

THESE exercises, in their various forms, constitute an important feature in gymnastic pursuits; and, simple as they may appear to many, really require skill and practice for the attainment of a tolerable degree of proficiency, without injury to the physical powers. There is a *method* in the way of doing all things, by which comparative ease and safety may be secured, and it will be our object to explain what is the best method in this case for the practice of the learner.

1. Before the attempt is made to accomplish any *feats*, it will be necessary to go through certain preparatory exercises, which will accustom you to the proper movements, and give the required degree of elasticity to the limbs. Begin all jumping exercises by the upward jump from the ground, which is to be performed in the following manner:—Stand in an erect position, with the arms hanging downward; bend the knees forward and rise slightly upon the toes; then spring upward to a moderate height, and alight upon the balls of the feet—not upon the heels, for this will give a concussion to the joints; also bend the knees slightly on coming down, which will help to break the force of the shock. In practising all jumping exercises the learner should remember these fundamental principles.

In the foregoing exercise the arms may either be kept straight to the body, or with the hands resting on the hips, or, thirdly, thrown forward and upward when the jump is taken. The learner will do well to practise each of these ways in turn; the last will be useful in giving additional impetus when the height or distance of the jump is an object.

2. Make the same jump, but, in the descent, face to the right; the next time, face to the left; and the next, turn the body completely round when in the act of jumping, so as to come to the ground with the face turned in the opposite direction to that in which it had been before making the jump.

3. In taking the jump, stretch the legs out sideways on rising from the ground, and extend the arms high above the head.

4. Another useful jump to practise is that shown in our first illustration (Fig. 9). Bring the feet back to their original position while in the air, and extend the arms at the same time. It will require some dexterity to enable the learner to cross and to *uncross* the legs before descending, so as to bring the feet back to the ground with the heels touching, but this will come in due time with regular practice.

Other jumps of a similar nature to the foregoing may be practised. To exhaust the list of such variations would require a special paper, but these will suggest others.

We have touched at present only on jumping movements, designed to practise the muscles, which will be employed in exercises of a higher order. We pass on now to these, which may more properly be called *leaping*.

THE HIGH LEAP.

This should be practised with the aid of a leaping-stand (see Fig. 10). It consists of two poles, about six or seven feet high, and perforated with holes from one to two inches apart; these holes commencing about a foot and a half from the bottom, and continuing upward to the top, or near it. The poles are fixed in the ground at from six to eight feet from each other. Two movable pegs are inserted into the holes at the desired height for the leap, and across these pegs a rope is then stretched, the rope being kept in position by the weight of a small sand-bag at each end; or a stick may be used instead of the rope to rest upon the pegs, but the rope is preferable for the beginner. While it fixes the height as well as any solid object would do so, it gives way at once to the slightest touch of the feet in passing over, and thus saves the leaper from a heavy fall, should he fail to clear the object. A piece of coloured cloth may be placed over the centre of the rope, more particularly to mark the spot over which the leap is to be made, as well as to show, by its displacement or otherwise, whether the object has been grazed in the passage over it.

Now, with this apparatus before you, commence leaping over a height which you can accomplish with ease; and then gradually raise the pegs and the rope from hole to hole, as you increase in power and dexterity.

The leaping may be practised either from the standing position, or with a previous run of a few paces. In performing the standing leap, let the preliminary movements be as described in the first jumping exercise; at the moment of passing over, throw the head and the arms well forward, and be careful to alight according to the instructions which have been already given.

A short run before the leap gives some impetus to the leaper to attain a greater height. Practise a run of two or three paces at first, and afterwards of six to eight paces, which is quite as much as should be taken. Let the rise into the air take place, as nearly as possible, at a distance from the poles equal to about half the height of the rope from the ground. Practise the upward spring, according to the directions given in our introductory remarks on "Jumping and Leaping," from either the right or the left foot, or from both, until you can leap equally well either way. About four feet high is an average leap; five feet is very good; and for a man to leap his own height is considered the perfection of proficiency in athletic pastime.

THE LONG LEAP.

In practising this leap, go gradually, as



Fig. 11.

before, from distances which can be accomplished with ease, to lengths which test all your powers. The distances should be indicated on the ground by chalk marks, or otherwise. Spring, as before, from the balls of the toes, and incline the body forward; but do not jump too high, for this will diminish the distance. At the same time a moderate height will be necessary in the spring, or you will not be able to clear so much ground. In a long leap without a run, eight or ten feet is very good. With a run of about twelve paces, five or six feet more may be accomplished without much difficulty.

The downward leap may be practised with advantage, but a leap from a height of more than six feet should not be attempted by the beginner. The proficient may accomplish ten or twelve feet with safety. In this, as in all other leaps, remember the elementary rule—to alight on the balls of the feet, and to bend the knees on alighting, to break the force of concussion with the ground.

Vaulting is another kind of leap, in which the hands are momentarily rested on some firm object, over which the body passes. Vaulting-horses, or blocks of wood roughly shaped like the body of a horse, are sometimes employed for this purpose; or the same end may be served by a piece of stout timber transversely placed on two supports fixed firmly in the ground. This exercise is of use in enabling the gymnast to clear any obstacle, such as a gate or stile, that he may meet when walking in the country, with ease and quickness.

LEAPING WITH THE POLE.

The pole used for this purpose should be of stout but light wood, from seven to ten feet long, and about an inch and a half in thickness. It should be pointed at one end, and the point shod with iron, to secure a firmer hold of the ground. With an implement thus fashioned, both long and high leaps may be accomplished in a light and graceful manner, and without the amount of physical exertion necessary without such an appliance. But proficiency in the exercise requires a *knack*, which can only be attained by practice.

In the moderate leaps which are best suited to the practice of the learner, the pole should be held in the manner represented in the illustration (Fig. 11), the left hand being placed below, and the right hand above. The position of the body in this cut is that assumed at the moment before taking the spring; the pole having previously been planted at a convenient distance in front of the leaper. Now rock the right leg once or twice, and, by a spring from the ball of the left foot, impel the body forward beyond the pole to the spot it is desired to reach. In the performance of the leap the body takes the position shown in Fig. 12. It is necessary to the proper execution of the

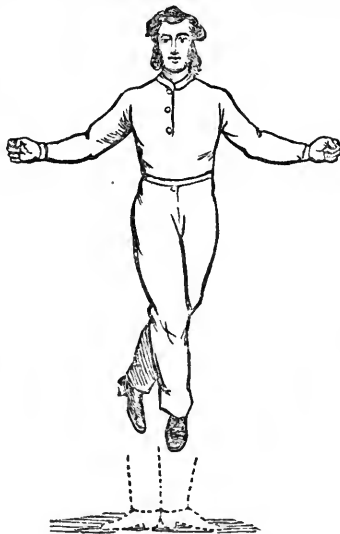


Fig. 9.



Fig. 12.

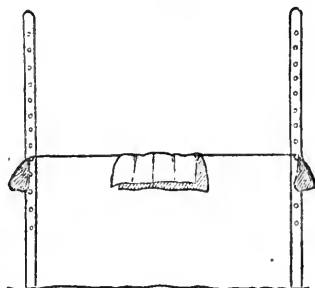


Fig. 10.

leap that the original starting-point, the spot on which the pole is rested before leaping, and the position which is attained by the leap, should all be in a straight line with each other.

In performing longer leaps, when some degree of familiarity with the use of the pole is acquired, it is desirable to place the hands nearer to each other than is shown

in these engravings; the precise height at which the pole should be grasped depending on the leap to be performed, and the amount of assistance required from the pole by the leaper.

High leaps with the pole should be practised with great care, and only in successive gradations from a point that may be leaped by the beginner with ease. They should not be tried, indeed, until the learner is familiar with the use of the pole in the long leap, and has acquired confidence in his own power to employ the implement with advantage.

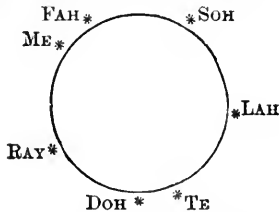
In the high leaps it is necessary that the pole should be held with both hands higher than the rope or bar it is intended to leap over; and at the moment when the body is passing over the rope, the hold upon the pole must be relinquished, and the pole pushed backward by a slight movement of the uppermost hand, so that it may not fall upon the leaper. A failure of nerve or confidence in passing over the rope will do more than anything else to prevent success in the movement. It is especially needful in these leaps to bend the knees on reaching the ground, as before explained.

LESSONS IN MUSIC.—III.

IN order to fix in the memory yet more distinctly the real structure of the scale, it may be well to notice that it is divisible into two similar sets of four notes, each set including two tones, crowned by a tonule. These sets of four notes have been called TETRACHORDS. If the replicate of the key-note is included, you will have DOH, RAY, ME, FAH for the first tetrachord, and SOH, LA, TE, DOH¹ for the second. These are called *disjunct* tetrachords, because the tone between FAH and SOH separates them. If the key-note is made the highest note of the one and the lowest of the other tetrachord, SOH, LAH, TE, DOH, will form the first, and DOH (repeated), RAY, ME, FAH, the second. These are called *conjunct* tetrachords, because they are joined in the key-note. Take coins or counters to represent the notes, and arrange them on the table, first with the disjunct, and then with the conjunct tetrachords—thus:—



Learn to do this *from memory*, and, having done it, to *name* the notes you have arranged. Some scale-makers, beginning upon RAY and ascending to the upper RAY¹, suppose they have got hold of a different scale, because the tonules (semi-tones) are between the second and third and sixth and seventh notes from RAY, while they were between the third and fourth and seventh and eighth from DOH¹! In the same way, they begin upon ME, and ascending to the upper ME¹, suppose they have discovered another new scale, with its tonules differently placed! And so on, making every note of the scale the beginning of what they strangely fancy to be a new scale! You will be saved from this delusion by simply observing that, whatever note you begin on, the tonules are divided by two tones on the one hand, and by three on the other. This will best appear by your placing the notes in the form of a circle, thus:—



Our pupil will not blame us for having so long drawn his attention to this foundation scale of all music, when he comes to see the importance in his after progress of thus thoroughly comprehending its structure. He will now be prepared to understand the "Modulator, or pointing board for teaching tunes." The middle column represents the seven notes of the scale in their proper order and at their proper distances. The replicates (octave notes) are added, both above and below, with the figures attached to them as already described. It will be seen that, with the exception of the middle octave (eight notes), the initial letters of the sol-fa syllables alone are used. The side columns (which are but repetitions of the same thing at different heights in pitch) and the additional notes given in these columns, namely, TA, pronounced *tau*, and FE, need not be attended to at present. They are only printed here for the sake of completeness. The scale is sometimes called the "common mode" (the common mode in which notes are arranged for a tune), and the word *modulate* means properly to sing "in mode," or, in other words, to sing correctly "in tune." The uses of the modulator are the following:—

1. It supplies the learner with a perfect pictorial representation of the notes he is singing, and thus enables him, as he sings and "points," to measure to the eye the exact intervals which the voice is taking. This cannot be done on the staff of five lines, for there is nothing there to indicate pictorially the place of the tonules (semi-tones) and it is not easy for the

learner to know at all times from that staff what part of the scale he is in—a knowledge which every true singer should carry with him, and which the learner cannot escape possessing if he faithfully and constantly uses the modulator. Let him steadily do this for the next twenty or thirty singing lessons, and he will find that the modulator has become a ready interpreter of the "staff," and a clear, sure light, guiding him through all the maze of flats and sharps, and clefs and keys, and whatever other difficulties may be crowded upon it.

2. It gives to the learner a simple and uniform "language of interval," for DOH being always the key-note, the intervals remain always the same, to whatever pitch the scale may be raised or lowered. Thus, the tonules are always between ME FAH, and TE DOH, and the pupil is so accustomed to sing those syllables to that interval, that he would find it difficult to sing them wrongly. This constant use of the syllables in connection always with the same intervals, helps the mind to recall those intervals with great ease. We all acknowledge the power of this mental association of syllable and interval. When we wish to remember some favourite tune, for instance, how frequently do we ask ourselves in aid of memory, "What are the words we usually sing it to?" and immediately that we think of the words we remember the tune. How is this? It is plain that the first syllables of the hymn or song had so often co-existed in our minds along with the first intervals of the tune, that the one had gained a power to suggest the other. This power of "association," proved to be occasionally so useful, we *systematise* and make of constant use. Several persons, recently made acquainted with this method of teaching to sing, have written to us in this manner:—"I was reckoned a very fair sight-singer before I became acquainted with this method, but I frequently, in preparing for our choral meetings, met with passages which I could not conquer without the help of an instrument. I now, however, simply trace out such passages on the modulator, translate them into this accurate and unchanging language of interval, and then it becomes really difficult to sing them wrongly."

3. It facilitates the practice of *teaching by pattern*. This is of great importance. The teacher sings, softly and distinctly, a short phrase of the tune to be taught. To this vocal pattern the pupils so listen that they may be able to imitate immediately afterwards. There are two mental processes in learning to sing a note. The first is an effort (if we may so speak) of perception in seeking to appreciate clearly the note to be imitated. The second is an effort of will, commanding the organs of voice to reproduce the notes thus clearly perceived. The "pattern" cultivates each of these distinctly. It stimulates the pupil to a strong mental effort in endeavouring to bring the ear and the voice to do the mind's bidding. In this mental effort alone consists the real work of learning to sing. That method is the best, therefore, which requires the most of it. One hour's training of this kind is far more effective than five spent in singing with a leader. The teacher also, not singing with his pupils, is better able to criticise and patiently correct their

SIMPLE MODULATOR,
OR POINTING BOARD FOR
TEACHING TUNES.

d ¹	f ¹	
t	m ¹	
l	r ¹	s
s	DOH ¹	f
	TE	m
f ta—		
m	LAH	r
	ne	
r	SOH	d
	—fe	t ₁
d	FAH	
t ₁	ME	l ₁
l ₁	RAY	s ₁
s ₁	DOH	f ₁
	t ₁	m ₁
f ₁ —		
m ₁	l ₁	r ₁
r ₁	s ₁	d ₁
		—t ₂
d ₁	f ₁	
t ₂	m ₁	l ₂
l ₂	r ₁	s ₂
s ₂	d ₁	f ₂

mistakes. The pupil who has to teach himself, with only an occasional pattern from some voice or instrument, must make himself *thoroughly perfect* in pointing on the modulator, and singing those pieces in which he has had the advantage of a pattern, and they will help him to the rest. The first sign of intelligence in a learner is that he *knows* when he sings wrong. Let him always, in that case, go back to the key-note and chord, and "try again." Many persons have taught themselves to sing in this way, often making mistakes of which they were ignorant for a while, but discovering their error and the means of correcting it, in their efforts to sing some following exercise. A teacher always by our side will, doubtless, save us from many misunderstandings and blunders; but he who cannot enjoy this advantage, may work on sturdily and hopefully without one. Let him remember that his *first business* is to use the modulator so constantly that it shall become "printed" in the eye of memory.

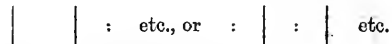
This introduces as our next topic that simple way of writing vocal music which we intend to use as the companion and interpreter of the more difficult and complex "old notation," of which we hope finally to make you master. It is the invention of an excellent and intelligent lady—Miss Glover, of Norwich—and has been modified and adapted to popular purposes by Mr. Curwen, in his "Grammar of Vocal Music," "Tonic-Solfa Edition of the People's Service of Song," and other works. It consists of the *first letters* of the solfa syllables, which you have used in learning a tune from the modulator, *written down*. And if you have used the modulator till you are able to carry one "in your mind's eye," this simple notation answers the purpose of *pointing out the notes on that mental scale*. But let it be remembered that *this notation should never be used apart from a perfect modulator either on paper before the learner, or clearly seen in his mind's eye*. When we remember that to secure this mental modulator it is only necessary to learn the proper position of seven notes, the effort does not appear a difficult one; yet, so inrooted is laziness in some people, that we have found many who go on using the solfa syllables to no advantage for years, without taking the trouble to learn this little ten minutes' lesson, which would make those syllables, in connection with the power of association just described, clear interpreters of music to them. You will perceive, then, that these notes of the new notation do not appear to our own pupils as they would to others, only on one horizontal line, but seem, as they sing them, to rise or fall to their proper places in the scale. Some persons have objected to this marking of the notes by the solfa syllables, saying, "If the old notation must be learnt at last, however difficult it is, because it contains all the stores of classical music, then why not begin with that at once? why teach two notations?" First, because there is really no trouble in teaching the solfa notation; we have seen children in an infants' school use it before they had learnt to read. It was to them, as we have described it, simply the letters from the modulator "written down." Secondly, because the old notation presents such difficulties to the learner as to make it impossible to teach music in any short time by its means alone. Many of the best systems make use of some simpler notation to interpret the old. Mr. Gall, of Edinburgh, Mr. Waite, and some others, make use of a notation by figures. Dr. Bryce, of Belfast, uses both the figures and the solfa syllables. And we have lately learnt that a sort of solfa notation was printed under the notes with some of the very earliest English psalm-tunes. It consisted of the initial letters of the solfa syllables placed under the notes such as we shall use them. Thirdly, because the use of some such new notation is the quickest and most perfect means of gaining a real command of the old. Already, by the method which we are now developing, many children in day-schools, in addition to a large number of adults, have learnt to sing "at sight" from the old notation.

It is of small consequence *what syllables* are used for this purpose. A great variety have been used at different times. We have chosen those given above because they are best known, only changing *Se* into *Te* for the sake of having a different initial letter from *So*. We have given the English spelling of the syllables instead of the Italian, as we have nothing to do with the Italian language in these lessons.

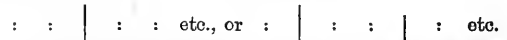
It may be easily noticed that, at certain distances throughout a tune, the voice is delivered with increased *distinctness* and *force*. This combination of distinctness and force is called

"accent." Close observation will enable you to distinguish three degrees of accent thus produced—the *louder* (or stronger), the *softer* (or weaker), and the *medium*. Listen to a well-sung tune more closely still, and you will find that the accents recur *in regular order, and at equal distances of time*. Take care to verify all these assertions by singing some well-known tune yourself, or by listening to another. Then remember that—the distance of time from one of the louder accents to the next is called a MEASURE. (It is sometimes inaccurately called a BAR.) The distance of time between *any* accent and the next is called an ALIQUOT, or equal part, of the measure. It may also be called a "pulse" of the voice. There are four sorts of MEASURE in common use.

The BINARY or TWO-PULSE MEASURE contains two aliquots, one having the louder and the other the softer accent. We use an upright bar to represent the louder accent, and two dots to represent the softer. The binary measure may, therefore, be represented thus:—



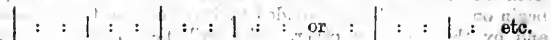
The TRINARY or THREE-PULSE MEASURE contains three aliquots, one of which has the louder and the other two the softer accent. It may be represented thus:—



The QUATERNARY or FOUR-PULSE MEASURE is formed from the binary by changing every alternate louder accent into one of *medium* force. We represent the medium accent by a shorter bar than that used for the louder accent. This measure may, then, be thus represented:—



The SENARY or SIX-PULSE MEASURE is formed from the trinary measure by changing every alternate louder accent into a medium accent, and may be represented thus:—



You perceive that these measures often begin on the softer or medium accents, but the imperfect measure is always completed at the end of a tune. Much of the delicacy and expressiveness of music depends on this proper recurrence of accent, sometimes called *rhythm*. By neglect of this a properly beautiful tune is often made dull, heavy, and unmeaning, while careful attention to it will give beauty to some of the plainest melodies. Many of our most popular tunes owe their effect almost entirely to *rhythm*, and it forms nearly the sole power of such instruments as the drum and the tambourine. It makes even the regulated step of the soldier and the dancer akin to music. The philosophy of the origin of our sense of *rhythm* is treated very admirably in the appendix to Dr. Bryce's "Rational Introduction to Music." He shows its connection with the pulsations of the heart, which are multiples of the respirations of the lungs. "About the commencement of each expiration of the breath, there is one moment at which the effort, whether muscular or elastic, is *stronger* than at any other time in the whole breathing. This is most apparent in a person sleeping soundly, when the mechanism of the body, not being controlled by the mind, follows unceremoniously its own laws. . . . Between the expiration and inspiration there seems to intervene a pause, during which the lungs are at rest; but during or immediately after great bodily exertion—running for example—this pause disappears, and expiration succeeds inspiration immediately, or with a very brief period of rest. The same happens when the breathing is impeded by disease. . . . Hence, a respiration may be divided into two (Binary) or into three (Trinary) parts. If into three parts, they will be—1st, expiration; 2nd, pause; 3rd, inspiration. If into two—1st, expiration; 2nd, inspiration."

Rhythm in its fullest sense has a wider range and more delicate expression than can be given within the boundaries of a single measure. General Thompson (*Westminster Review*, Oct., 1832), very beautifully describes it thus:—"Whoever has been rocked in a boat upon what in plain prose may be called 'the ocean waves' will have been conscious that besides the petty furrow which lifted its head and stern alternately in a time approaching to the vibrations of a church pendulum, there was

a larger swell, of which the others were but inconsiderable parts, and even a mightier still, of which this second was but a limb and portion. Something like this appears to be the nature of the undulations of musical notes. There is a great swell and a little one, and both of them contribute to the general effect. The examination may therefore on this principle be conducted in two directions:—First, to inquire what quantity of minor undulations may be within the compass of a bar or 'measure;' and secondly, to ask whether bars themselves may not be fractions of greater undulations, and whether out of these again may not be constituted undulations of higher orders in succession, to an extent that can only be measured by the skill of the performer, and probably also by the cultivated sensitiveness of the hearer. Any person who will attend critically to the execution of superior instrumental performers, will be surprised to find to what an extent this species of 'linked sweetness' may be traced, and how large a number of bars may be formed into a connected whole, by means of the relations of what is here termed accent."

LESSONS IN FRENCH.—X.

SECTION I.—FRENCH PRONUNCIATION (continued).

IV. NAME AND SOUND OF THE CONSONANTS.

52. **H, h.**—This letter is used in the French language in two ways, usually styled *mute* and *aspirate*—a definition perfectly intelligible to natives of France, but not equally so to others, that is, to foreigners. Let us explain. When we say *h* is *mute*, every one knows what is meant; but when we say *h* is *aspirate* in the French language, we do not mean that it ever has the same sound as *h* in the English words *have, high, hold, and hull*, that is, a forcible breathing, or emission of the voice at the commencement of a word. There seems to be a misapprehension of this matter with many writers and teachers, not natives of France. It is believed that the true theory is this, namely—the French never sound the *h*. It is with them, virtually, always *mute*. But, besides being *mute*, it has a particular duty to do, so to speak. But when we say *h* is *aspirate*, we only mean that the vowel immediately following partakes so much of the property of a consonant, as to prevent elision with the preceding vowel. The following examples will illustrate our meaning very clearly, viz:—

First, of the *h* mute.

Habit	is pronounced	Ab-bee.
Homme	"	Om, etc.

In these words there is no sound whatever of the *h*.
Secondly, of the *h* aspirate.

Héros is pronounced Ay-ro;

not hay-ro, as an Englishman would pronounce it, with a strong guttural articulation. But to add to the force and office of the aspirate *h* in the word *héros*, let the article *le* be placed before it, thus—*le héros*. Now, if the *h* were mute, these two words would become one in pronunciation, viz.—*léros*. The *h* not being mute in this word *héros*, but *aspirate*, what is its office? It enables the following letter *é* to prevent elision with the *e* of the word preceding it, and consequently, the two words must be pronounced as if printed *le-é-ros*.

Thus it will be seen, that one particular use of the aspirated *h* is to prevent elision of the two vowels between which it may chance to be placed, in being the initial of a word. If aspirate is best determined by consulting a French dictionary, because no particular and definite rule can be given for distinguishing it from *h* mute. It must be granted that this whole matter is now considered debatable ground among orthoepists. One side affirms that the *h* aspirate is never sounded, any more than *h* mute is, but serves the sole purpose of preventing elision. The other side affirms that the aspiration is very slight, which, in common conversation, amounts to nothing, but is barely observable only in serious reading, and the use of devotional language. One thing, however, is quite certain—that a native Frenchman never aspirates the *h* of his own language as we do in pronouncing the words *have, high, hold, and hull*.

53. **J, j.**—This letter has the sound of the two English letters *zh*. In the two English words, *glavier* and *azure*, the *z* has the sound of *zh*, viz. *glazh-eev* and *azh-oor*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Jalon	Zha-lonh	Beacon.	Jet	Zhay	Stream.
Jamais	Zha-may	Always.	Joujou	Zhoo-zhoo	A toy.

54. **K, k.**—This letter has the sound of the English *k* in all situations.

55. **L, l.**—This letter has the sound of the English *l* in nearly all situations, except when used with the vowel *i*, as a liquid. In a few words, *l* final is silent. The dictionary will best determine which these are.

56. **M, m.**—When initial, the letter *m* has only the sound of the English *m*. It is used in nasal combinations like the following, viz:—

am, im, um;

and in old French:—

em, om, ym,

which sounds will be illustrated at the proper place. It is also silent in the body of some words. Refer to the dictionary to determine when.

57. **N, n.**—When initial, the letter *n* has only the sound of English *n*. It is used in nasal combinations mostly, namely:—

an, in, un;

and in old French:—

en, ou, yn,

which sounds will be illustrated in the proper place.

After *m* and *n* in the end of words, final consonants are usually silent, viz:—

Prends	as if printed	Preu,	and pronounced	Pranh.
Romps	"	Rom,	"	Rouh.
Temps	"	Tem,	"	Tanh.

When *n* is final before another word beginning with a vowel or *h* mute, it requires, besides being pronounced with a nasal sound, that another *n* should be added in pronunciation to the beginning of the next word, namely:—

Ancien ami	as if printed	Ancien-namnee.
Bou homme	"	Bon-nomn.
Mon ame	"	Mon-nahm.
Mon ami	"	Mon-namnee.

SECTION XIV.—LIST OF WORDS FOR EXERCISES IN COMPOSITION (continued).

11. ARBRES FRUITIERS, FRUITS.—FRUIT TREES, FRUITS.

Abrioot, m., apricot.	Mûre, f., mulberry.
Abricotier, m., apricot-tree.	Nêfle, f., medlar.
Amande, f., almond.	Noisette, f., hazel-nut.
Amandier, m., almond-tree.	Noix, f., nut.
Ananas, m., pineapple.	Orange, f., orange.
Aveline, f., fibert.	Pêche, f., peach.
Châtaigne, f., chestnut.	Poire, f., pear.
Citron, m., citron, lemon.	Poirier, m., pear-tree.
Coing, m., quince.	Pomme, f., apple.
Datte, f., date.	Pommier, m., apple-tree.
Figue, f., fig.	Pruue, f., plum.
Fraise, f., strawberry.	Prunier, m., plum-tree.
Framboise, f., raspberry.	Raisin, m., grape.
Groseille, f., gooseberry, currant.	Vigne, f., vine.
Melon, m., melon.	

12. ARBRES FORESTIERS, ETC.—FOREST TREES, ETC.

Bouleau, m., birch.	Peuplier, m., poplar.
Chêne, m., oak.	Rameau, m., bough.
Ecorce, f., bark.	Sapin, m., pine.
Erable, m., maple.	Saule, m., willow.
Èrène, m., ash.	Tilleul, m., linden-tree.
Hêtre, m., beech.	Tremble, m., aspen.
Mélèze, m., larch.	Tronc, m., trunk.
Orme, m., elm.	

13. OISEAUX.—BIRDS.

Aigle, m., eagle.	Chauve-souris, f., bat.
Aile, f., wing.	Cigogne, f., stork.
Alouette, f., lark.	Colombe, f., dove.
Autour, m., hawk.	Corbeau, m., raven.
Antruche, f., ostrich.	Cornicille, f., crow.
Bee, m., beak.	Coucou, m., cuckoo.
Bécasse, f., woodcock.	Cygne, m., swan.
Bécassine, f., snipe.	Dindon, m., turkey.
Bergeronnette, f., wagtail.	Faisan, m., pheasant.
Caille, f., quail.	Geni, m., jackdane.
Canard, m., duck.	Grive, f., thrush.
Canari, m., canary-bird.	Héron, m., heron.
Charbonnet, m., goldfinch.	Hirondelle, f., swallow.

Linotte, f., *linnet*.
 Merle, m., *blackbird*.
 Oie, f., *goose*.
 Oiseau de proie, m., *bird of prey*.
 Paon, m., *peacock*.
 Passereau, m., *sparrow*.
 Perdrix, f., *partridge*.
 Perroquet, m., *parrot*.
 Pie, f., *magpie*.

Pigeon, m., *pigeon*.
 Poule, f., *hen*.
 Poulet, m., *chicken*.
 Roitelet, m., *weaver*.
 Rossignol, m., *nightingale*.
 Rouge-gorge, m., *redbreast*.
 Serin, m., *canary-bird*.
 Tourterelle, f., *turtle-dove*.
 Vautour, m., *vulture*.

14. QUADRUPÈDES.—QUADRUPEDS.

Agneau, m., *lamb*.
 Blaireau, m., *badger*.
 Castor, m., *beaver*.
 Cerf, m., *stag*.
 Chamois, m., *chamois, wild goat*.
 Chèvre, f., *goat*.
 Chevreuil, m., *roe-buck*.
 Écureuil, m., *squirrel*.
 Furet, m., *ferret*.
 Hérisson, m., *hedgehog*.
 Lapin, m., *rabbit*.

Lièvre, m., *hare*.
 Lion, m., *lion*.
 Loup, m., *wolf*.
 Mule, f., *mule*.
 Ours, m., *bear*.
 Poulain, m., *colt*.
 Porceau, m., *hog, swine*.
 Renard, m., *fox*.
 Singe, m., *monkey*.
 Taupe, f., *mole*.
 Tigre, m., *tiger*.

15. POISSONS.—FISHES.

Anguille, f., *eel*.
 Baleine, f., *whale*.
 Brochet, m., *pike*.
 Carpe, f., *carp*.
 Chevette, f., *shrimp*.
 Écrevisse, f., *crayfish*.
 Esturgeon, m., *sturgeon*.
 Hareng, m., *herring*.
 Hareng saur, m., *red herring*.
 Homard, m., *lobster*.

Merlan, m., *whiting*.
 Morue, f., *codfish*.
 Perche, f., *perch*.
 Requin, m., *shark*.
 Saumon, m., *salmon*.
 Sole, f., *sole*.
 Tanche, f., *tench*.
 Tortue, f., *turtle*.
 Truite, f., *trout*.
 Turbot, m., *turbot*.

16. INSECTES, ETC.—INSECTS, ETC.

Abeille, f., *bee*.
 Araignée, f., *spider*.
 Chenille, f., *caterpillar*.
 Cigale, f., *grasshopper*.
 Couleuvre, f., *adder*.
 Cousin, m., *gnat*.
 Crapaud, m., *toad*.
 Escarbot, m., *beetle*.
 Fourmi, f., *ant*.
 Grenouille, f., *frog*.
 Grillon, m., *cricket*.
 Guêpe, f., *wasp*.

Lézard, m., *lizard*.
 Limaçon, m., *snail*.
 Mouche, f., *fly*.
 Papillon, m., *butterfly*.
 Puce, f., *flea*.
 Punaïse, f., *bug*.
 Sangsue, f., *leech*.
 Sauterelle, f., *locust*.
 Serpent, m., *serpent*.
 Teigne, f., *moth*.
 Ver, m., *worm*.
 Vipère, f., *viper*.

SECTION XIX.—THE VERBS AVOIR AND ÊTRE IN REFERENCE TO THE TIME OF DAY, QUANTITY, ETC.

1. For the time of the day, the verb être is used unipersonally in French, in the same manner as the verb to be is used in English for the same object. The word heure, sing., heures, pl., represents the English expressions *o'clock*, or *time*, and must always be expressed.

Quelle heure est-il ? *What o'clock (time) is it ?*
 Il est une heure, *It is one o'clock.*
 Il est dix heures, *It is ten, it is ten o'clock.*

2. Midi is used for *twelve o'clock* in the day, and *minuit* for *midnight*, or *twelve at night*. Douze heures is never used except in the sense of *twelve hours*.

Est-il midi ? Est-il minuit ? *Is it noon ? Is it midnight ?*

3. Et quart, et demi [§ 84 (2)], answers to the English expressions a *quarter*, *half-past*, *after*, etc.

Il est neuf heures et quart, *It is a quarter after nine.*
 Il est midi et demi, *It is half after twelve.*
 Il est un heure et demie, *It is half after one.*

4. Moins un quart, moins vingt minutes, answer to the English expressions a *quarter before*, *twenty minutes before*, etc.

Il est dix heures moins un quart, *It wants a quarter of ten.*
 Il est neuf heures moins dix minutes, *It is ten minutes before nine.*

5. The word demi, preceding the word heure, does not vary. Placed after it, it is variable [§ 84 (2)].

Une demi-heure, *Half an hour.*
 Une heure et demie, *An hour and a half.*

6. The verb avoir is used actively [§ 43 (2) (3)] in French in speaking of age, and the word an, *year*, is always expressed.

Quel âge avez-vous ? *How old are you ? i.e., What age have you ?*

J'ai plus de vingt ans. *I am more than twenty.*

7. Plus de, moins de, are used for *more than*, *less than*, before a number :—

Avons-nous plus de dix mètres de cette toile de Hollande ? *Have we more than ten metres (yards) of this holland (linen of Holland).*
 Vous en avez moins de six aunes. *You have less than six ells of it.*

RÉSUMÉ OF EXAMPLES.

Il n'est pas encore deux heures. *It is not yet two o'clock.*
 Est-il une heure et demie ? *Is it half-past one ?*
 Il est midi et quart ou midi et demi. *It is a quarter or half-past twelve.*
 Il est huit heures moins un quart. *It wants a quarter of eight.*
 Quel âge votre fils a-t-il ? *How old is your son ?*
 Il n'a que dix-huit ans. *He is only eighteen years old.*
 Votre beau-frère n'a-t-il pas plus de dix-neuf ans ? *Is not your brother-in-law more than nineteen years old ?*
 Ma belle sœur n'a pas moins de dix-huit ans et demi. *My sister-in-law is not less than eighteen years and a half.*
 Est-il plus de dix heures à votre montre ? *Is it more than ten o'clock by your watch ?*
 Il n'est que neuf heures à ma pendule. *It is only nine by my clock.*
 Votre fils est-il plus âgé que le mien ? *Is your son older than mine ?*
 Il est plus jeune que le votre. *He is younger than yours.*

VOCABULARY.

Âgé, -e, old.	Belle-sœur, f., sister-in-law.	Jeune, young.
Aune, f., ell.	Cela, that.	Jour, m., day.
Beau-fils, son-in-law.	Cinquante, fifty.	Maintenant, now.
Beau-frère, brother-in-law.	Cousin-germain, m., first-cousin.	Mars, m., March.
Beau-père, father-in-law.	Enfant, m., child.	Mètre, m., yard.*
Belle-mère, mother-in-law.	Février, m., February.	Mois, m., month.
	Indienne, f., printed calico.	Pendule, f., clock.
		Ruban, m., ribbon.
		Tard, late.

EXERCISE 33.

1. Votre beau-frère est-il plus âgé que le mien ? 2. Le vôtre est plus jeune que le mien. 3. Quel âge a votre belle-mère ? 4. Elle a près de cinquante ans. 5. Quelle heure est-il maintenant ? 6. Il est six heures passées. 7. Êtes-vous certain de cela ? 8. Oui, Monsieur, j'en suis certain. 9. Est-il plus de deux heures à votre montre ? 10. Il n'est que midi à ma montre ? 11. Avez-vous plus de cinq ans, mon enfant ? 12. Je n'ai pas encore quatre ans. 13. Avez-vous plus de six mètres d'indienne ? 14. J'en ai moins de trois mètres. 15. Combien d'aunes de ruban votre beau-père a-t-il ? 16. Il n'a guère de ruban, il n'en a qu'une demi-aune. 17. Est-il midi moins un quart ? 18. Il est plus tard, Monsieur ; il est midi et quart. 19. Quel jour du mois avons-nous ? 20. Nous avons le six Octobre. 21. N'est-ce pas le huit Février ? 22. Non, Madame, c'est le huit Mars. 23. Combien de jardins a votre cousin-germain ? 24. Il n'en a qu'un, mais il est très-beau. 25. Il en a plus de dix.

EXERCISE 34.

1. How old is your brother-in-law ? 2. He is fifty years old. 3. Is your sister-in-law older than mine ? 4. No, Sir, my sister-in-law is younger than yours. 5. Is your son twenty-five years old ? 6. No, Madam, he is only sixteen. 7. What day of the month is it (have we) to-day ? 8. It is (we have) the eleventh. 9. Have you the twentieth volume of Chateaubriand's works ? 10. No, Madam, we have the eleventh. 11. What o'clock is it, Sir ? 12. It is only twelve o'clock. 13. Is it not later ? 14. It wants a quarter of one. 15. It is a quarter after five. 16. How many yards of this holland (toile de Hollande, f.) have you ? 17. I have ten ells and a half. 18. I have six metres of it, and sixteen yards of Italian silk. 19. Is your mother-in-law younger than your father-in-law. 20. She is younger than he. 21. Are you twenty years old ? 22. No, Sir, I am only nineteen and a half. 23. Are you sure (sûr) that it is ten o'clock ? 24. Yes, Madam, I am sure of it. 25. Is it twenty minutes of ten ? 26. No, Sir, it is a quarter before twelve (midi). 27. How many houses have you ? 28. I have only one, but my sister-in-law has two. 29. Have you mine (f.) or yours ? 30. I have neither yours nor mine, I have your son-in-law's. 31. Has your mother-in-law five yards of that printed calico ? 32. She has only two yards of it. 33. What o'clock is it by (à) your watch ? 34. It is half-past four by my watch. 35. It is more than seven o'clock by mine (à la mienne).

* The French mètre is exactly 39/371 inches English measure; it is therefore longer than the English yard by about 3 1/2 inches, or more accurately 3 1/2 inches.

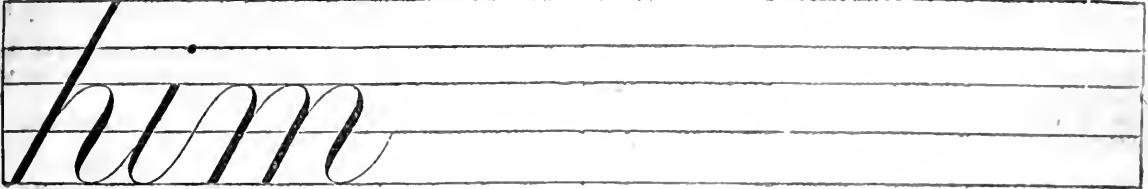
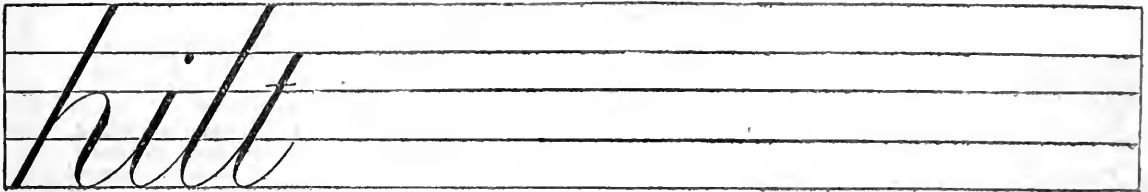
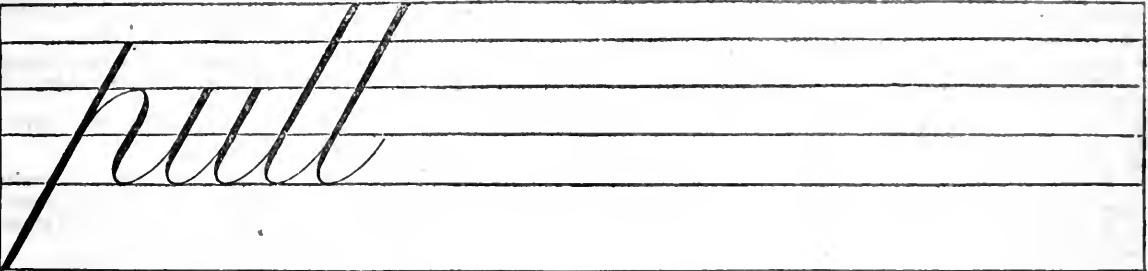
LESSONS IN PENMANSHIP.—X.

With the three copy-slips on this page the learner will finish the series of copies that is based on letters or combinations of letters formed of the bottom-turn, top-turn, top-and-bottom-turn, and straight stroke. In our next lesson we shall give the self-teacher a new letter, which is in itself an elementary form that enters into the composition of the majority of the letters that he has yet to learn to write.

If any of those who are endeavouring to acquire a knowledge of the art of Penmanship from our lessons will now take the trouble to glance over the thirty-four copy-slips that we have placed before them, they will see by how gentle and easy a gradation we have led them on from the first simple stroke, known as the bottom-turn, to words involving combinations of all the four elementary strokes that have hitherto been brought

by drawing or dragging," or the word hull, which means the "frame or body of a ship," the huge black mass that floats upon the waters that sustain it, and from which rise the tapering masts and network of cordage that give grace and beauty to a vessel's form. It is unnecessary to mention more cases in which confusion would arise from a want of proper attention to the relative proportion of the strokes of which letters are formed. The reader can find out many for himself by altering the height or length of strokes above or below the lines that contain the body of the letters in any copy-slip that is either a combination of letters, or a word that conveys a distinct and special meaning of its own.

A clear and legible handwriting is what every man should strive to attain, whatever may be his rank or station in life. Many suppose that it is vulgar and commonplace to write a legible hand—that it shows good breeding to write such a scrawl that it is impossible for any one but an expert to decipher

COPY-SLIP NO. 32.—THE WORD *him*,COPY-SLIP NO. 33.—THE WORD *hilt*,COPY-SLIP NO. 34.—THE WORD *pull*.

before their notice. The words in Copy-slips Nos. 33 and 34 will bear efficient witness to the truth and propriety of the statement we made in our last lesson, that unless due attention be paid to the relative proportion of the strokes of letters that extend above or below the lines that contain the body of any letter, the appearance of any handwriting will be far from pleasing, as it will be wanting in that harmony that is so absolutely necessary to satisfy the eye. Suppose, for instance, that in Copy-slip No. 33 the letter *l* in the word *hilt* had been carried no higher than the *t*, how unsatisfactory would have been its aspect: or, again, if the letter *t* in the same word had been carried as high as the *l*, what trouble would the reader have to determine whether the writer meant what he had written to be the word that means the "handle of a sword," or that by which "rising ground" is denoted. Then, also, in Copy-slip No. 34, if the straight stroke of the *p* in *pull* were not carried down to its proper extent, but allowed to terminate a little below the lower of the lines that contain the letter *u*, what doubt would arise in a reader's mind as to whether the writer meant to write the word which means "to draw," or "to move

it. How the notion has arisen it is difficult to say; but, to hazard a guess, it is fair to suppose that it originated in an idea that to be engaged in trade and commerce was low, and that as people in business generally wrote legibly and plainly, it was the stamp of a commercial huxtering spirit to go and do likewise. Happily, in our times legible handwriting is not thought unworthy of a man of education and good social position, while, indeed, it is one of the principal qualifications that is insisted on in those who aspire to the Civil Service and employment in Government offices. To write a good hand is one of the first steps towards the attainment of that liberal education which stamps a man as a gentleman without any of the adventitious claims that arise out of a man's descent and social standing, and it is now as absurd for any man to sneer at another because he can write legibly as it was for Jack Cade to dub the clerk of Chatham a villain because he was taken "setting of boy's copies," and to hang him as a traitor, with his pen and ink-horn about his neck, because he could write his own name, and had not a mark to himself, like, in Cade's estimation, "an honest, plain-dealing man."

LESSONS IN GERMAN.—IX.

SECTION XVII.—PERSONAL PRONOUNS; VERBS OF THE NEW CONJUGATION, ETC.

IN English the relation of property or possession is denoted by means of *personal* pronouns in the possessive case, while in German the same relation is shown by means of a distinct class of words (Sect. X.), called *possessive* pronouns; and these are used not merely in the corresponding case (*i.e.*, the genitive), but in all the cases. The German *personal* pronoun, therefore, is rarely used in the *genitive* like our *personal* pronoun in the possessive.

DECLENSION OF THE PERSONAL PRONOUNS.

<i>Singular.</i>		
<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>
N. Ich, I;	Du, thou;	Er, you.
G. Meiner, of me;	Deiner, of thee;	Ihrer, of you.
D. Mir, to, or for me;	Dir, to, or for thee;	Ihnen, to, or for you.
A. Mich, me;	Dich, thee;	Sie, you.
<i>Plural.</i>		
N. Wir, we;	Ihr, you;	Sie, you (§ 57. 6).
G. Unser, of us;	Euer, of you;	Ihrer, of you.
D. Uns, to, or for us;	Euch, to, or for you;	Ihnen, to, or for you.
A. Uns, us;	Euch, you;	Sie, you.
<i>Singular.</i>		
N. Er, he;	sie, she;	es, it.
G. Seiner, of him;	ihrer, of her;	seiner, of it.
D. Ihn, to, or for him;	ih, to, or for her;	ihm, to, or for it.
A. Ihn, him;	sie, her;	es, it.
<i>Plural.</i>		
N. Sie, they;	sie, they;	sie, they.
G. Ihrer, of them;	ihrer, of them;	ihrer, of them.
D. Ihnen, to, for them;	ihnen, to, for them;	ihnen, to, for them.
A. Sie, them;	sie, them;	sie, them.

1. The personal pronouns (in the 1st and 2nd persons) are often used reflexively; and are to be rendered by our compounds, myself, thyself, ourselves, yourselves, as:—*Ich liebe mich*, I praise myself. *Du lobst Dich*, thou praisest thyself. *Wir loben uns*; we praise ourselves. *Ihr lobt Euch*, etc.

2. The reflexive form of the personal pronouns in the *third* person *singular* and *plural* is *sich* (Latin, *se*), and answers to our objective himself, herself, itself, themselves; its gender and number being determined by the *subject* of the verb, as:—*Er erlaubt sich*, he allows (to) himself. *Sie erlaubt sich*, she allows (to) herself. *Der Knabe lobt sich*, the boy praises himself. *Sie alle loben sich*, they all praise themselves, etc. (See § 60. 4.)

3. A personal pronoun of *one* gender is frequently translated by one of *another*, as:—*Der Tisch ist gut*, aber er ist nicht groß, the table is good, but it is not large. *Das Mädchen ist schön*, aber es ist nicht fleißig, the girl is beautiful, but she is not industrious. *Diese Feder schreibt nicht gut*, sie ist zu weich, this pen does not write well, it is too soft (limber).

Obs.—This respects merely the translation. If, for instance, we were to translate the last German sentence according to the German idiom, the English for it would be, "This pen does not write well, she is too soft." Now such a rendering would be contrary to the English idiom, and therefore on translating German into English, we try to come as near the English idiom as possible; although it ought to be remembered that the difference of gender, as referring to the same noun, does never take place in German.

DECLENSION OF *Niemand* (with examples of each case).

N. Niemand, nobody (§ 59. 3).	Niemand ist hier, nobody is here.
G. Niemand's, of nobody.	Niemand's Hut ist hier, nobody's hat is here.
D. Niemanden, to nobody.	Es ist Niemanden nützlich, it is profitable to nobody.
A. { Niemand, or Niemanden, } nobody.	Ich sehe Niemand; I see nobody.

4. Verbs of the New Conjugation (See § 79. 1, 2) form the *Imperfect* by adding to the root the suffix *te*, for the *first* and for the *third* person *singular*; the corresponding parts in the *plural*

being made by the addition of the letter *n*. The *second* person *singular* is formed by adding to the root the letters *test*; the *plural* of the same person taking *tet*.

The root is found by removing the letters *en* from the form of the present infinitive: thus, from *loben* (to praise), take *en*, and you get *lob*, which is the root.

The *Present Participle* is made by adding to the root the syllable *end*; as, *lobend*, praising.

The *Perfect Participle* is produced by prefixing to the root the augment *ge* (§ 69. 2, 4), and suffixing the letter *t* (sometimes *et*): thus, *ge-lob-t*, praised.

The *Perfect tense* is formed by combining the perfect participle with the present indicative of the auxiliary *haben* or *sein*, to HAVE or to BE: as, *ich habe gelobt*, I have praised.

The *Pluperfect* is formed by combining the perfect participle with the *imperfect* of *haben* or *sein*: as, *ich hatte gelobt*, I had praised.

The *First Future* is formed by adding to the present of the infinitive, the present indicative of the auxiliary *werden*, to BECOME: as, *ich werde loben*, I shall praise.

The *Second Future* is formed by adding to the perfect of the infinitive, the present indicative of the auxiliary *werden*: as, *ich werde gelobt haben*, I shall have praised.

CONJUGATION OF THE REGULAR VERB *loben* IN THE INDICATIVE.

<i>Infinitive.</i>	<i>Participles.</i>
PRES. <i>loben</i> , to praise.	PRES. <i>lobend</i> , praising.
PERF. <i>Gelobt haben</i> , to have praised.	PERF. <i>Gelobt</i> , praised.
PRESENT TENSE.	
<i>Singular.</i>	<i>Plural.</i>
Ich <i>lobe</i> , I praise.	Wir <i>loben</i> , we praise.
Du <i>lobst</i> , thou praisest.	Ihr <i>lobet</i> , you praise.
Er <i>lobt</i> , he praises.	Sie <i>loben</i> , they praise.
IMPERFECT TENSE.	
Ich <i>lob-te</i> , I praised.	Wir <i>lob-ten</i> , we praised.
Du <i>lob-test</i> , thou praisedst.	Ihr <i>lob-tet</i> , you praised.
Er <i>lob-te</i> , he praised.	Sie <i>lob-ten</i> , they praised.
PERFECT TENSE.	
Ich <i>habe gelobt</i> , I have praised.	Wir <i>haben gelobt</i> , we have praised.
Du <i>hast gelobt</i> , thou hast praised.	Ihr <i>habet gelobt</i> , you have praised.
Er <i>hat gelobt</i> , he has praised.	Sie <i>haben gelobt</i> , they have praised.
PLUPERFECT TENSE.	
Ich <i>hatte gelobt</i> , I had praised.	Wir <i>hätten gelobt</i> , we had praised.
Du <i>hattest gelobt</i> , thou hadst praised.	Ihr <i>hättet gelobt</i> , you had praised.
Er <i>hatte gelobt</i> , he had praised.	Sie <i>hätten gelobt</i> , they had praised.
FIRST FUTURE TENSE.	
Ich <i>werde loben</i> , I shall praise.	Wir <i>werden loben</i> , we shall praise.
Du <i>wirst loben</i> , thou wilt praise.	Ihr <i>wiret loben</i> , you will praise.
Er <i>wird loben</i> , he will praise.	Sie <i>werden loben</i> , they will praise.
SECOND FUTURE TENSE.	
Ich <i>werde gelobt haben</i> , I shall have praised.	Wir <i>werden gelobt haben</i> , we shall have praised.
Du <i>wirst gelobt haben</i> , thou wilt have praised.	Ihr <i>wiret gelobt haben</i> , you will have praised.
Er <i>wird gelobt haben</i> , he will have praised.	Sie <i>werden gelobt haben</i> , they will have praised.
IMPERATIVE.	
Lobe <i>tu</i> , praise thou.	Lobet (or <i>lobt</i>) <i>ih</i> r, praise you.
Lobe <i>er</i> , let him praise.	Loben <i>sie</i> , let them praise.

The preceding paragraph must be well understood and the verb thoroughly mastered, before proceeding any further. The pupil will derive much benefit from working out other verbs after the above model. The vocabularies will furnish sufficient examples.

5. In compound tenses, the participle or infinitive is put at the end of the sentence, whether affirmative or interrogative, as:—*Ich hatte den Brief gelobt*, I had praised the letter; *Hatte ich den Brief gelobt?* had I praised the letter? *Wem werden Sie loben?* whom will you praise? *Werden Sie ihn gelobt haben?* will you have praised him?

6. In English we have three forms for the present tense; he praises, he does praise, he is praising. The German has for all

these but one form: er lebt. The present, besides its ordinary use, is often used in relation to *past* time, when the period referred to is still unfinished, as:—Ich wohne schon ein ganzes Jahr in Berlin, I reside (have resided) already a whole year in Berlin. Ich habe das Pferd nur eine Woche, I have (had) the horse only a week. The present is moreover often used for the *future*, as:—Morgen gehe ich nach Wien, to-morrow I am going to Vienna. Ich gebe Ihnen einen Gulden für das Buch, I (will) give you a florin for the book.

7. The *imperfect* is used to denote *continuance* of being, action, or passion, as:—Die Schlacht bei Leipzig dauerte drei Tage, the battle near Leipsic continued three days. Hence it comes, also, to be used in expressing what is *ostinatory* or *habitual*, as:—Die alten Deutschen jagten gern, und führten oft Krieg mit den Römern, the ancient Germans were fond of hunting, and often carried on war with the Romans. Kindred to this, is its use in cases where one action or event is to be represented as simultaneous* with another, as:—Er starb, als er auf dem Felde war, he died, while he was in the country; er spielte, als ich arbeitete, he played while I worked. (See § 138.)

8. The perfect describes an action as finished without reference to another action, and, unlike the same tense in English, may be used with an adverb that denotes past as well as present time, as:—Er hat ihn gelobt, he has praised him. Er hat ihn gestern gelobt, he (has) praised him yesterday. Er hat ihn heute gelobt, he has praised him to-day. (See § 139.)

9. The *second future* is often used in reference to past time to indicate a probability, as:—Er wird es gehört haben, he has probably heard it; literally, he will have heard it.

VOCABULARY.

Als, as, than.	Jünger, m. young nobleman.	Seele, f. soul.
Ausset, f. labour.	Körper, m. body.	Sehen, to see.
Aufenthalt, m. residence.	Körper, to grove.	Sommer, m. summer.
Bauen, to build.	Kühl, adj. cool.	Stadt, f. city.
Begleiter, m. attendant.	Lehren, to teach.	Stärken, to strengthen
Betrachten, to regard.	Ment, m. moon.	Stroh, n. straw.
Bote, m. messenger.	Nachmittag, m. afternoon.	Stube, f. room.
Decken, to cover.	Nacht, f. night.	Sünne, f. sin.
Dorf, n. village.	Nähe, f. vicinity.	Tapfer, adj. brave,
Ehe, before.	Person, f. person.	valiant.
Einjamkeit, f. solitude.	Prüfen, to pluck.	Täuschen, to deceive,
Feld, n. field.	Prüfen, to test, prove.	disappoint.
Fisch, m. fish.	Rein, adj. pure.	Tban, m. dew.
Frömmigkeit, f. piety.	Rose, f. rose.	Trester, m. comforter.
Ganz, adj. and adv. entire, whole.	Ruhm, m. fame.	Trum, m. draught.
Geschick, adj. skilful.	Schenken, to present.	Ungefährten, ill-bred.
Gras, n. grass.	Schätzen, to prize, to esteem.	Unglück, n. misfortune.
Hören, to hear.	Schicken, to send.	Vor, before, from.
Jagen, to hunt.	Schmerz, m. pain.	Versichtlich, adj. cautious.
Jugend, f. youth.	Schimmer, m. glitter.	Wachen, to watch.
		Warnen, to warn.
		Welf, adj. withered.

RÉSUMÉ OF EXAMPLES.

Eine schöne Musik* stimmt das Herz froh und heiter.	(A) sweet music (attunes) makes the heart glad and cheerful.
Die Freunde suchten mich in dem Garten.	The friends sought me in the garden.
Der Kaufmann hat den Edelstein sehr hoch geschätzt.	The merchant (has) prized the precious stone very highly.
Die Freundin wird diesen Nachmittag nach der Stadt kommen.	The friend will come to the city this afternoon.
Er wird die Nachricht schon gehört haben.	He will already have heard the news.

EXERCISE 23.

1. Ich liebe das Kind des Nachbarns. 2. Der Vater hat mir diesen Brief geschickt. 3. Ich werde den Freund warnen. 4. Ich habe die ganze Nacht bei dem kranken Weiter gewacht. 5. Die Jäger jagten gestern Morgen in dem Walde, und werten diesen Nachmittag in der Nähe des Dorfes jagen. 6. Mein Freund liebt den Ruhm und den Schimmer. 7. Er hat eine Rose gepflückt, und sie seiner Freundin geschenkt. 8. Ein geschickter Maurer dieser Stadt hat dieses schöne Haus gebaut. 9. Napoleon schätzte den tapferen Soldaten, und nicht den Junker und Edelmann. 10. Die Weibchen in meiner Jugend haben meinen Körper gestärkt. 11. Das Gewissen warnt die Diensten vor (§ 116. List) der Sünne.

* Simultaneous—existing at the same time.

EXERCISE 24.

1. The teacher presented a beautiful book to the [tem] scholar [Schüler]. 2. She had deceived her [ihre] friend. 3. The children have probably (See 9 of this section) grieved the [ten] old father. 4. An ill-bred child grieves (the) father and (the) mother. 5. I have heard thy voice [Stimme] in the room. 6. He has probably tested the messenger before he sent him to [zu] the [tem] friend [Freunde]. 7. The peasant has covered his house with [mit] straw. 8. This misfortune has probably taught him to be cautious. 9. I have seen [gesehen] many [viele] fishes in the river. 10. A cool draught strengthens in [in tem] summer the body, as [wie] the dew the [das] withered grass of the field. 11. (The) pain loves the moon as [als] a [einen] comforter, (the) solitude loves it as a [einen] companion, and (the) piety as the [ten] residence of a pure soul.

LESSONS IN BOTANY.—V.

SECTION VIII.—ON THE NERVATION OR VENATION OF LEAVES; AND THE FORMS OF LEAVES.

ANIMAL anatomists understand by veins and nerves two widely different portions of the human frame: not so botanists, in whose language veins and nerves mean the same thing, being applied to those cord-like ribs which ramify upon, or rather under, the surface of leaves. The manner in which these nerves or veins are distributed requires careful study, as it serves to distinguish divisions of vegetables from each other. Plants examined with reference to this manner in which their leaves are veined, admit of being separated into two great divisions: the parallel-veined, and the meshed or reticulated.

For example, in Fig. 19 is given the representation of the leaves of an iris plant, while Fig. 20 is a drawing of a leaf of a melon. How great is the difference between the general aspect of these leaves we need not say. In the former the veins or nerves are almost parallel to each other, or converge at either extremity of the leaf by a very imperceptible gradation, and never in any part of the leaf combine or interlace together. In the second example, the melon leaf, this parallelism is totally wanting, and in place of it we find the intermingling of nerves to be so frequent that a complete net-work results, hence this leaf and all like it are said to be *reticulated*. The word *reticulated* is derived from the Latin *rete*, a net.

Does not the reader remember that we have already established the existence of two grand natural divisions amongst flowering plants, as determined by the sectional aspect of their stems? Does he not remember that, from a consideration of this difference of appearance, we have already agreed to divide flowering plants into the exogenous and endogenous? Does he not also remember our promise to tell him other means of distinguishing an endogenous from an exogenous plant by another sign than the sectional aspect of the stem? One means is this. The leaves of endogenous plants are straight-veined, while the leaves of exogenous are reticulated. Hence, referring to the iris, we know at once that it is an endogenous, or *within-growing* plant, and we know by the same kind of examination that the melon is an *exogenous* or *without-growing* plant. What can be more simple than this mode of discrimination?

Botanists distinguish the various forms that the leaves of plants assume by different names, and that our readers may be enabled to recognise these shapes at sight, and understand the terms that are applied to them, we have given examples of the greater part of them in our illustrations of leaves in the following pages, and will now proceed to describe their peculiarities, and give the derivations of the botanical names by which they are known.

Pedate Leaf (Fig. 21).—A leaf of three or five or more divisions. Called a pedate or pedalate leaf, from the Latin *pes*, a foot, because the outer divisions are parted into several segments.

Peltate Leaves (Fig. 22).—Leaves like those of the garden nasturtium, a name improperly applied to some species of Tropaeolum or Indian cress. This kind of leaf is called *peltate* from its fancied resemblance to the *pelta*, or circular buckler of the ancients, which was held by a thong fastened to the under side. The chief peculiarity of the peltate leaf is that it is attached to its petiole at some part of the under side, and not at the margin, as leaves usually are.



19. IRIS LEAVES. 20. MELON LEAF. 21. PEDATE OR PEDALATE LEAF. 22. PELTATE LEAVES. 23. PINNATE LEAF. 24. ALTERNATE LEAVES. 25. PALMIFID LEAF. 26. FASCICULATE LEAVES. 27. SAGITTATE LEAF. 28. SPATULATE LEAF. 29. VERTICILLATE OR WHORLED LEAVES. 30. PINNATE LEAF, WITH TENDRILS. 31. CORDATE LEAF. 32. CONFLUENT OR PERFOLIATE LEAVES. 33. LANCEOLATE LEAF. 34. ORBICULAR LEAF.

Pinnate Leaf (Fig. 23).—A leaf cut like a feather, from the Latin *penna*, a wing or feather. The leaf figured consists of pairs of leaflets, without foot-stalks, ranged along a common petiole with a single leaflet at its extremity. The points at which the pairs of leaflets join the petiole are not exactly opposite each other.

Alternate Leaves (Fig. 24).—Leaves are said to be alternate when they grow from different points of the stem one above another—first on one side and then on the other.

Palmifid Leaf (Fig. 25).—Leaves divided about half way

down into several lobes, like the leaves of the sycamore, are called palmate or palmifid, from their resemblance to the palm and fingers of the hand when extended. The word is derived from the Latin *palma*, the hand, and *findo*, to cleave or split.

Fasciculate Leaves (Fig. 26).—Leaves issuing from a common point, and arranged in the form of bundles, from the Latin *fasciculus*, a little bundle. This peculiar arrangement of the foliage is found in some of the *coniferae*, or trees of the pine tribe.



35. DENTATE LEAF. 36. DELTOID LEAF. 37. DECOMPOSITE LEAF. 38. RENIFORM LEAF. 39. PINNATIFID LEAF. 40. PALMATE LEAF. 41. DIGITATE LEAF. 42. CAPILLARY LEAF. 43. SPINY LEAF. 44. SESSILE LEAVES. 45. CILIATE LEAF. 46. SERRATE LEAF. 47. OVAL LEAF. 48. PINNATE LEAF. 49. BIPINNATE LEAF. 50. DISTICHOUS LEAVES. 51. ACUTE LEAVES.

Sagittate Leaf (Fig. 27).—A leaf shaped like the head of an arrow, from the Latin *sagitta*, an arrow, triangular in form, with pointed lobes at the base extending backwards. A variety of this form is called *hastate*, or spear-shaped, from the Latin *hasta*, a spear.

Spatulate Leaf (Fig. 28).—A leaf formed something like a spatula (Latin, *spatula*), a broad flat knife used by chemists for spreading plasters. It is broad and rounded at the end, but tapers gradually towards the stalk.

Verticillate Leaves (Fig. 29).—When more than two leaves

grow on the same level, they are termed verticillate, from the Latin *verticillus*, the whirl of a spindle, derived from *verto*, to turn. Leaves growing in this manner, in a ring round the stem, are also said to be *whorled*.

Pinnate Leaf, with Tendrils (Fig. 30).—Here we have two opposite leaflets, with a tendril issuing from the point of junction between them. Found in the leaf of the everlasting pea.

Cordate Leaf (Fig. 31).—A leaf, such as the leaf of the lime-tree, so called from being shaped like a heart, from the Latin

cor, cordis, the heart. A cordate leaf is broad at the base, where it is attached to the petiole, and pointed at the extremity. When a leaf is narrow or pointed at the base and broad at the end, or shaped something like the figure presented by the section of a pear, it is called *obcordate*.

Confluent Leaves (Fig. 32).—Leaves which are joined together, or which surround the stem in such a way that it appears to pass through the centre of them; from the Latin *con*, together, and *fluo*, to flow. Leaves of this kind are more often called *perfoliate*.

Lanceolate Leaf (Fig. 33).—A leaf formed like the head of a lance, oblong, narrow, and tapering from the broadest part in the centre towards the base and extremity.

Orbicular Leaf (Fig. 34).—A leaf circular in outline, from the Latin *orbiculus*, the diminutive of *orbis*, a globe or sphere. Leaves of this kind resemble peltate leaves in shape, but differ from them in being cleft as far as the point of junction with the petiole. A good example may be found in the leaf of the common mallow.

Dentate Leaf (Fig. 35).—When the edge of a leaf is notched or indented it is said to be dentate, from the Latin *dens*, a tooth. When the margin of the leaf is unbroken, as is the leaf of the myrtle, or nasturtium, it is said to be *entire*.

Deltaid Leaf (Fig. 36).—A leaf with a broad base and triangular in form, so called from its resemblance to the Greek letter Δ, or capital D, called delta.

Decomposite Leaf (Fig. 37).—A leaf divided into a great number of leaflets, as in the illustration, in which leaflets are attached on either side to the branches which issue from the petiole. It should be noted that the meaning of this term is very different to *decomposition*, which means a state of decay or dissolution, the word decomposite being derived from the Latin *compono*, to put together, with *de* prefixed to increase the force of its signification, and indicating a composition of things already compounded, the leaflets of the compound leaf being also themselves compound.

Reniform Leaf (Fig. 38).—A leaf shaped like a kidney, and so called from the Latin *ren*, a kidney.

Pinnatifid Leaf (Fig. 39).—A leaf indented along the margin with deep irregular notches extending about half way into the mid-rib, as in the leaf of the dandelion, or sow-thistle; so called from the Latin *penna*, a feather, and *findo*, to split.

Palmate Leaf (Fig. 40).—A leaf consisting of five leaflets attached to a common petiole, so called from its resemblance to the extended fingers of the hand, from the Latin *palma*, a hand. Leaves of this kind are sometimes termed *quinate*.

Digitate Leaf (Fig. 41).—A leaf consisting of several leaflets, or lobes proceeding from the same point of a common leaf-stalk, so called from the Latin *digitus*, a finger, the lobes being extended like the fingers of a hand. An example may be found in the leaf of the horse-chestnut. Scarcely differs from the last.

Capillary Leaf (Fig. 42).—A leaf branching out in all directions in narrow hair-like divisions, so called from the Latin *capillus*, hair. Examples of this kind of leaf are found in some of the tribe of umbellifera.

Spiny Leaf (Fig. 43).—A leaf with spines or sharp points projecting at intervals round the margin, like the leaf of the holly, so called from the Latin *spina*, a thorn.

Sessile Leaves (Fig. 44).—When leaves are attached to the stem of a plant without any petiole or leaf-stalk, they are termed sessile, from *sessum*, a part of the Latin verb *sedeo*, to sit, because the leaves are closely attached to the stem as if sitting on it.

Ciliate Leaf (Fig. 45).—When a leaf is bordered or edged with short hair-like appendages it is termed ciliate, from the Latin *cilia*, eyelashes.

Serrate Leaf (Fig. 46).—When the margin of a leaf is toothed sharply, like a saw, the teeth projecting forward, as in the rose-leaf, it is termed serrate, from the Latin *serra*, a saw.

Oval Leaf (Fig. 47).—A leaf longer than it is broad, but equally rounded at the base and extremity, so called from the Latin *ovum*, an egg. Oval leaves which are broader at the base, where the leaf is attached to the petiole, than at the extremity are called *ovate*; but leaves which are narrower at the base than at the extremity are called *obovate*.

Pinnate Leaf (another variety). (Fig. 48).—Consisting of pairs of leaflets ranged along a common petiole opposite to each other, and attached to the common petiole by leaf-stalks; so called from the Latin *penna*, a wing, the attachment of each pair being like the wings of a bird, or the small feathers that branch out on either side of the mid-rib of a complete feather.

Bipinnate Leaf (Fig. 49).—A leaf consisting of pairs of pinnate leaves arranged along a common petiole opposite to each other; the leaf, in other words, being pinnately branched, and each branch pinnate with leaflets. Leaves are tri-pinnate, or three times pinnate, when the mid-rib is pinnately branched, the branches again pinnately branched, and these last furnished with leaflets pinnately arranged.

Distichous Leaves (Fig. 50).—Leaves springing from alternate points in two rows, one on the right of the stem, and the other on the left, from the Greek *διστιχος* (pronounced *dis-tick-os*) a couplet.

Acute Leaves (Fig. 51).—Narrow leaves terminating in a sharp point, from the Latin *acutus*, sharp.

The above list includes the principal terms applied to leaves. Sometimes, however, to describe a leaf correctly, it is necessary to apply two or three of these terms; as, for example, when a leaf is long, narrow, and pointed at either end, fringed with hair-like appendages, and notched with small regular indentations along the margin projecting forwards, it is described as lanceolate ciliate serrate.

READING AND ELOCUTION.—V.

PUNCTUATION (continued).

VII. THE PARENTHESIS, CROTCHETS, AND BRACKETS.

() []

41. A PARENTHESIS is a sentence, or part of a sentence, enclosed between two curved lines, thus ().

42. The curved lines in which the parenthesis is enclosed are called Crotchets.

43. The parenthesis, with the crotchets which enclose it, is generally inserted between the words of another sentence, and may be omitted without injuring the sense.

44. The parenthesis should generally be read in a quicker and lower tone of voice than the other parts of the sentence in which it stands.

45. Sometimes a sentence is enclosed in marks like these [], which are called Brackets.

46. Sentences which are included within crotchets or brackets, should generally be read in a quicker and lower tone of voice.

47. Although the crotchet and the bracket are sometimes indiscriminately used, the following difference in their use may be noticed:—Crotchets are used to enclose a sentence, or part of a sentence, which is inserted between the parts of another sentence; brackets are generally used to separate two subjects, or to enclose an explanation, note, or observation, standing by itself. When a parenthesis occurs within another parenthesis, brackets enclose the former, and crotchets enclose the latter.

Examples.

I asked my eldest son (a boy who never was guilty of a falsehood) to give me a correct account of the matter.

The master told me that the lesson (which was a very difficult one) was recited correctly by every pupil in the class.

When they were both turned of forty (an age in which, according to Mr. Cowley, there is no dallying with life), they determined to retire, and pass the remainder of their days in the country.

Notwithstanding all this care of Cicero, history informs us that Marcus proved a mere blockhead; and that Nature (who, it seems, was even with the son for her prodigality to the father) rendered him incapable of improving, by all the rules of eloquence, the precepts of philosophy, his own endeavours, and the most refined conversation in Athens.

Natural historians observe (for whilst I am in the country I must fetch my allusions from thence) that only the male birds have voices; that their songs begin a little before breeding time, and end a little after.

Dr. Clark has observed that Homer is more perspicuous than any other author; but if he is so (which yet may be questioned), the perspicuity arises from his subject, and not from the language itself in which he writes.

The many letters which come to me from persons of the best sense of both sexes (for I may pronounce their characters from their way of writing) do not a little encourage me in the prosecution of this my undertaking.

It is this sense which furnishes the imagination with its ideas; so that by the pleasures of the imagination, or fancy (terms which I shall use promiscuously), I here mean such as arise from visible objects.

The stomach (examined from every dish, a tomb of boiled and roast, and flesh and fish, where bile, and wind, and phlegm, and acid, jar, and all the man is one intestine war) remembers oft the schoolboy's simple fare, the temperate sleep, and spirits light as air.

William Penn was distinguished from his companions by wearing a blue sash of silk network (which, it seems, is still preserved by Mr. Kott, of Seething Hall, near Norwich), and by having in his hand a roll of parchment, on which was engrossed the confirmation of the treaty of purchase and amity.

Again, would your worship a moment suppose (it is a case that has happened, and may be again) that the visage or countenance had not a nose, pry who would, or who could, wear spectacles then?

Upon this the dial-plate (if we may credit the fable) changed countenance with alarm.

To speak of nothing else, the arrival of the English in her father's dominions must have appeared (as indeed it turned out to be) a most portentous phenomenon.

Surely, in this age of invention, something may be struck out to obviate the necessity (if such necessity exists) of so tasking the human intellect.

I compassionate the unfortunates now (at this very moment, perhaps) screwed up perpendicularly in the seat of torture, having in the right hand a fresh-nibbed patent pen, dipped ever and anon into the ink-bottle, as if to hook up ideas, and under the outspread palm of the left hand a fair sheet of best Bath post (ready to receive thoughts yet unhatched), on which their eyes are riveted with a stare of disconsolate perplexity, infinitely touching to a feeling mind.

O the unspeakable relief (could such a machine be invented) of having only to grind an answer to one of one's dear five hundred friends!

Have I not groaned under similar horrors, from the hour when I was first shut up (under lock and key, I believe) to indite a dutiful epistle to an honoured aunt?

To such unhappy persons, then, I would fain offer a few hints (the fruit of long experience), which may prove serviceable in the hour of emergency.

If ever you should come to Modena (where, among other relics, you may see Tassoni's bucket), stop at a palace near the Reggio gate, dwell in of old by one of the Donati.

My father and my uncle Toby (clever soul) were sitting by the fire with Dr. Slop; and Corporal Trim (a brave and honest fellow) was reading a sermon to them.

As the sermon contains many parentheses, and affords an opportunity also of showing you a sentence in brackets (you will observe that all the previous parentheses in this lesson are enclosed in crotchets), I shall insert part of it in the following paragraph:—

To have the fear of God before our eyes, and in our mutual dealings with each other, to govern our actions by the eternal measures of right and wrong: the first of these will comprehend the duties of religion; the second those of morality, which are so inseparably connected together, that you cannot divide these two tables, even in imagination (though the attempt is often made in practice), without breaking and mutually destroying them both. [Here my father observed that Dr. Slop was fast asleep]. I said the attempt is often made; and so it is; there being nothing more common than to see a man who has no sense at all of religion, and, indeed, has so much honesty as to pretend to none, who would take it as the bitterest affront should you but hint at a suspicion of his moral character, or imagine he was not conscientiously just and scrupulous to the uttermost mite.

I know the banker I deal with, or the physician I usually call in ["There is no need," cried Dr. Slop (waking) "to call in any physician in this case"], to be neither of them men of much religion.

Experienced schoolmasters may quickly make a grammar of boys' natures, and reduce them all (saving some few exceptions) to certain general rules.

Ingenious boys, who are idle, think, with the hare in the fable, that, running with snails (so they count the rest of their school-fellows), they shall come soon enough to the post; though sleeping a good while before their starting.

VIII. THE DASH.

48. The Dash is a short straight line which occurs in reading, and which is placed between the sentences in such a manner as to be parallel to the top or the bottom of the page.

49. The dash is sometimes used to express a sudden stop, or change in the subject.

50. The dash requires a pause sometimes as short as that of a comma, and sometimes one as long as, if not longer than, that of a period.

51. The dash is frequently used instead of crotchets or brackets, and a parenthesis is thus placed between two dashes.

52. The dash is sometimes used to precede something unexpected; as when a sentence beginning seriously ends humorously.

53. In the following examples, the dash is used to express a sudden stop, or change of the subject.

Examples.

If you will give me your attention, I will show you—but stop, I do not know that you wish to see.

Alas! that folly and falsehood should be so hard to grapple with—but he that hopes to make mankind the wiser for his labours, must not be soon tired.

"Please your honours," quoth Trim, "the inquisition is the vilest—Prithee, spare thy description, Trim; I hate the very name of it," said my father.

The fierce wolf prowls around thee—there he stands listening—not fearful, for he nothing fears.

The wild stag hears the falling waters' sound, and tremblingly flies forward—o'er his back he bends his stately horns—the noiseless ground his hurried feet impress not—and his track is lost amidst the tumult of the breeze, and the leaves falling from the rustling trees.

The wild horse thee approaches in his turn. His mane stands erect—his nostrils burn—he snorts—he pricks his ears and starts aside.

There was silence—not a word was said—their meal was before them—God had been thanked, and they began to eat.

They hear not—see not—know not—for their eyes are covered with thick mists—they will not see.

And ye like fading autumn leaves will fall; your throne but dust—your empire but a grave—your martial pomp a black funeral pall—your palace trampled by your meanest slave.

To-day is thine—improve to-day, nor trust to-morrow's distant ray.

For some time the struggle was most amusing—the fish pulling, and the bird screaming with all its might—the one attempting to fly, and the other to swim from its invisible enemy—the gander at one moment losing and the next regaining his centre of gravity.

54. The dash is sometimes to be read as a period, with the falling inflection of the voice.

Examples.

The favoured child of Nature, who combines in herself these united perfections, may justly be considered as the masterpiece of creation—as the most perfect image of the Divinity here below.

Now launch the boat upon the wave—the wind is blowing off the shore—I will not live a cowering slave, in these polluted islands more.

The wind is blowing off the shore, and out to sea the steamers fly—my music is the dashing roar, my canopy the stainless sky—it bends above, so fair a blue, that heaven seems opening to my view.

He had stopped soon after beginning the tale—he had laid the fragment away among his papers, and had never looked at it again.

The exaltation of his soul left him—he sunk down—and his misery went over him like a flood.

Mr. Playfair was too indulgent, in truth, and favourable to his friends—and made a kind of liberal allowance for the faults of all mankind—except only faults of baseness or of cruelty; against which he never failed to manifest the most open scorn and detestation.

Towards women he had the most chivalrous feelings of regard and attention, and was, beyond almost all men, acceptable and agreeable in their society—though without the least levity or pretension unbecoming his age or condition.

55. The dash is sometimes to be read like a comma, with the voice suspended.

Examples.

"I have always felt that I could meet death with composure; but I did not know," she said, with a tremulous voice, her lips quivering—"I did not know how hard a thing it would be to leave my children, till now that the hour is come."

And Babylon shall become—she that was the beauty of kingdoms, the glory of the pride of the Chaldeans—as the overthrow of Sodom and Gomorrah by the hand of God.

Our land—the first garden of liberty's tree—it has been, and shall yet be, the land of the free.

They shall find that the name which they have dared to proscribe—that the name of Mac Gregor is a spell.

Delightful in his manners—inflexible in his principles—and generous in his affections, he had all that could charm in society, or attach in private.

The joys of life in hurried exile go—till hope's fair smile, and beauty's ray of light, are shrouded in the griefs and storms of night.

Day after day prepares the funeral shroud; the world is grey with age: the striking hour is but an echo of death's summons loud—the jarring of the dark grave's prison door. Into its deep abyss—devouring all—kings and the friends of kings alike must fall.

She made an effort to put on something like mourning for her son; and nothing could be more touching than this struggle between pious affection and utter poverty: a black ribbon or so—a faded black handkerchief, and one or two more such humble attempts to express by outward signs that grief that passeth show.

LESSONS IN GEOMETRY.—V.

SIMPLE GEOMETRICAL THEOREMS.

BEFORE entering on the consideration of problems in geometry which will be found to be practically useful to all who are engaged in any mechanical art, it will be necessary for the learner to become acquainted with a few simple statements or facts in geometry, the truth of which is so clear and plain that they require but little, if any explanation. These are called *theorems*, or self-evident propositions, from the Greek *θεωρημα* (*the-o-re'-ma*), literally a sight, or something which can be seen, in contradistinction to *problems*, or propositions which require something to be done in order to effect their solution. The word "problem" is derived from the Greek *προβλημα* (*pro-ble'-ma*), which is derived in its turn from *προ* (*pro*) before, and *βαλλω* (*bal-lo*) to cast or throw, while the word "proposition" is derived from the Latin *pro*, before, and *pono*, to place. Hence the meaning of the words "problem" and "proposition" is precisely the same, namely, something that is placed before you to be done or solved.

1. When one straight line intersects another straight line, the vertical or opposite angles are equal to one another.

Let the straight line *AB* intersect the straight line *CD* in the point *E*. Now, by the intersection of these two straight lines, four angles are formed, namely, *CEA*, *AED*, *DEB*, and *BEC*. Of these the vertical or opposite angles are equal, namely, *CEA* to *DEB*, and *AED* to *BEC*.

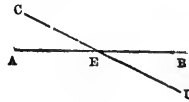


Fig. 1.

The truth of this may be shown in a very simple and practical manner by copying the figure on a piece of paper, and then cutting out the angles and placing them on each other, the greater on the greater and the less on the less. This mode of proof will frequently be found useful in similar cases.

Opposite angles are also called vertical angles, because the top or vertex of each angle is directly opposite to the vertex of the other.

2. When a straight line intersects two parallel straight lines, the alternate angles are equal.

Let the straight line *EF* intersect the parallel straight lines *AB*, *CD*, in the points *G*, *H*. The angles *AGH*, *GHD* are alternate angles, and are equal to one another, and the angles *CHG*, *HGB* are also alternate and equal.

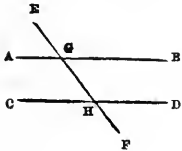


Fig. 2.

There are eight angles formed by the intersection of the straight lines *AB*, *CD*, *EF*, in Fig. 2. Of these the reader will find that there are two sets of four angles that are equal to one another—namely, $AGE = BGH = GHC = DHF$, and $EGB = AGH = GHD = CHF$. Let him demonstrate the truth of this practically by drawing the figure on paper, cutting out one of the greater angles and one of the less, and placing them on the remaining angles in each set of four.

3. The adjacent angles which are formed when one straight line stands on another straight line, are together equal to two right angles.

In Fig. 3 the adjacent angles *ABC*, *ABD*, which are formed by the straight line *AB* standing on the straight line *CD*, are equal to two right angles. The truth of this is evident when we consider that each of the angles *CBE*,

DBE is a right angle, the straight line *BE* being at right angles to the straight line *CD*, and making the adjacent angles *DBE*, *EBC* equal to one another. The pupil will remember that the *measure* of an angle is the extent of the opening of the lines or legs of which the angle is formed. Thus, the sum of the openings of the two angles *ABC*, *ABD*, or the sum of the openings of the three angles *CBA*, *ABE*, *EBD* is equal to the sum of the openings of the angles *CBE*, *EBD*.

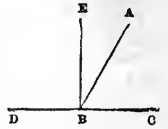


Fig. 3.

Thus we learn that if any number of straight lines meet in a point in another straight line on one side of it, the sum of the angles which they make with this straight line and with each other are equal to two right angles; and if any number of straight lines meet in the same point on the other side of it, the angles thus made are also equal to two right angles. Hence the angles made by any number of lines meeting together in the same point are together equal to four right angles.

As a familiar illustration of this, the spokes of a wheel may be taken, which radiate from the nave as a common centre. If a chalk line were drawn down the middle of each spoke, these lines would meet in the centre of the nave, and the angles formed by these lines at their point of meeting would be equal to four right angles.

4. Any angle drawn in a semicircle is a right angle.

An angle drawn in a semicircle is one which has its top or vertex in the arc, while its legs pass through the extremities of the diameter at its points of contact with the arc. Thus, the angle *ACB* in the semicircle *ACB* is a right angle. The truth of this may be shown by cutting out a right-angled triangle and applying it to a semicircle. If large enough, it will be found that the legs of the right



Fig. 4.

angle will pass through the ends of the diameter of the semicircle, no matter at what point in the arc of the semicircle the vertex of the right angle may be placed.

5. The greatest side of every triangle is opposite the greatest angle.

In the triangle *ABC* in Fig. 5, of the three angles—*ABC*, *BCA*, *CAB*—*ABC* is manifestly the greatest; while of the three straight lines *AB*, *BC*, *CA*, which form its sides, *AC* is the greatest. *AC*, the greatest side, is opposite the greatest angle *ABC*; or, in other words, *AC*, the greatest side, subtends the greatest angle *ABC*.

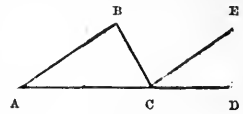


Fig. 5.

A moment's reflection will show that the greatest angle of any triangle must have the greatest opening between the lines of which it is formed, and that the line which is opposite to or subtends the greatest opening, must of necessity be greatest of the three lines which subtend the three openings of the angles of the triangle.

6. If one side of a triangle be produced, the outer or exterior angle is equal to the two interior and opposite angles of the triangle.

In the figure that accompanies the preceding theorem let the side *AC* of the triangle *ABC* be produced to *D*. The outer or exterior angle *BCD* is equal to the two interior and opposite angles *CBA*, *BAC*. For if at the point *c* in the straight line *AD* the straight line *CE* be drawn parallel to *AB*, then the alternate angles *ECB*, *CBA* are equal to one another, and by Theorem 2, the angle *DCE* is equal to the angle *CAB*; but the angles *DCE*, *ECB* together make up the angle *DCB*, which is therefore equal to the angles *CBA*, *BAC*.

7. The three interior angles of every triangle are together equal to two right angles.

In Fig. 5 the angle *BCD* has been shown to be equal to the angles *CBA*, *BAC*; to each of these equals add the angle *BCA*. Now, by Theorem 3 the angles *DCB*, *BCA* are equal to two right angles, and *CBA*, *BAC*, *BCA*, the three interior angles of the triangle *ABC*, which are equal to these two angles, must therefore be equal to two right angles.

PROBLEMS IN PRACTICAL GEOMETRY.

PROBLEM 1.—To bisect a given straight line—that is, to divide it into two equal parts.

Let AB (Fig. 6) be the straight line to be bisected. From the two extremities A and B , with a radius of any length greater than half of the line, describe or draw arcs of circles, intersecting or crossing each other at the point C , above the straight line AB , and at the point D , below it. Then, from the point of intersection C , draw a straight line to the point of intersection D ; and the straight line AB will be bisected by the straight line CD , at the point E ; that is, AB is divided into two equal parts, AE , EB , at the point E .

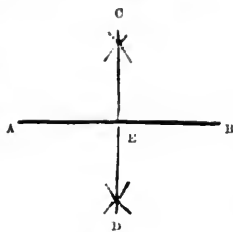


Fig. 6.

By this method of construction, a straight line may be divided into any number of equal parts, denoted by the series 2, 4, 8, 16, 32, 64, 128, etc.

It is not necessary in the above construction that the two arcs at D be drawn with the same radius as the two arcs at C ; but it is necessary that each pair be drawn with the same radius; that is, practically speaking, without shifting the legs of the compasses.

It is self-evident that in Fig. 6 the straight line CD is bisected by the straight line AB at the point E ; and that AB and CD intersect each other at right angles. The problem therefore teaches us how to draw two straight lines at right angles to each other.

PROBLEM II.—To draw a perpendicular to a straight line from a point in it.

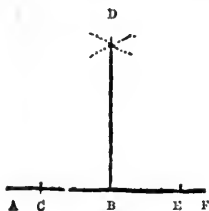


Fig. 7.

Let AF (Fig. 7) be the straight line to which the perpendicular is to be drawn, and B the point in it. From the point B , with any convenient radius, less than BA or BF , cut off, or measure off equal parts of the straight lines BA , BF —namely, BC , BE ; and from the points C , E , with any radius greater than CB or EB , describe arcs of circles intersecting each other at the point D . Then join DB , that is, draw a straight line from the point D to the point B , and BD will be perpendicular to AF .

PROBLEM III.—To draw a perpendicular to a straight line from one of its extremities.

Let AB (Fig. 8) be the straight line, and B one of its extremities, from which the perpendicular is to be drawn. Take any point C , at a convenient distance from B , and nearly over the middle of the straight line AB ; then with C as a centre, at the distance CB as radius, describe the arc DCE , so that it shall be greater than a semicircle; from the point D , draw through the point C , the straight line DCE , to meet the arc in the point E ; and join EB , that is, draw a straight line from the point E to the point B , and BE will be perpendicular to AB , at the extremity of B , as required.

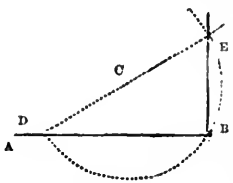


Fig. 8.

The demonstration of this proposition is founded on the fact that the angle contained in a semicircle is a right angle. This fact, indeed, is well known to intelligent workmen, who are accustomed to make use of the F or the T square; for they try the accuracy of that instrument by this property of the circle. Thus, if in Fig. 9 AGC were an angle drawn by means of an F or T square, in order to test its accuracy, and consequently that of the instrument, they join any two points in the legs of the angle, say D , C , by drawing the straight line DC ; they bisect it in E by means of the arcs shown in the figure on either side of the straight line CD , and drawn by the method explained in

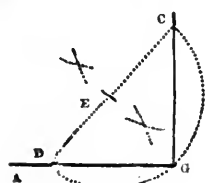


Fig. 9.

Problem I.; and then, with radius EC or ED , they describe the semicircle DGC ; if the arc of this semicircle passes exactly

through the point G , the angle and the instrument are correct; if not, they are incorrect, and the instrument must be adjusted.

PROBLEM IV.—To draw a perpendicular to a straight line from a point without it.

Let AB (Fig. 10) be the straight line, and C the point from which the perpendicular is to be drawn. From the point C as a centre, with any radius sufficient to extend beyond the straight line AB , describe an arc of a circle DE , intersecting the straight line AB in the points D , E ; then, from these points as centres, with any radius greater than half the straight line DE , describe arcs intersecting each other in the point F ; then join CF ; that is, draw a straight line from C to F , cutting AB in the point G ; then CG is perpendicular to AB , and is drawn from the point C , as required.

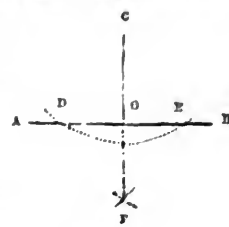


Fig. 10.

PROBLEM V.—To draw a perpendicular to a straight line at or near one of its extremities, from a point without it.

Let AG (Fig. 9) be the straight line, G one of its extremities, and C the point without it, from which the perpendicular is to be drawn. Take any point D in AG , and join DC ; bisect it in E ; and from the point E , as a centre, with radius ED or EC , describe the semicircle DGC ; then join GC , and it will be perpendicular to AG . It is evident, from the remarks made on Problem III., that CG is perpendicular to AG , and it is drawn from the point C , as required.

Observe, that unless the point happens to be exactly in the vertical line above the point G , the semicircle will not pass exactly through G , but will pass through a point either nearer to or farther from the point A . In the latter case, the straight line AG must be produced till it meets the arc of the semicircle. This problem is considered as merely a case of the preceding problem, although the construction be different.

HISTORIC SKETCHES.—V.

THE RISING OF THE LABOURERS UNDER RICHARD II.

ON Whit Monday, 1382, Sir Simon Burley, who is called by one historian "a favourite of King Richard II.," and by another, "a Knight of the King's Household," rode into Gravesend, and seeing one of the townsmen, claimed him as his slave. There was great dissatisfaction and open murmuring among the people, with whom the man was a favourite, and they protested against his removal. The townsman himself loudly declared that he never was slave to any one, to Sir Simon or another, and seeing the sympathy the crowd had with him, he appealed to them for help. Sir Simon claimed the man as the son of one of his female slaves, called niefs, and disregarding the earnest entreaty of the crowd, would not abate his claim unless he were paid three hundred pounds of silver—a price he well knew the friends of the bondman could not possibly raise. Some disorder ensuing, Sir Simon, who was attended by two serjeants of law and a following of armed men, pushed on through the crowd, and gave orders that the prisoner should be taken to Rochester Castle.

As soon as the great man's train had left, the awe inspired by its presence died away, and the people, whom the seizure of their fellow had taken completely by surprise, and had also deprived of their power to act, recovered their self-possession, and began to cry out with one voice, "Down with the tyrants! Let us go to Rochester! Let us join our brethren of Essex!"

The Essex men had already risen in arms, and were vowing vengeance on all the lords and owners of land, and especially against lawyers, whom they hated as the ministers of the law that crushed them. Norfolk, Suffolk, Cambridgeshire, and some of the other home counties, had been infected with the same spirit. In them the bubbles of rebellion were beginning to rise to the surface and to break, though as yet there was nothing like united action. The above-mentioned claim of Sir Simon Burley, made in spite of the ferment which was going on only on the opposite bank of the river, was the spark which fired the train of the Kentish men's anger.

Before time enough had elapsed to throw cold water on the fire, another and more serious offence had been given to the

people of the county, which not only caused them to make common cause at once with the men of the Eastern Counties, but drew to the front men of a certain kind of ability—such as Wat Tyler and the priest John Ball—who marshalled the malcontents into something like order, and put them under leadership.

This second cause of offence is well known by tradition to almost every one. A poll-tax, that is to say, a tax of so much a head—in this case it was fourpence—had been ordered to be levied on all persons above the age of fifteen. The tax was very unpopular in itself, but the manner in which it was raised rendered it almost unbearable. To begin with, it was not committed to the royal officers to collect the money, but men of influence about the Court gave the king a certain sum in lieu of the tax, and then were permitted to make as much profit as they could out of the tax-gathering itself. Under these circumstances it is no wonder the tax was hated; the farmers of it naturally strove to make the yield as large as possible, and they instructed their agents to see that no one who was liable to the tax—every man and woman above fifteen years of age was liable—escaped payment.

One of these agents came to Dartford, in Kent, and began to pursue his business. The household of John of Dartford, a hielier or tiler, consisted of himself, his wife, his daughter, and two other persons. John himself was from home, at his work roofing a house, when the tax-gatherer came and demanded the dues. John's wife paid for herself, her husband, and the two servants or apprentices, but claimed exemption for her daughter, as being under the taxable age. The man disputed the woman's statement about her daughter, who, he averred, must be quite fifteen, and to this he held, demanding the tax for her, in spite of her mother's statement, which was supported by the witness of all her neighbours. High words followed, the tiler's wife refusing to submit to an injustice, and the collector, presuming on his position and his authority, speaking in most unseemly way about the maiden. A friend ran off to where John was working, and told him what was going on at home, and probably magnified the true state of the case, after the manner of rumour-bearers. Anyhow, John no sooner heard his neighbour's words than he jumped down from the work he was engaged upon, and snatching up his heavy helving hammer, ran away home. Arrived at his own door, he found a crowd assembled, the tax-man still insisting on the poll-tax for the maiden, and in the very act of taking an indecent liberty, for the purpose, as he said, of ascertaining whether she was of full age or not.

The same practice, it seems, had been pursued in other places, where the people had not had the strength or the spirit to resist it; but Dartford was not the place in which to try such a thing, and John the Tiler was the last man in Dartford to put up with it. The scoundrel collector had barely time to draw his sword, which was all too useless as a guard, when the enraged father attacked him. No fence, however well sustained, could ward off the tiler's blow. Quickly the hammer rose in the air, swung by sinewy arms; more quickly still it descended, cleaved a way through the idle guard, which it shivered and broke, and falling with tremendous force on the skull of the collector, dashed out his brains on to the adjacent wall. Without a struggle or a groan the man fell dead, and the people stood around wondering at what was done. Yet no man laid hands on the tiler, no man regarded him as a murderer; and when he broke the silence, and told them in a few short words how that his cause was theirs, that this act for which the collector had died was of a piece with the rest of the treatment the people received from those above them, they rent the air with shouts of approval, and proposed to march at once to Canterbury and join their brethren who were already under arms.

John the Tiler was a working man, and the people he addressed were of the same class. To that class also belonged "the brethren," who were in rebellion all over the Eastern Counties; agricultural labourers, fishermen, and some artisans employed in towns, composed the army—if it could be so called—which Wat Tyler of Maidstone, Jack Straw, Hob the Miller, John Ball, and others, led to Rochester, Canterbury, and Blackheath, and bearded the king even in the Tower of London. Working men alone were concerned in the affair; none of the knights, clergy, lawyers, or landowners taking any part in it, except for its suppression. Had some such men put themselves

at the head of the movement, they might have succeeded in restraining the fury of the multitude, and in directing its energy into a channel where it would have borne good fruit. But there was no Stephen de Langton—no prophet. The people merely knew they were oppressed both by the lords and by the law which the lords had made; they knew not how to provide a remedy. Goaded to desperation, they turned and kicked, as a worm will twist when trampled on, and they became drunk in their fury, and turned away even such sympathy as otherwise there might have been in the breasts of their rulers. With blind guides, demagogues, and men whose heads were turned by the possession of power, "the Commons of England" went from place to place, committing all sorts of excesses, cutting off the heads of all lawyers they could lay hands on, burning books and records, houses and colleges, opening the prisons, getting very drunk on the wine for which they ransacked the cellars of castles and mansions, and, for the purpose of enjoying the contrast, making earls, barons, and knights attend upon them in the capacity of servants and stable-men. To women, however, it is not reported that they did any harm, though they sadly frightened the Princess Dowager of Wales, widow of the Black Prince, and mother of King Richard, by detaining her on her journey from Canterbury to London, and declining to let her proceed until she had kissed some of them, which she did, the old chroniclers report, with a very ill grace, though glad to get away at such a price.

But what was the cause of this rising of the Commons? The end of it we know. The rebels marched from all the home counties to London, sacked the Temple, the Duke of Lancaster's Palace of the Savoy, and burnt many other houses; they broke into the Tower, cut off the head of the Archbishop of Canterbury, with that of the Prior of St. John's, and some other noblemen; and proposed to do the like to all the knights and lords in the country, though they still professed affection for the king, and rallied to the cry of "King Richard and the true Commons." Then came the end of all. Many of the insurgents had left London with charters of liberties which they obtained from the king, but Wat Tyler, at the head of several thousands, chiefly Kentish men, remained, and venturing to be insolent to the king himself at an interview which took place in Smithfield, was slain in view of his host by Sir William Walworth, the Lord Mayor of London. The men, disconcerted by the fall of their leader, were partly cajoled, partly driven from the metropolis, and when they were dispersed, commissions were issued for the trial and punishment of the leaders, the charters already granted were taken away, and the people were reduced to a state of bondage worse than before. The commissions to punish were carried out with so much excessive zeal, that even in those days, when might was not over squeamish about the way in which it kicked right against the prieks, an Act of Indemnity was thought necessary to hide the acts of the officers of the Crown.

But what was the cause of the rebellion? We have seen a part of it in the odious claim made by Sir Simon Burley at Gravesend, and in the outrageous conduct of the tax-gatherer at Dartford. These, however, were only the outward, visible signs of a very oppressive state of things which had their foundation in the laws and institutions of the country.

In King John's time (1199—1215), when the population of England was under two millions, there were upwards of one million villeins, that is to say, half the population were in a state of bondage. A villein was one man or woman, who was sold as a separate chattel, or with the stock on the land—one who, in the terse language of the chronicler, "knew not in the evening what he was to do in the morning, but he was bound to do whatever he was commanded." His children were slaves like himself—hence Sir Simon Burley's claim to the Gravesend man—he might be beaten, chained, ill-fed, over-worked: his master might do anything to him short of killing him. The whole of the agricultural labourers were of this condition. In towns there were free workmen and free labourers, but their number was not large, and their influence was a creature of slow growth. Their wages were, moreover, fixed, not by the means of competition in an open market, but by regulations made by those who employed them. Thus, in the reign of Edward I. (A.D. 1272), the wages of carpenters, tilers, masons, and plasterers, in London, where the terms were probably more liberal than in the provinces, were fixed at fourpence a day. As time went on, the number of free men increased, both in town

and country, chiefly through the medium of the Church, which gradually emancipated a large number of those whom it claimed its vassals.

In the reign of Edward III., however, another cause operated to enlarge their ranks. A dreadful disease, known as the Black Death, which appears to have originated in China, in which country thirteen millions of men, women, and children are said to have died, swept across Europe from the East, and coming to England, destroyed half the population. Villeins were left without masters, masters without villeins, and death in many cases made equal the high and low. After the Black Death went away, the number of workmen was found to be much reduced; the price of their labour, therefore, ought to have been much higher, in accordance with the law of supply and demand, since the demand had increased while the supply had diminished. In the country, where the ravages of the plague had been desolating, there was a cry for more wages, and the number of men who were freed by their owners' death from bondage made the number of wages-takers formidable. The men would not work without "outrageous and excessive hire," as the employers said; so a Parliament, consisting wholly of employers, passed a law, called The Statute of Labourers, by which the wages of agriculturists were fixed at the price they had been before the plague. An ox-herd had six shillings and eightpence a year; a farm bailiff, thirteen shillings and fourpence; and a shepherd, ten shillings a year, and clothing; and no man was to quit his work without leave, under pain of being put in the stocks. An ordinance, made about the year 1370, ordered that saddlers, skippers, and tanners should be "chastised for charging excessively."

Thus we find that among the principal causes of the rising of the labouring classes in 1382, were the practice of villeinage, which was not yet extinct, the unfair and oppressive regulations about wages, the dearth of living, and the demands, barbarously made, and frequently brutally enforced, for taxes out of the people, notwithstanding.

As has been said, the people got little at the moment by their rebellion, the disastrous conduct and termination of which left them with the fetters of bondage more firmly riveted on their necks. A fresh and more stringent Statute of Labourers was passed, and the poor people in country places suffered on for many years.

In towns the workmen were better off—better able to defend themselves—and the interests of the employers could not there be advanced without a corresponding advantage to the men. Some Acts of Henry VII. (1485—1509) and Henry VIII. (1509—1547), which aimed at fixing the price of skilled labour, proved to be abortive, and things remained on the old basis till 1563, when a law was passed, which remained unrepealed till 1813, though it must have become inoperative in many places before that date. This was, perhaps, one of the most exceptional laws ever put on the statute-roll. Justices of the peace in the country, and the mayor, sheriffs, or other authorities in towns, were to meet every year after Easter, and taking into consideration the price of living, and of house rent, the demand and supply for labour, were to fix the wages of all workmen and labourers for the ensuing year. Any one giving more than these wages was to be fined five pounds, and put in prison for ten days; any one taking more was to be imprisoned for three weeks. No workman or labourer was to leave his work without a passport sealed with the town seal, and approved by two householders. If he did so he was liable to scourging, exposure in the stocks, and imprisonment. The hours of labour were fixed, for weekly or daily labourers, at from five a.m. till between seven and eight p.m., between the middle of March and the middle of September, two hours and a half being allowed for meals and refreshment.

Such was the state of things till 1813, except that there were besides some very objectionable laws, punishing with great severity all workmen who combined to raise the price of their labour, and to make an open market. These laws were, however repealed in 1825, since which date the workman has been as free as the merchant to buy and sell his labour in the best market, and even to a great extent to make the market. He is now, politically speaking, the equal of any of his fellow countrymen, and as far removed in every respect from his prototype as he existed in the days of King Richard II. as the freeman is from the slave.

SYNOPSIS OF THE LIFE AND REIGN OF RICHARD II.

Richard II. was the son of the famous Black Prince, and the grandson of Edward III. He was the twelfth King of England under the Norman Conquest, and the eighth and last of the Plantagenet dynasty.

Born at Bordeaux	Jan. 6, 1367	The King takes the govern-
Death of the Black Prince	1376	ment into his own hands
Began to reign	June 22, 1377	Statute of "Præsumptum" en-
Wat Tyler resists the poll-tax	1381	acted
Insurgents under Wat Tyler		Quarrel and subsequent ban-
march to London June 12, 1381		ishment of Norfolk and
Wat Tyler slain in Smithfield		Bolingbroke, afterwards
by the Lord Mayor of Lon-		Henry IV.
don, Sir William Walworth,		Bolingbroke lands at Kaven-
June 15, 1381		spur, in Yorkshire
Death of Wickliffe	Dec. 31, 1384	The King is deposed Sept. 29 1399
Battle of Otterburn (Chevy		Murdered in Pontefract or
Chase)	Aug. 10, 1388	Ponfret Castle . Feb. 14, 1400

SOVEREIGNS CONTEMPORARY WITH RICHARD II.

<i>Denmark, Sovereigns of.</i>	<i>Germany, Emperors of.</i>	<i>Clement VII.</i>
Olaus V.	Charles IV.	(anti-pope)
Margaret	Wenceslas	Bonifacio IX.
"Union of Calmar"	Norway, Kings of.	Benedict XIII.
by which Sweden,	Haco VII.	(anti-pope)
Norway, and Den-	Olaf IV.	Scotland, Kings of.
mark, are united	Eric III.	Robert II.
under Margaret	Norway united to	Robert III.
and Eric of Nor-	Denmark	
way	Poland, Kings of.	Spain, Kings of.
	Louis	Henry II.
<i>Eastern Empire.</i>	Ladislas V.	John I.
John Palæologus 1354	Portugal, Kings of.	Henry III.
Manuel Palæologus 1391	Ferdinand I.	Sweden, Kings of.
	John I.	Albert of Meck-
<i>France, Kings of.</i>	Rome, Popes of.	lenburg
Charles V.	Gregory XI.	Sweden united to
Charles VI.	Urban VI.	Denmark

*** It will be noticed that the word "anti-pope" is added to the names of two of the Popes of Rome above. The anti-pope was a pope chosen by the will of some king, or the intrigues of a party hostile to the reigning pope, who had been elected by the College of Cardinals. Urban VI., for instance, had been chosen by the cardinals to please the people of Rome, who wished for an Italian pope, who would reside in the Eternal City, and not at Avignon or elsewhere, as some of the popes who preceded him had done. On his election the French and Spanish cardinals retired to Provence, and chose Robert of Geneva to occupy the papal chair. This ecclesiastic assumed the title of Clement VII., and as soon as his election was made known Christendom was riven asunder, and presented the appearance of a house divided against itself, France, Spain, Scotland, and Savoy declaring for Clement VII., while Italy, Germany, England, and other parts of Europe acknowledged Urban VI. as the visible head of the Church. As a matter of course, these rivals for the enjoyment and management of the temporalities of the "Vicar of Christ," as the bishops of Rome delight to style themselves, utterly ignored the "new commandment" of the meek and gentle Master whom they professed to follow. They solemnly cursed each other by bell, book, and candle, and each declared his opponent, and those who supported him, excommunicated. Those who gave the matter thoughtful consideration soon began to see that the dogma of the infallibility of the popes must be a mistake, and the quarrels of the angry claimants for the chair of St. Peter, in the persons of the popes and anti-popes, kindled the spark that smouldered till the sixteenth century, and then suddenly broke forth into the glorious blaze of the Reformation.

LESSONS IN ARITHMETIC.—X.
FRACTIONS.

1. WHEN a number or thing is divided into two equal parts, each of these parts is called *one half*; if the number or thing be divided into three equal parts, each is called *one third*; if it is divided into four equal parts, each of the parts is called *one fourth*, or one quarter; and so universally when a number or thing is divided into any number of equal parts, the parts take their name from the number of parts into which the thing or number is divided.

One of these parts, or a collection containing any number of them, is called a *fraction* of the original number or thing.

Thus, if a straight line be divided into seven parts, each part is one-seventh of the line, and any number of the parts—as, for instance, five of them, *i.e.*, five-sevenths of the whole—is a fraction of the whole line.

The number of parts into which the unit or whole is divided is called the *denominator*, because it indicates or *denominates* the number of parts into which the whole is divided.

The particular number of these parts taken to form any fraction of the whole is called the *numerator*, because it expresses the *number* of parts taken.

Thus in the case given above, 7 is the denominator, because the line is divided into seven parts, and 5 is the numerator of the fraction.

Fractions are expressed by writing the numerator above the denominator, and drawing a line between them. Thus the above fraction would be written $\frac{5}{7}$, one half would be written $\frac{1}{2}$, eight-ninths, $\frac{8}{9}$, and so on.

The word *fraction*, which means a part or portion broken from any *integer* or whole, is derived from *fractus*, broken, a part of the Latin verb *frangere*, to break. The word *integer* is simply a Latin adjective meaning fresh, entire, or unbroken, which has been adopted into the English language.

2. A *proper* fraction is one whose numerator is less than its denominator, as $\frac{1}{2}$, $\frac{3}{5}$, $\frac{2}{3}$.

An *improper* fraction is one whose numerator is not less than its denominator, as $\frac{3}{2}$, $\frac{5}{3}$, etc.

A *mixed number* consists of a whole number and a fraction expressed together; for example, 3 and $\frac{2}{3}$. This is generally written thus, $3\frac{2}{3}$; similarly, $4\frac{3}{5}$, $7\frac{1}{2}$, etc.

Fractions in which the denominators are 10, or any power of 10 (Lesson VI., Art. 5), are called *Decimal Fractions*, or *Decimals*. All other fractions are called *Vulgar Fractions*.

A *compound* fraction is a fraction of a fraction, as $\frac{1}{2}$ of $\frac{2}{3}$, $\frac{2}{3}$ of $\frac{1}{2}$; for any fractional part of a unit may be regarded as a new unit. This fractional part may itself be divided into any number of equal parts, and a certain number of them may be taken.

A *complex*, or mixed fraction, is one which has a fraction in its numerator or denominator, or in both; as, for instance—

$$\frac{\frac{3}{4}}{\frac{2}{5}}, \frac{3\frac{1}{5}}{\frac{2}{5}}, \frac{2}{3\frac{4}{5}}, \frac{4\frac{3}{5}}{\frac{2}{5}}, \frac{\frac{3}{4} \text{ of } \frac{2}{5}}{\frac{2}{5}}$$

Every whole number may be looked upon as a fraction, of which the denominator is unity; thus 5 is $\frac{5}{1}$.

3. Fractions, it will readily be seen, are expressions of *unexecuted division*, the numerator being the dividend, and the denominator the divisor. Take, for example, $\frac{4}{9}$. We are supposed to have one unit or thing to be divided, and dividing it into 9 equal parts, to take 4 of them. But it will be the same thing if we take 4 such units, and dividing this collection into 9 equal parts, take one of these parts. This gives the same fraction of the original unit as before; but, looked at in this light, it expresses the quotient which results from dividing the numerator by the denominator.

4. To multiply a fraction by a whole number.

Multiply the numerator by the whole number. For instance, to multiply $\frac{2}{9}$ by 4. Here the unit is divided into 9 parts, two of which are taken; four times as many of these parts will give eight parts, or $\frac{8}{9}$; therefore $4 \times \frac{2}{9} = \frac{8}{9}$.

5. To divide a fraction by a whole number.

Either divide the numerator or multiply the denominator by the whole number. Thus, $\frac{2}{9} \div 2 = \frac{1}{9}$; for, the unit being divided into 9 parts, 6 are taken, halving which gives 3 parts, or $\frac{3}{9}$. Again, $\frac{2}{9} \div 2 = \frac{2}{9 \times 2} = \frac{2}{18}$. In $\frac{2}{18}$ the unit is divided into 18 parts, 5 of which are taken. In $\frac{2}{9}$ the unit is divided into 9 parts, 5 of which are taken. But each of these latter 14 parts is equal to each one of the former 7th parts divided by 2, and therefore five of the latter will be equal to five of the former divided by 2, or $\frac{5}{14} = \frac{5}{2 \times 7} = \frac{5}{14}$.

6. From the above reasoning we see that it produces exactly the same result whether we divide the numerator or multiply the denominator by any number. Hence, if we *multiply* both numerator and denominator by the same quantity, the value of the fraction is unaltered. Multiplying the denominator divides the unit into so many more parts, and multiplying the nume-

erator takes exactly so many times more of them. Similarly it follows, that if we *divide* both the numerator and the denominator by the same quantity, the value of the fraction remains unaltered.

7. To reduce a fraction to its lowest terms.

The numerator and denominator of a fraction are sometimes called the *terms* of the fraction. If both the numerator and denominator of a fraction can be divided by the same number (an operation which we have just seen does not alter its value), it is said not to be in its *lowest terms*. A fraction, then, may be defined to be in its lowest terms when the numerator and denominator have no common factors. Hence to reduce a fraction to its lowest terms, we must first find the greatest common measure of the numerator, and denominator, and then divide them both by it.

EXAMPLE.—Reduce $\frac{27}{36}$ to its lowest terms.

The greatest common measure of 27 and 36 is 9, and therefore dividing numerator and denominator by 9 we get the fraction expressed in its lowest terms. It is not necessary always to find the G. C. M. of the numerator and denominator, but it is often more convenient in practice to divide the numerator and denominator by numbers which are seen to be factors common to both until we arrive at the lowest terms. Thus—

$$\frac{270}{270} = \frac{10 \times 27}{10 \times 27} = \frac{27}{27} = \frac{3 \times 7}{3 \times 9} = \frac{7}{9} = \frac{7 \times 11}{7 \times 13} = \frac{11}{13}$$

the fraction in its lowest terms.

EXERCISE 22.

1. Reduce the following fractions to their lowest terms:—

- | | | |
|----------------------|---------------------------|-----------------------------|
| 1. $\frac{1}{2}$. | 9. $\frac{37}{40}$. | 17. $\frac{1090}{1090}$. |
| 2. $\frac{37}{40}$. | 10. $\frac{1090}{1090}$. | 18. $\frac{37000}{37000}$. |
| 3. $\frac{30}{40}$. | 11. $\frac{1090}{1090}$. | 19. $\frac{1090}{1090}$. |
| 4. $\frac{20}{40}$. | 12. $\frac{1090}{1090}$. | 20. $\frac{1090}{1090}$. |
| 5. $\frac{21}{40}$. | 13. $\frac{21}{40}$. | 21. $\frac{1090}{1090}$. |
| 6. $\frac{22}{40}$. | 14. $\frac{22}{40}$. | 22. $\frac{1090}{1090}$. |
| 7. $\frac{23}{40}$. | 15. $\frac{23}{40}$. | 23. $\frac{1090}{1090}$. |
| 8. $\frac{24}{40}$. | 16. $\frac{24}{40}$. | 24. $\frac{1090}{1090}$. |

2. In a joint-stock company which was divided into 10,800 shares, what part of the whole concern belongs to the individual who holds 4,050 shares?

3. A ship is worth £21,600; what fraction of the ship belongs to him who contributed to this sum no less than £12,960?

8. To reduce an improper fraction to a whole or mixed number.

Divide the numerator by the denominator. If there is no remainder, the quotient will be the equivalent whole number. If there is a remainder, the improper fraction is equivalent to a mixed number, of which the quotient is the whole number (or, as it is called, the *integral part*), and the remainder the numerator of the fractional part, which will evidently have the same denominator as the original improper fraction. Thus, $\frac{7}{3} = 2\frac{1}{3}$, a whole number; and $\frac{23}{7} = 3\frac{2}{7}$. Since 7 sevenths make one whole unit, 23 sevenths will make as many whole units as 7 is contained in 23, *i.e.*, 3 whole units, and 2 sevenths over. Hence $\frac{23}{7} = 3\frac{2}{7}$.

9. To convert a mixed number into an improper fraction.

Multiply the integral part by the denominator of the fractional part, to which product add the numerator of the fractional part. This sum will be the numerator, and the denominator of the fractional part will be the required denominator. Thus, $4\frac{6}{7} = \frac{7 \times 4 + 6}{7} = \frac{34}{7}$; for $4\frac{6}{7} = 4 + \frac{6}{7} = \frac{7 \times 4}{7} + \frac{6}{7} = \frac{28}{7} + \frac{6}{7}$, and 28 sevenths and 6 sevenths make 34 sevenths, or $\frac{34}{7}$.

EXERCISE 23.

1. Reduce the following improper fractions to whole or mixed numbers:—

- | | | | | |
|----------------------|-----------------------|----------------------|-------------------------|-------------------------|
| 1. $\frac{33}{10}$. | 3. $\frac{94}{10}$. | 5. $\frac{21}{10}$. | 7. $\frac{707}{10}$. | 9. $\frac{2130}{10}$. |
| 2. $\frac{17}{10}$. | 4. $\frac{707}{10}$. | 6. $\frac{6}{10}$. | 8. $\frac{13300}{10}$. | 10. $\frac{4330}{10}$. |

2. Reduce the following mixed numbers to improper fractions in their lowest terms:—

- | | | | | |
|----------------------|------------------------|-----------------------|------------------------|------------------------|
| 1. $17\frac{2}{3}$. | 3. $115\frac{1}{5}$. | 5. $25\frac{3}{5}$. | 7. $4725\frac{1}{4}$. | 9. $62\frac{1}{2}$. |
| 2. $48\frac{2}{3}$. | 4. $1304\frac{1}{4}$. | 6. $856\frac{3}{5}$. | 8. $525\frac{1}{4}$. | 10. $891\frac{1}{5}$. |

- Reduce 445 to tenths, fourteenths, seventeenths and thirds.
- Reduce 672 to eighths, twelfths, eighteenth and fourths.
- Reduce 3830 to hundredths, fifteenths and thirty-fifths.

ANIMAL PHYSIOLOGY.—V.

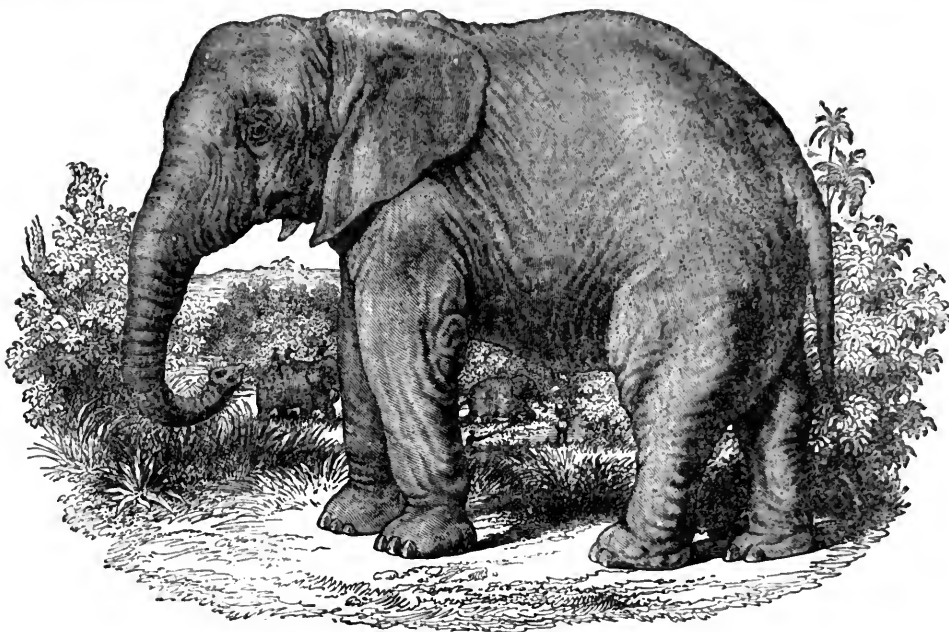
THE EAR (*continued*).

THE external ear of brutes is often so marked a feature in the outline of their bodies, it adds so much grace and finish to the head, its movements give such animation to the gestures, and it is itself an organ so ornamental, that it is almost superfluous to remind the reader that its form and foldings are very various throughout the class Mammalia. Every one who is alive to the beauties of animated nature—and there are few who are dead to their attractions—must have looked with delight on the ear of the squirrel, with its tassel of soft brown hair. That universal favourite, the rabbit, the dainty little fennec fox, and even the fallow deer, despite the excellent majesty of its horns, would all cut but sorry figures without the external ear.

Among the strangest forms of ears, we may mention that of the African elephant, which makes him look like a warrior armed with a double shield. So flat and ample are these ears that Sir Samuel Baker cut a tolerably good mattress out of one of them. The membranous and delicate ear of our larger

It has been remarked, that while the ears of carnivorous animals are directed forwards, those of herbivorous animals are turned backwards; so that, in the pursuit of the latter by the former, the ears of both are so placed as to catch the sound from the object whose movements it is of the highest importance they should be acquainted with. Perhaps this idea has been dwelt on too much, yet every one must have noticed how the cat, the fox, and the ferret, carry their ears pricked forward, while the ears of the deer and hare are, at least, as readily turned backward as forward. In the case of the hare, however, the shape and direction of the ear seems to be given in relation to the habit it has of crouching in its form. While in its form, the long ears stretch along the flanks, with their orifices turned outward, and must be very efficient in apprehending the sounds which proceed from the feet of man or dog as they beat the stubble.

The concha, or external ear, is very generally found throughout the whole of the class Mammalia, but in a few it is "conspicuous from its absence." Thus, two of our native insectivorous mammals, the mole and the shrew, are without it



THE AFRICAN ELEPHANT.

English bat is proportionately as monstrous, but instead of being flat, its foldings are so decided, that it looks like an ear within an ear. The long trumpet-shaped ear of ruminants and horses, capable of being turned in any direction, is admirably suited by its shape, and by the fringe of hair which encircles it, and partially extends across its orifice, to accomplish the double purpose of receiving aerial waves, and excluding any small particles of dust, rain, or hail, which would otherwise get down to the sensitive tympanum. This office of protection is, indeed, by no means unimportant, as any foreign body on the drum membrane causes exquisite annoyance, and the steadiest horse will become restive when thus troubled. In the setter and spaniel dogs, the function of protection seems paramount to that of collection of sounds, so that the thick matted ear hangs down, when at rest, right over the orifice of the ear. In the above cases the ear is not only an organ of definite utility, but of conspicuous beauty, and, indeed, it is a fine exemplification of how use and beauty go hand in hand throughout all God's works. Why stupidity should, in popular estimation, be especially associated with the ears of the ass, is even more inexplicable than why it should be considered as the special attribute of that much-abused animal. The fairy Titania, when "enamoured of an ass," showed a discriminating appreciation of good points when she kissed the "fair large ears" of her "gentle joy."

In the whale and his tribe, it is not only absent, but the very foramen which leads to the internal ear in this enormous animal will scarcely admit a pin. Indeed, this entrance to the ear seems to be retained only to establish or strengthen the affinity between the whale and the land mammalia, for the impressions of sound are probably conveyed to the internal ear through the substance of the animal's body, as in the case of fish. The tympanic cavity, however, is kept supplied with air by an eustachian tube that communicates with the passage which runs to the blow-hole near that orifice; so that when the monster discharges the air from the reservoir of its lungs with so forcible a jet that it carries the sea-water before it like a fountain, the air of the tympanic cavity is, at the same time, partially renewed; and when he plunges once more unseen into the depths, this cavity is in communication with the air he carries with him. This arrangement, whereby sound, which has been conveyed from the exterior through the solid structures of the body, is made afterwards to traverse, or to be regenerated in, an internal air cavity, is not uncommon among the denizens of the water, and sometimes it is effected by such singular contrivances, as we shall find when we describe the ear of some fish, that we are almost justified in supposing that there is some quality in the vibrations of an elastic fluid, like the air, which makes it a better medium for transmitting sound to the nerve fitted to

receive such impressions, than those inelastic or solid media in which its vibrations are more energetic. This is the more singular, because in no case is air or gas the last substance through which sound passes to the sentient nerve, only it seems desirable that it should be one link in the chain for conveying sound. It is difficult to conceive how the message should be made more distinct by the fact, that air carries it for one postal stage in the central part of its course, yet such seems to be the case.

In the case of the whale, the bony sheath of the tympanum is not embedded in the substance of the ear-bone, as in other animals, but hangs below it, and is shaped like a scroll, or like the shell of a volute, or bulla, with a very thick column or inner central part, and a very thin outer lip. By this thin outer margin of the scroll it is attached to the remainder of the ear-bone, but the attachment is so slight that in the dry skull it is easily broken off. In some geological strata this part of the ear-bone is found commonly, while the other bones of the whale are rare; and some attribute this anomaly to the easy severance of the bone, by fracture, from the rest of the skull, just mentioned. It is supposed that from the huge rotting carcass, distended with gas, and beaten about by the waves, the dense tympanic bones may have dropped and been quickly covered by preserving sediment, while the remainder of the animal, drifted to shore, and being left to the influence of the atmosphere, left no other vestige behind to attest the presence of these whales in the ancient seas.

We have dwelt thus long on the outer courts of the ear, in the animals that give suck to their young, because the variety displayed in these non-essential parts of the ear is not shown in the parts of the internal or essential ear. All the parts of the internal ear, the semi-circular canals, the vestibule, with its oval hole, and the cochlea, are always present in all mammals. There are, however, some slight differences in the proportion of the parts; thus the so-called circular staircases which mount the cochlea have three and a-half turns, or whirls, in the guinea-pig and porcupine, and only one and a-half in the whale, and in this last it can scarcely be called a staircase at all, as it does not mount upward, but only curls inwards on the same plane, like the hollow of the shell of the nautilus, instead of that of the trochus, or top-shell. There is some variation also in the little chain of bones which spans the drum from the drum membrane to the oval hole; thus the hammer and anvil bones are fused together in the pouched animals. These slight differences, however, do not invalidate the statement that the ears of all mammals are made on the same pattern; and if the reader have the patience to accomplish the by no means easy task of dissecting out from its bony case the ear of any such animal, while referring to the description of the human ear, given in the first article on the ear, he will be able to identify the several parts, or if he fail to do so, he may search again, for they are all there, though minute and difficult to trace.

The efficiency of the sense of hearing in brutes is a matter of notoriety. Whoever has had the opportunity of watching a herd of wild animals, while unobserved by them, will have been struck with the vigilance with which each unaccustomed sound is remarked. The electric start, by which every individual of the community is thrown at once into an attitude of attention and preparation for a hasty flight, is a beautiful sight. When we remember how many animals are nocturnal in their habits, how many find their home in dense tangled forests, and also how necessary it is that dispersed members of a gregarious tribe, the sexes of wandering species, the helpless young, and protecting dams, should be able to find each other, it is not surprising that this sense is made so wonderfully acute. So much is this sense relied upon for the above-named purposes, that the crafty backwoodsman finds no better expedient for alluring shy game to within reach of his rifle than by imitating the call of the species; yet so discriminating are the wild animals, that the slightest error in the intonation, or even the frequency, of the cry, will send them scampering away from the ambush.

It would seem as though man, who employs this organ so generally in the higher uses of the mind and soul, necessarily sacrifices to these uses some of the acuteness to mere sound of which the ear is capable. The savage starts like the brute when a sound, such as the European would scarcely be aware of, reaches him from the distant hill; but civilised man, who passes his life amidst the hum of crowded cities, striving rather to

abstract his thoughts from intrusive noises, and directing his attention, even when most attentive, to the thoughts that sounds embody rather than to the sounds themselves, is at a disadvantage when brought into contact with the unthinking brute, and he will sometimes pass through scenes teeming with life, and think them inanimate solitudes, because he, the object of dread, has no corresponding acuteness of observation to detect the animals which hide themselves at his approach. Yet, as we have seen, his organ is as delicate and complicated as any of theirs, and the disadvantage arises rather from neglect than deficiency, and when the kind of impression comes which strikes the mind, the sense is found to be wonderfully wakeful. Many will remember the thrilling anecdote of the Scotch woman, who, when besieged at Delhi, expecting with all the Europeans nothing but cruel massacre, for no earthly help seemed available, started up, and said, "I hear them; they are playing 'The Campbells are coming.'" And those who then thought her mad rejoiced with her on the same day, for a regiment of Scottish soldiers had marched to their relief.

LESSONS IN GERMAN.—X.

SECTION XVIII.—DIFFERENCE BETWEEN VERBS OF THE OLD AND NEW CONJUGATIONS.

VERBS of the Old Conjugation (commonly called irregular verbs) differ from those of the New, not only in respect to terminational variations, but also in regard to changes of the radical vowels, as:—Ich komme, I come; ich kam, I came; ich schreibe, I write; ich schrieb, I wrote; ich sehe, I see; ich sah, I saw. (See § 77; also list of irregular verbs, § 78. 1.)

The form of the past participle, in verbs of the Old Conjugation, frequently differs from that of the infinitive only by the augment *ge*, as:—Infinitive, kommen. Past participle, *ge* kommen.

Infinitive.

Fallen, to fall;
Geben, to give;
Gehen, to go;
Kommen, to come;
Sprechen, to speak;
Springen, to spring;
Schreiben, to write;
Singen, to sing;
Sehen, to see;

Present.

ich falle, I fall.
ich gebe, I give.
ich gehe, I go.
ich komme, I come.
ich spreche, I speak.
ich springe, I spring.
ich schreibe, I write.
ich singe, I sing.
ich sehe, I see.

Imperfect.

Ich fiel, I fell;
Ich gab, I gave;
Ich ging, I went;
Ich kam, I came;
Ich sprach, I spoke;
Ich sprang, I sprang;
Ich schrieb, I wrote;
Ich sang, I sang;
Ich sah, I saw;

Past Participle.

gefallen, fallen.
gegeben, given.
gegangen, gone.
gekommen, come.
gesprochen, spoken.
gesprungen, sprung.
geschrieben, written.
gesungen, sung.
gesehen, seen.

1. The present tense of some verbs of the Old Conjugation is irregular in the second and third persons singular, as:—

Fallen, to fall.	Geben, to give.
Ich falle, I fall.	Ich gebe, I give.
Du fällst, thou fallest.	Du gibst, thou givest.
Er fällt, he falls.	Er gibt, he gives.
Gehen, to see.	Sprechen, to speak.
Ich sehe, I see.	Ich spreche, I speak.
Du siehst, thou seest.	Du sprichst, thou speakest.
Er sieht, he sees.	Er spricht, he speaks.

2. In the imperfect tense of verbs of the Old Conjugation, as well as of the New, the second and third persons are regularly formed from the first person singular in the following manner:—

	Gehen.	
Ich ging, I went;		mit gingen, we went.
Du gingst, thou wentest;		ist ginget, you went.
Er, sic, or es ging, he, she, or it went;		sie gingen, they went.

Geben.

Ich gab, I gave; Du gabst, thou gavest; Er gab, he gave; wir gaben, we gave. ihr gabet, you gave. sie gaben, they gave.

CONJUGATION OF THE IRREGULAR VERB „haben“ IN THE INDICATIVE.

Infinitive.

Participles.

PRES. Haben, to have. PRES. Habent, having. PERF. Ge habt zu haben, to have had. PERF. Ge habt, had.

PRESENT TENSE.

Singular.

Plural.

Ich habe, I have; Du hast, thou hast; Er hat, he has; wir haben, we have. ihr habet, you have. sie haben, they have.

IMPERFECT TENSE.

Ich hatte, I had; Du hattest, thou hadst; Er hatte, he had; wir hatten, we had. ihr hattet, you had. sie hatten, they had.

PERFECT TENSE.

Ich habe gehabt, I have had; Du hast gehabt, thou hast had; Er hat gehabt, he has had; wir haben gehabt, we have had. ihr habt gehabt, you have had. sie haben gehabt, they have had.

PLUPERFECT TENSE.

Ich hatte gehabt, I had had; Du hattest gehabt, thou hadst had; Er hatte gehabt, he had had; wir hatten gehabt, we had had. ihr hattet gehabt, you had had. sie hatten gehabt, they had had.

FIRST FUTURE TENSE.

Ich werde haben, I shall have; Du wirst haben, thou wilt have; Er wird haben, he will have; wir werden haben, we shall have. ihr werdet haben, you will have. sie werden haben, they will have.

SECOND FUTURE TENSE.

Ich werde gehabt haben, I shall have had; Du wirst gehabt haben, thou wilt have had; Er wird gehabt haben, he will have had; wir werden gehabt haben, we shall have had. ihr werdet gehabt haben, you will have had. sie werden gehabt haben, they will have had.

IMPERATIVE.

Singular.

Plural.

Have tu, have thou; habe er, sie, or es, let him, her, or it have; haben wir, let us have. habt or habet ihr, or haben Sie, you. haben sie, let them have.

VOCABULARY.

Ab'reise, f. departure.	Heute, to-day.	Tag, m. day.
An'genem, adj. agreeable.	Kleid, n. dross, garment.	Tasch'entuch, n. handkerchief.
Geben, just, even, now.	Niemand, nobody, no one.	Vor'gestern, day before yesterday.
Gramma'tik, f. grammar.	Schu'h, m. shoe.	Warum'? why?
Hand'schu'h, m. glove.		

RÉSUMÉ OF EXAMPLES.

Ich habe ihn heute gesehen. I have seen him to-day.
 Ich habe ihn gestern gesehen. I saw (have seen) him yesterday.
 Was Sie hoffen, ist sehr ungewiß. What you hope is very uncertain.
 Ging Ihr Herr Bruder gestern nach Leipzig? Did your brother go to Leipsic yesterday?
 Nein, er ging nach Dresden; aber ich werde wahrscheinlich, morgen nach Leipzig gehen. No, he went to Dresden; but I shall probably go to Leipsic to-morrow.
 Du singst schön; aber deine Schwester sang in ihrer Jugend göttlich. You sing beautifully, but your sister sang in her youth divinely.
 Wem nahmst du dieses Schwert? From whom did you take this sword?
 Ich habe es meinem Feinde genommen, und gab es meinem Freunde. I took it from my enemy, and gave it to my friend.

EXERCISE 25.

1. Was hat Ihr Herr Bruder? 2. Er hat neue Kleider und neue Händer. 3. Warum haben Sie heute meine weißen Handschuhe gehabt? 4. Ich hatte sie gestern; aber heute habe ich sie nicht gehabt. 5. Wir werden morgen einen angenehmen Tag haben. 6. Mein Vater wird meinen Brief vor seiner Abreise gehabt haben. 7. Dieser arme Mann ging vorgestern zu meinem Onkel. 8. Er gab ihm zwei Taschentücher und einen neuen Hut. 9. Siehst du meinen Bruder oft und sprichst du zuweilen mit ihm? 10. Ich sah ihn gestern; aber ich habe nicht mit ihm gesprochen. 11. Sagen Sie heute Morgen, oder sang Ihre Bräutlein Tochter? 12. Ich habe in meiner Jugend gefungen; aber jetzt singe ich nicht mehr. 13. Haben Sie meine neue deutsche Grammatik? 14. Nein, eben nicht, aber ich habe sie gestern gehabt. 15. Niemand ist glücklich als der Zufriedene (Sect. XVI.), und Niemand ist weise als nur der Fromme. 16. Hat Ihre Frau Gemahlin einen Brief an Ihren Herrn Vetter geschrieben? 17. Nein, noch nicht, aber sie wird morgen an ihn schreiben. 18. Guter schrieb nach Rem: „Ich kam, sah, und siegte.“ 19. Ich gab diesem armen Manne meine alten Schuhe.

EXERCISE 26.

1. Have you seen my [meinen] brother? 2. No, I have not seen him, but my wife saw him the day before yesterday. 3. He wrote a long [langen] letter and spoke not a [ein] word [Wort]. 4. She has given to me [mir] a new dress and a beautiful handkerchief. 5. Do you think [glauben Sie] that we shall have fine weather [Wetter] to-morrow? 6. No, but I think [glaube] that it will rain [regnen].

SECTION XIX.—DEMONSTRATIVE AND SUBSTANTIVE PRONOUNS.

Welcher? welche? welches? (which?) as interrogative, is declined precisely like dieser, diese, dieses. The genitive is seldom used.

DECLENSION OF THE DEMONSTRATIVE PRONOUN, dieser, diese, dieses (this).

SINGULAR.			PLURAL.
Masc.	Fem.	Neut.	All genders.
Der, dieser,	diese,	dieses, this.	Diese, these.
Der, dieses,	dieser,	dieses, of this.	Dieser, of these.
Der, dieses,	dieser,	diesem, to this.	Diesem, to these.
Der, diesen,	diese,	diesem, this.	Diese, these.

Der, die, das frequently stand independently; i.e., not belonging to a noun. When so used, it is called a substantive pronoun, and answers to our demonstrative pronoun *that*. Its inflection, as seen in the Declension following, differs from that of the article, and it is likewise commonly pronounced with a stronger emphasis.

DECLENSION OF THE SUBSTANTIVE PRONOUN der, die, das.

SINGULAR.			PLURAL.
Masc.	Fem.	Neut.	All genders.
Der,	die,	das, that.	Die, those.
Der, dessen,	deren,	dessen, of that.	Deren, of those.
Der, dem,	der,	dem, to that.	Deren, to, for those.
Der, den,	die,	dem, that.	Die, those.

Examples of the use of the Substantive Pronouns.

Sein Mantel ist schwarz, und der His cloak is black, and *that* of seines Bruders* ist blau. his brother is blue.
 Die Uhr meines Vaters ist groß, und The watch of my father is die seines Freundes ist klein. large, and *that* of his friend is small.
 Das Leder des Schuhmachers ist The leather of the shoemaker schwarz, und das des Sattlers is black, and *that* of the saddle ist gelb. dler is yellow.
 Seine Gänse sind grau, und die His geese are grey, and *those* of seines Nachbarn sind weiß. his neighbour are white.
 Ich habe meinen Hut und den I have my hat and *that* of my meines Freundes. friend.
 Sie hat ihre Feder und die ihrer She has her pen and *that* of her Freundin. friend.

* Such elliptical form as "His cloak is black and his brother's is blue" (Sein Mantel ist schwarz, und seines Bruders ist blau) is very seldom employed in German.

Der Knabe hat sein Buch und das seines Vaters. The boy has his book and that of his father.
 Die Knaben haben ihre Bälle und die ihrer Freunde. The boys have their balls and those of their friends.

VOCABULARY.

Adolph, <i>m.</i> Adolphus.	Buchhalter, <i>m.</i> book-keeper.	Tinte, <i>f.</i> ink.
Amerikanisch, <i>adj.</i> American.	Fabel, <i>f.</i> fable.	Wann, when.
Bild, <i>n.</i> picture, image.	Gellert, <i>m.</i> Gellert.	Welcher, which.
Bildhauer, <i>m.</i> sculptor.	Heinrich, <i>m.</i> Henry.	Zimmermann, <i>m.</i> Zimmerman.
Brief, <i>m.</i> letter.	Rathhaus, <i>n.</i> city-hall, counting-house.	Zolleinnehmer, <i>m.</i> toll-gatherer.
	No'senfarben, <i>adj.</i> pink-coloured.	Zwilling, <i>m.</i> twin.

RÉSUMÉ OF EXAMPLES.

Haben Sie den Gesang' der Nachtigall gehört? Have you ever heard the song of the nightingale?
 Ja, sehr oft, aber nie den der Lerche. Yes, very often, but never that of the lark.
 Das Licht der Sonne ist nützlich. The light of the sun is useful.
 Welches Buch ist dieses? Whose book is this?
 Welchem von Ihnen gehört' dieses Buch? To which of you does this book belong?
 Welches Buch meinen Sie? Which book do you mean?
 Das neue, große Buch. The new large book.
 Welches ist denn der rechte Name? Which is then the right name?

EXERCISE 27.

1. Welches Tisch haben Sie? 2. Ich habe den meines Freundes, des Tischlers. 3. Welches Papier haben Sie? 4. Ich habe das meines Freundes, des Lehrers. 5. Welcher von diesen Knaben hat meine blaue Tinte? 6. Keiner von ihnen hat Ihre Tinte, aber einer von diesen Knaben hat Ihr schönes rosenfarbenes Papier. 7. Welcher von ihnen hat es? 8. Adolph hat es, und Heinrich, Ihr kleiner Vetter, hat Ihren hölzernen Bleistift. 9. Welches von meinen Büchern ist in Ihrem Zimmer? 10. Ihre Gellert's Fabeln sind dort. 11. Welcher von diesen zwei kleinen Knaben ist Ihr Neffe? 12. Sie sind beide meine Vettern. 13. Sind sie Brüder? 14. Ja, sie sind Zwillinge. 15. Welche Ihrer amerikanischen Freunde sind in dem Rathhause? 16. Herr G. und Herr L. 17. Welchen Buch haben Sie? 18. Ich habe das Ihres Veters. 19. Wann hat Herr Zimmermann meinen Brief gehabt? 20. Er hat ihn vorgestern gehabt, und sein Freund, der Maler, hat ihn gestern gehabt, und ich habe ihn heute. 21. Hat der Lehrer den Sohn des Bäckers oder den des Schneiders gelobt? 22. Er hat weder den des Bäckers, noch den des Schneiders, sondern den des Maurers gelobt. 23. Haben Sie die Vettern des Kaufmanns, oder die des Buchhalters? 24. Ich habe weder die des Kaufmanns, noch die des Buchhalters, sondern ich habe die des Zolleinnehmers. 25. Wer lobt den alten Capitän? 26. Der Hauptmann lobt ihn. 27. Er lobt das ganze Volk. 28. Der Wagen des Franzosen ist groß, und der des Engländers schön.

EXERCISE 28.

1. Which umbrella [Regenschirm] have you? 2. I have that of my brother, the sculptor. 3. When did you buy [kauften Sie] this pink-coloured dress? 4. I bought it yesterday from my cousin, the draper [Tuchhändler]. 5. Will [wollen] you give this book to this man or that? 6. I will not give it to either [Keinem].

LESSONS IN DRAWING.—VI.

BEFORE proceeding with the more practical part of our instructions upon drawing, we wish to offer a few words of advice respecting the advantages of the errors the pupil may frequently make, and to persuade him, that although errors must naturally occur, there is no reason for discouragement, so long as he understands them and can feel his way out of his difficulties in correcting them. All beginners are liable to make many and great mistakes; but it is not their number that ought to discourage; it is the not seeing them, which in the first place disheartens the master, and then when pointed out disheartens the pupil, if he has not the courage and capability to correct and avoid them for the future. In the practice of drawing, errors, when seen and understood, are quite as valuable as those portions of the drawing that are right; we know then as well what we ought not to do, as what we ought to do, and it is this knowledge of right and wrong that keeps us in the true path.

The first errors that a pupil will make will be in the arrangement of his subject; he will find them out the second time he looks it over before he begins to draw it. We advise him then only to "faint" them, not to obliterate them; they are useful by pointing out to him where he is not to draw his line; and they may be considered as beacons on a dangerous coast, warning him of the perils he is to avoid. Here is their advantage; when mistakes are totally effaced, it is as likely as not that the same errors may be repeated, or, what is equally bad, a fresh fault may be committed by drawing the line in an opposite extreme. It is a common thing to hear those who are struggling with their difficulties say, "It's all wrong, but where I cannot tell." The work may be all wrong, it is true; but that learners may be the better able to tell where the errors are, and how to correct them, it is necessary that teachers should take care to set up guide-posts in the shape of the rules and principles of the art, so that the safest and most direct path may be pointed out, and to put up warnings marked "dangerous," by which the inexperienced may be cautioned when they attempt to pursue what may appear to be shorter ways, but which lead only to discouragement and failure. We have often heard pupils say, "I have tried to draw this so many times, and I cannot do it." Of course not; leave off the drawing, and try the arrangement first. After what has been now said we resume our instructions with greater confidence, feeling sure that our pupils, knowing where they are likely to fall into error, will adhere closely to the course of procedure we have marked out for them.

We turn now to objects of a uniform character—viz., bottles, wine-glasses, vases, etc. We will first consider only their profile form—that is, the outward line when presented horizontally before the eye; afterwards we will exhibit them with their retiring parts. Fig. 45 is a bottle. Draw *ab*, a perpendicular line passing through the whole centre from the top to the bottom. In drawing objects of this class we advise the pupil always first to draw this perpendicular line, because from this line each way he may mark in the distances of the several parts as they approach or depart from it. The characteristic points of the outline are *c, d, e, f, g, h*, marked on both sides of the central straight line with a corresponding equidistance from it; therefore, if these points are carefully arranged with regard to their distances from each other, and from the centre, there will be very little difficulty in drawing through them the continued outline which will represent the object.

The wine-glass, Fig. 46, is another subject requiring the same mode of treatment; and the method we have given for drawing the bottle will apply here also.

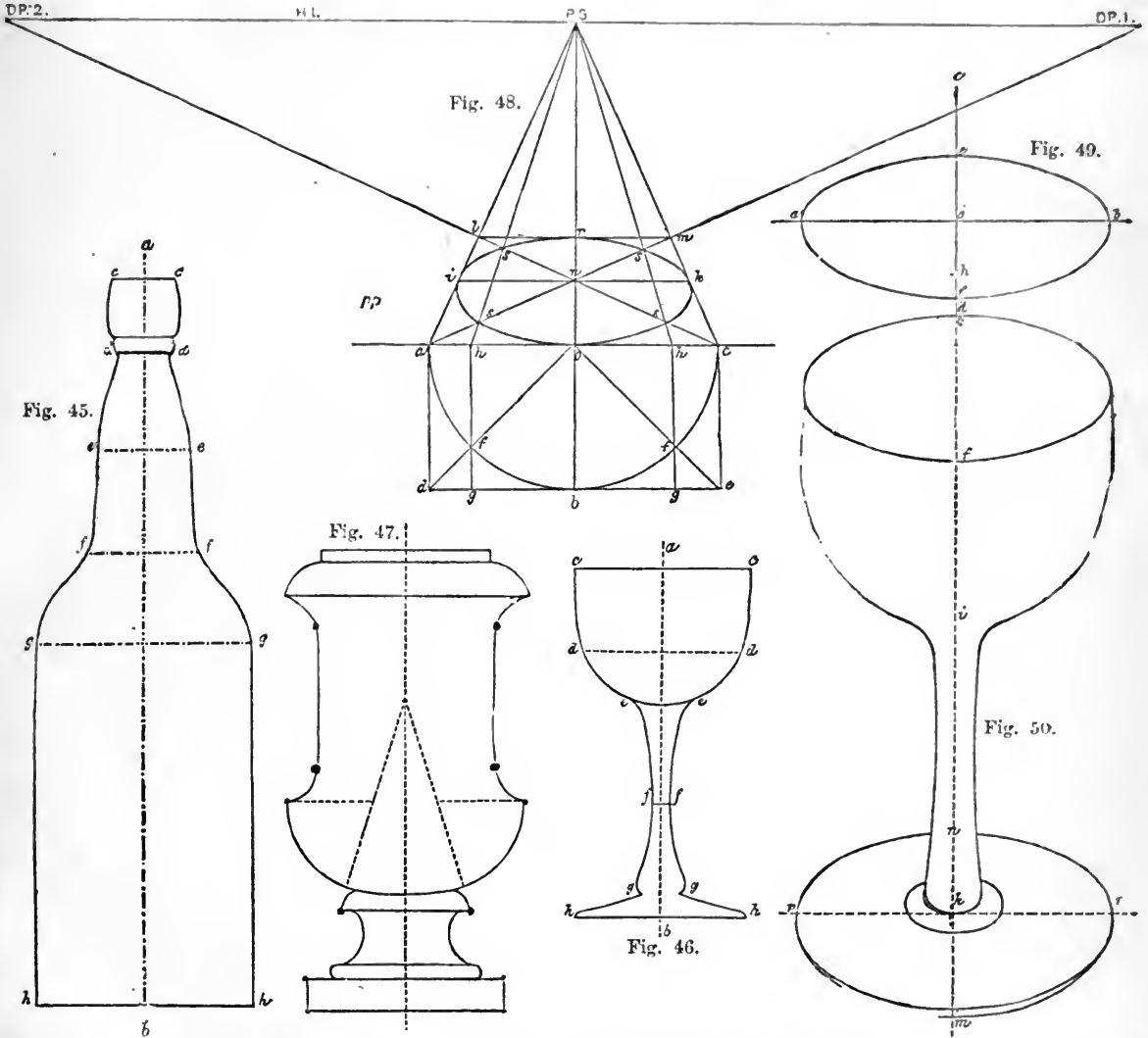
The vase, Fig. 47, is another example; the letters are not repeated here, simply because we wish the pupil to apply the above method of drawing it without our assistance; he will easily recognise the characteristic points and angles for himself. We propose now to draw these objects with their retiring parts, and, as they are for the most part circular at their extremities, we must first explain the geometrical method of drawing a circle in perspective. Many suppose that a circle in perspective is a true ellipse; such is not the case. If the pupil will examine Fig. 48, he will see that the portion above the central line *ik* is much smaller than the portion below *ik*, owing, as we have before stated, to the diminishing appearance of objects in perspective.

To draw Fig. 48, he must make use of parallel rulers and compasses. Begin, then, by ruling the plane of the picture, here represented by a line, because, the plane or surface of the picture being always considered in an upright position, the plan of that plane or surface would be a line. This will be fully explained when we enter into geometrical perspective. Draw the line of sight, *HL*, anywhere above, and parallel to, the plane of the picture; place the point of sight, *P*, *S*, and draw the line *PS* *o* *b* perpendicularly, or at right angles with the *HL* and picture plane; from *o*, as a centre, draw the semicircle *afbf*; about it describe the rectangle *adec*; draw *od* and *oe*; and through the points where these last lines cut the semicircle draw *hg* and *hg*. From *a* *h* *o* *h* and *c* respectively, draw lines to the *PS*. Place on each side of *PS* on the *HL* two points, *D* *P* 1 and *D* *P* 2. These are called *distance points*, and represent the distance of the eye from the picture plane—in this case, also, from the object, as the circle touches the picture plane. From *c* and *a* draw the diagonal lines *am* and *cl* towards the distance

points, $DP1$, $DP2$. Join lm ; $lmca$ will be a square in perspective, within which we draw the circle by hand as follows:—The point n , where the diagonals lc and am intersect each other, is the centre of $lmca$ (see p. 138); through this centre n draw the line ik parallel to ac . Now observe where the lines from hh cut the diagonals in s , s , s ; through these points, and also through $riok$, draw by hand the perspective circle as in the figure. We recommend the pupil to draw this figure several times, as it requires much practice to draw the perspective circle properly.

When this difficulty has been overcome, he may try to draw the circle without the geometrical perspective lines, as follows

more underneath the eye than the top, he has a more enlarged view of the base; through k draw pr , the diameter of the base, equal to the diameter ab of the top, and mark the distance kn , which, from its being lower to the eye than the distance oe of the upper circle, the line kn will be somewhat longer. (Now here, again, we should like to prove this by another geometrical drawing, but we decline it at present for reasons already stated; but the pupil may very easily, for his own satisfaction, draw again Fig. 48, placing the HL double the height from the plane of the picture as therein shown, keeping $DP1$ and $DP2$ the same distance from PS as before; the result will show him



(see Fig. 49):—First draw ab , according to the required width or diameter of circle, say the top of a wine-glass; through o , the centre of ab , draw the perpendicular cd , mark the point e from o (if the pupil has a glass before him, let him stretch a piece of thread over the top of the glass to represent ab ; he will then perceive that the distance oe must be regulated according to the view the object presents to the eye); make oh equal to oe , and divide oh into three equal parts, add one of these parts from h to f ; then through $aebf$ draw, by hand, the perspective view of the circle as in the copy. This, we allow, is an approximation, but sufficiently near for practical purposes. To complete the wine-glass, Fig. 50, continue the line cf to m any length; mark fi for the depth of the glass, and ik for the length of the stem. If the pupil will place a wine-glass before him on the table, he will notice that the circular base, being

that, when the circle is placed lower, the eye looks more upon it.) Proceed with km and the divisions as before, and draw by hand the circle through the points pnm . There is scarcely anything more difficult for a beginner than the circle, under any conditions; therefore we earnestly recommend him to practise it well from the foregoing instructions. Our reason for giving the above simple geometrical problem for constructing the perspective view of a circle is to satisfy the mind of the pupil upon the proportions and changes of its retiring dimensions, according as it is seen nearer to or further below the level of the eye. Let him raise the glass until the top is on a level with the eye; the top will then present a straight line; let him lower it gradually, and he will see that the retiring diameter of the circle seems to expand, until, when it is exactly under his eye (looking down upon it), it then presents the true circle.

LESSONS IN LATIN.—VI.

NOUNS, SUBSTANTIVE AND ADJECTIVE.—THE FIRST DECLENSION.

We now pass on to the several declensions. By declension, you know, is meant the manner of forming the cases of a noun.

FIRST DECLENSION.

Sign æ in the Genitive Singular.

CASE-ENDINGS WITH THE ENGLISH SIGNS.

Singular.		Plural.			
Cases.	LATIN.	ENGLISH.	Cases.	LATIN.	ENGLISH.
Nom.	-a	(subject)	Nom.	-æ	(subject)
Gen.	-æ	of	Gen.	-arum	of
Dat.	-æ	to or for.	Dat.	-is	to or for.
Acc.	-am	(object)	Acc.	-as	(object)
Voc.	-a	O!	Voc.	-æ	O!
Abl.	-a	by, with, or from.	Abl.	-is	by, with, or from.

Here you may remark that in the singular two case-endings are the same—namely, those of the nominative and the vocative, both being *a*; and that in the plural taken with the singular, four case-endings are the same—namely, in the plural those of the nominative and the vocative; in the singular, the genitive and the dative. This undoubtedly is a defect in the language. By practice only can you learn in reading to ascertain which, in any particular instance, the writer intended; the difficulty, however, is not so great as you might imagine.

EXAMPLE.

Mensa, æ, 1, fem., a table.

Cases.	Singular.	Cases.	Plural.
Nom.	Mensa, a table.	Nom.	Mensæ, tables.
Gen.	Mensæ, of a table.	Gen.	Mensarum, of tables.
Dat.	Mensæ, to a table.	Dat.	Mensis, to tables.
Acc.	Mensam, a table.	Acc.	Mensas, tables.
Voc.	Mensa, O table!	Voc.	Mensæ, O tables!
Abl.	Mensâ, by a table.	Abl.	Mensis, by tables.

Mensa is thus seen to consist of two parts. These two parts are the stem *mens* and the case-endings. To the stem *mens* add the several case-endings, and you form the several cases. Thus, if to *mens* you join *am*, you obtain the accusative singular; if to *mens* you add *orum*, you obtain the genitive plural; and so on with the rest.

Before you proceed further, you should make yourself perfectly master of the case-endings and the example. Exercise yourself in giving from memory any case-endings you may please to require; also in giving the corresponding English sign.

Observe that in the example, after the word *mensa, æ*, stand 1 and fem. Here 1 with a noun denotes the first declension, as afterwards 2 with a noun will denote the second declension, 3 with a noun the third declension, and so on; f. or fem. denotes the feminine gender, and intimates that *mensa* is a noun of the feminine gender. It may appear strange to you that a thing which in English is of the neuter "gender," as being without sex, should in the Latin be of the feminine gender. So, however, it is. In Latin, one way of determining gender is by the termination. Thus, all nouns ending in *a* (with an exception which will be pointed out by-and-by), are of the feminine gender. And as all nouns ending in *a* are of the first declension, so all nouns of the first declension, generally speaking, are of the feminine gender.

Decline the following nouns like *mensa* :—

Alauda, a lark.	Columba, a dove.	Puella, a girl.
Aquila, an eagle.	Insula, an island.	Silva, a wood.

Obs.—These nouns should be written out like the example *mensa*, from memory, distinguishing the case-endings and substituting the English to each case of each noun.

VOCABULARY.

A (prep.), by.	Gigno, 3, I produce.	Procella, a storm.
Aqua, water.	Herba, a herb.	Quam (adv.), how!
Ciconia, a stork.	Noceo, 2, I injure.	Rana, a frog.
Coaxo, 1, I coax.	Planta, a plant.	Sæpe (adv.), often.
Copia, abundance.	Præda, prey. [fully].	Terra, the earth.
Devoro, 1, I devour.	Pulchre (adv.), beauti-	Turbo, 1, I disturb.

Note that the preposition *a* becomes *ab*, for the sake of sound, before a vowel or a silent *h*.

EXERCISE 15.—LATIN-ENGLISH.

1. Rana coxat. 2. Rana sæpe est præda ciconiæ. 3. Ciconia nocet ranæ. 4. Ciconia devorat ranam. 5. O ranæ, coaxas. 6. Aqua turbatur a ranâ. 7. Planta florent. 8. Terra vestitur copiâ plantarum. 9. Procellæ nocent plantis. 10. Terra gignit plantas. 11. O plantæ, quam pulchre ornatis terram! 12. Terra vestitur plantis.

On this exercise I must give a few words of explanation. In the sentence *Ciconia nocet ranæ*, you have the object in the dative case. Generally the object is in the accusative case, but *noceo* is one of the verbs which govern their object in the dative instead of in the accusative case, as will be more fully set forth hereafter.

After the passive verb *turbatur*, you have the instrument *ranâ* with the preposition *a*; whereas after the passive verb *vestitur*, you have *copiâ* without the preposition. The reason is that, in Latin, when the instrument is a person or living creature, the preposition *a* is usual; but it is not used when, as in the second case, the instrument is a thing, that is, something without life.

Vestitur is not given in the vocabulary to this declension, because it has been given before. Here, as in other instances, words, the English of which has been previously stated, are repeated without the English, in order to secure attention and to assist the memory by repetition.

As the English sign of the dative is *to or for*, so you must use the one or the other as the sense requires. And as the English sign of the ablative is *by, with, or from*, so must you use either *by, or with, or from*, according as the English idiom requires.

EXERCISE 16.—ENGLISH-LATIN.

1. The plants flourish. 2. The storm injures the plant. 3. Plants are injured by the storm. 4. Frogs are swallowed by the stork. 5. The earth produces plants. 6. Plants are produced by the earth. 7. O plants, how beautifully are you produced by the earth! 8. I praise abundance of water. 9. The storm moves the waters. 10. The waters are moved by the storm.

After having learnt each vocabulary, you will do well to try to ascertain what words in it have representatives in English. These English representatives (denoted by the initials E. R.) are words in English derived more or less directly from the corresponding Latin words. Thus, from *agua* we have E. R. *aquatic*; from *copia*, we have E. R. *copious*; from *herba* we have E. R. *herb*; from *præda* we have E. R. *prey*; from *terra* we have E. R. *terrene*, etc. You will soon acquire skill in discovering the E. R. in all cases, and in the discovery you will gain an aid to memory, as well as an insight into the exact original meaning of many English words. Indeed, you should never allow a Latin word to pass you without endeavouring to ascertain whether it has any E. R., and if any, whether one or more, what they are, and what their signification.

Adjectives in the feminine gender are declined like *mensa*. This you see exemplified in the following example :—

DECLENSION OF SUBSTANTIVE AND ADJECTIVE. FIRST DECLENSION, FEMININE GENDER.

Cases.	Singular.	Cases.	Plural.
N.	Bona puella, a good girl.	N.	Bonæ puellæ, good girls.
G.	Bonæ puellæ, of a good girl.	G.	Bonarum puellarum, of good girls.
D.	Bonæ puellæ, to a good girl.	D.	Bonis puellis, to good girls.
Ac.	Bonam puellam, a good girl.	Ac.	Bonas puellas, good girls.
V.	Bona puella, O good girl!	V.	Bonæ puellæ, O good girls!
Ab.	Bonâ puellâ, by a good girl.	Ab.	Bonis puellis, by good girls!

EXERCISE.—After the same manner write out and learn by heart—

Alba rosa, a white rose.	Pulchra columba, a beautiful pigeon.
Magna præda, great booty.	Quadrata mensa, a square table.

VOCABULARY.

Ancilla, a maid-servant.	Est tibi, thou hast.	Mihi, to me.
Augusta, sacred.	Magna, great.	Tibi, to thee.
Est mihi, I have.	Mea, my.	Tua, thy.

Obs.—The Latin word *ne* is employed in asking a question, and is placed after a word and joined to the word it follows; the Latin word *an* is employed in asking a question, and is placed before a word or sentence; *nonne* asks a question with not included, as, *nonne vituperas? dost thou not blame?*

EXERCISE 17.—LATIN-ENGLISH.

1. Est mihi pulchra alauda. 2. Estne tibi pulchra alauda? 3. Mea alauda est pulchra. 4. Estne mea alauda pulchra? 5. Nonne est

tua lauda pulchra? 6. Tua columba valde est pulchra. 7. Est mihi bona ancilla. 8. Mea ancilla est pulchra. 9. Julia est augusta. 10. Julia augusta est pulchra. 11. Estne Julia augusta pulchra? 12. Alauda mea ancillæ est pulchra. 13. Tua mensa non est quadrata. 14. Magna est insula.

EXERCISE 18.—ENGLISH-LATIN.

1. I have a pigeon. 2. Thou hast a good girl. 3. Hast thou a good girl? 4. I have not a good girl. 5. Thy lark is beautiful. 6. Is not the island great? 7. The island is not great. 8. Hast thou a good maid-servant? 9. I have not a good maid-servant. 10. The lark of the girl (the girl's lark) is beautiful.

In *dea*, a goddess, and *filia*, a daughter, the dative and the ablative end in *abus*, instead of *is*; thus, *deabus*, to or by the goddesses; *filibus*, to or by the daughters. This change is made in order to distinguish the dative and the ablative cases of these feminine nouns from the same cases of the corresponding masculine nouns, namely, *deus*, a god; which has *deis* or *diis*, in the dative and ablative; and *filius*, a son, which has *filiiis*.

Nouns of the first declension which denote male beings are of the masculine gender (denoted by *m*). This fact remains a fact, though the termination of those nouns should happen to be feminine. Thus, *nauta*, a sailor, is masculine, though its termination is the same as that of *mensa*, a table, and *puella*, a girl. Masculine nouns of the first declension are declined like feminine nouns of the first declension. Observe, however, that they take their adjectives in the masculine; that is, the adjectives agree not in *form* but in *sense* with these masculine nouns of the first declension, as in the following example:—

DECLENSION OF SUBSTANTIVE AND ADJECTIVE.
FIRST DECLENSION—MASCULINE GENDER.

Singular.		Plural.	
N. Bonus nauta, a good sailor.	N. Boni nautæ, good sailors. [sailors.		
G. Boni nautæ, of a good sailor.	G. Bonorum nautarum, of good		
D. Bonus nautæ, to a good sailor.	D. Bonis nautis, to good sailors.		
Ac. Bonum nautam, a good sailor.	Ac. Bonus nautas, good sailors.		
V. Bone nauta, O good sailor!	V. Boni nautæ, O good sailors!		
Ab. Bono nauta, by a good sailor.	Ab. Bonis nautis, by good sailors!		

EXERCISE.—Write out after the same manner and learn by heart—

Bonus agricola, a good husbandman. | Magnus Nerva, great Nero.
Malus pirata, a bad pirate. | Trepidus auriga, a timid charioteer.

VOCAULARY.

Ad, to.	Jugurtha, Jugurthæ, an African prince.	Per, through.
Auriga, -æ, m., a charioteer.	Laudo, I, I praise.	Perfuga, -æ, m., a deserter.
Equa, -æ, a mare.	Magnopere, greatly.	Poeta, -æ, m., a poet.
Equito, I, I ride.	Navigo, I, I sail.	Silva, -æ, a wood.
Erro, I, I wander, I err.	Patria, -æ, one's native country, fatherland.	Tristitia, -æ, sadness.
		Umbra, -æ, a shade.

EXERCISE 19.—LATIN-ENGLISH.

1. Perfuga Jugurthæ est mihi. 2. Malus perfuga est tibi. 3. Poetam bonum laudo. 4. Bonus poeta laudatur. 5. Equa laudatur ab auriga. 6. Nautæ ad insulam navigant. 7. Boni nautæ patriam laudant. 8. Aquila a poetis sæpe laudatur. 9. Agricola magnopere delectatur plantis. 10. Erras, O nauta! 11. Nouno erratis, aurigæ? 12. Tristitia poetarum bonorum est mihi. 13. Umbras silvarum magnopere amo. 14. Agricola per silvam equitant.

EXERCISE 20.—ENGLISH-LATIN.

1. Hast thou a deserter? 2. Is the deserter bad? 3. Good poets are praised. 4. I praise good poets. 5. Good husbandmen praise (their) native country. 6. The native country of good poets is praised. 7. The pirate rides through the wood. 8. The sailor sails to the island. 9. The mare of the good charioteer is good.

LESSONS IN GEOGRAPHY.—VI.

DISCOVERIES OF THE EIGHTEENTH CENTURY.

In 1700 Dampier, at this time celebrated for his buccaneer (piratical) expeditions, discovered some new islands contiguous to New Guinea, or Papua. Wood Rogers sailed round the world in three years and three months; and encouraged by his successful expedition, the maritime powers proceeded to attempt similar enterprises, hitherto considered as extremely dangerous. Towards the end of the preceding century, France had also made expeditions into the Southern Ocean. Her first vessel which appeared in the Pacific Ocean was commanded by one

Lafouillade; but the voyage, which took place in 1667, produced no new discovery.

The discoveries of the Russians in the north of Asia must be noticed. At the beginning of the seventeenth century they knew nothing of the coasts of Siberia beyond the Yenisei. War and conquests laid open to the emperors the way to this immense region. In the space of less than a century, the whole of Northern Asia, from the frontiers of China to the Frozen Ocean, was brought under the dominion of Russia. Geography was benefited by this annexation, which gave to the Russians new facilities for performing useful explorations in these inhospitable countries. In 1728 Behring made the important discovery of the strait which separates Asia from America, and rendered the peopling of the New World no longer a question of difficulty or doubt.

The northern circumpolar regions had not been the theatre of any important expedition, from that of Baffin, above mentioned, until the middle of the eighteenth century. The era of scientific expeditions was now begun. Geography, so long retarded in her progress to perfection, proceeded with a sure and rapid step. This was the most brilliant period of the history of navigation from the time of the great discoveries of the sixteenth century. It was particularly remarkable for the positive character of its results. Bougainville, who had gained renown in the wars of Canada, anticipated that which he gained as a navigator, by an expedition to the Malouine or Falkland Islands, where he went to found a French colony in 1764. The circumnavigation of the world by Commodore Byron, also begun in the same year, produced very important results; and so did the voyages of Wallis and Carteret, in clearing up some practical questions relating to the geography of Oceania. Carteret, in particular, determined the geographical positions (that is, the latitudes and longitudes) of several islands in the direction of New Britain; his vessel having been the first English man-of-war which had touched at the island of Celebes. Three years after his first voyage, in 1767, Bougainville undertook his grand expedition to circumnavigate the globe. After a short stay in the river La Plata, he was detained in the Strait of Magellan no less than fifty-two days. He then entered the South Pacific Ocean, or South Sea, as it was then called, and discovered the islands of Pomotou, which he called the Dangerous Archipelago. He then entered the chief port of Tahiti, or Otahite; and his transactions with the inhabitants of New Cythera were not only pacific but amicable. He next visited the Samoa or Navigator's Islands, touched at Papua or New Guinea, discovered to the east of it an assemblage of islands which he called the Louisiade Archipelago, several of the Admiralty Isles, and another called by his own name near Solomon Isles. In the same direction he discovered several other islands of less importance, which had been seen by other navigators; and having visited New Ireland, discovered by Carteret, he arrived at Batavia; whence he sailed to Europe by the Cape of Good Hope. This expedition was well received in France and in Europe; it had made several important discoveries, and had been marked with interesting episodes which were related with spirit and talent; and created a still greater desire for circumnavigating expeditions.

The greatest navigator of modern times is acknowledged to be Captain James Cook. His first voyage to the Pacific had for its grand object the observation of the transit of Venus, that is, the passage of this planet in its orbit over the disc of the sun, a phenomenon alike important in astronomy, navigation, and geography. Having received his promotion from the rank of master in the Royal Navy to that of lieutenant, he was put in command of the *Endeavour*, a small ship of 370 tons, in which he left England in August, 1768. After touching at Rio de Janeiro, he proceeded to the Strait of Lemaire, in order to double Cape Horn. Tierra del Fuego did not present to him such a dreadful aspect as it did to Wallis; the naturalists of the expedition, Sir Joseph Banks and his friend Dr. Solander, a Swedish gentleman, a pupil of the eminent botanist Linnaeus, collected there some plants and animals. One of their excursions, however, nearly proved fatal to them. Having ascended a mountain whose vegetable products they wished to examine, they were overtaken by the shades of evening and the coldness of a severe frost. Dr. Solander was on the point of perishing under its influence, when the wise impertunity, or rather pertinacity, of his companions saved his life, by hindering him from

giving way to sleep, the forerunner of death. Having spent several hours in great distress, and having witnessed two of their servants sink under its power, the imprudent explorers with much difficulty reached the coast. After this delay in the Strait of Magellan, Cook stood out for Tahiti, where the astronomical observations entrusted to the care of the expedition were to be made.

The natives of Tahiti welcomed this expedition in the same way as they had done that under Bougainville, in a hospitable and agreeable manner. During their three months' residence in this island, Cook and his learned companions made an ample collection of specimens of its natural history, and of observations on the manners and customs of its natives. They then visited several other islands of the Tahitian group, and gave to the whole archipelago the name of the Society Islands. They explored New Zealand, and found the natives the very opposite of the Tahitians in their disposition, both hostile and cruel. They discovered that this country, supposed to have been a single island, consisted of two separate islands divided by a

expedition proceeded directly southward; but in latitude $67^{\circ} 13' S.$ it met with rocks which appeared to be impassable. No attempt was made to get beyond this obstacle, and the expedition returned northward to the nearest cape, under the conviction that if any southern continent existed, it could only be at a very great distance, and quite in the vicinity of the south pole. The two vessels, which were separated from each other among the ice, proceeded to New Zealand, where they again met. After useless explorations to the east of this island, as far as the 46th parallel of latitude, Captain Cook made for the Society Islands, where he remained until the health of the expedition was recruited.

A second attempt to discover the southern continent soon brought the expedition to latitude $71^{\circ} S.$, but here again the passage to the south was blocked up by ice, and it was obliged to return northwards. In a new exploration of the seas of Oceania, Captain Cook re-discovered Easter Island, which Commodore Byron, Carteret, and Bougainville had searched for in vain; he also discovered some new islands belonging to the



NEW ZEALANDERS.

CAPTAIN COOK.

SIR JOSEPH BANKS.

strait, which now bears the name of Cook; but they durst not examine the interior of the country, as it would have been too dangerous to have ventured into the midst of a race of cannibals, whose savage habits were very soon observed by the expedition. Cook left the shores of New Zealand on the 31st of March, 1770, and in twenty days afterwards beheld those of New Holland, or Australia, where he discovered Botany Bay, an inlet on which stands Sydney, the metropolis of our Australian colonies, and one of the most important of our colonial settlements. Proceeding northward, he was nearly shipwrecked in latitude $16^{\circ} S.$ by the vessel striking on a coral rock. The *Endeavour* was providentially saved, and enabled to reach a small harbour where she was repaired, and put into a condition to resume her homeward voyage, which she completed without meeting any further disaster.

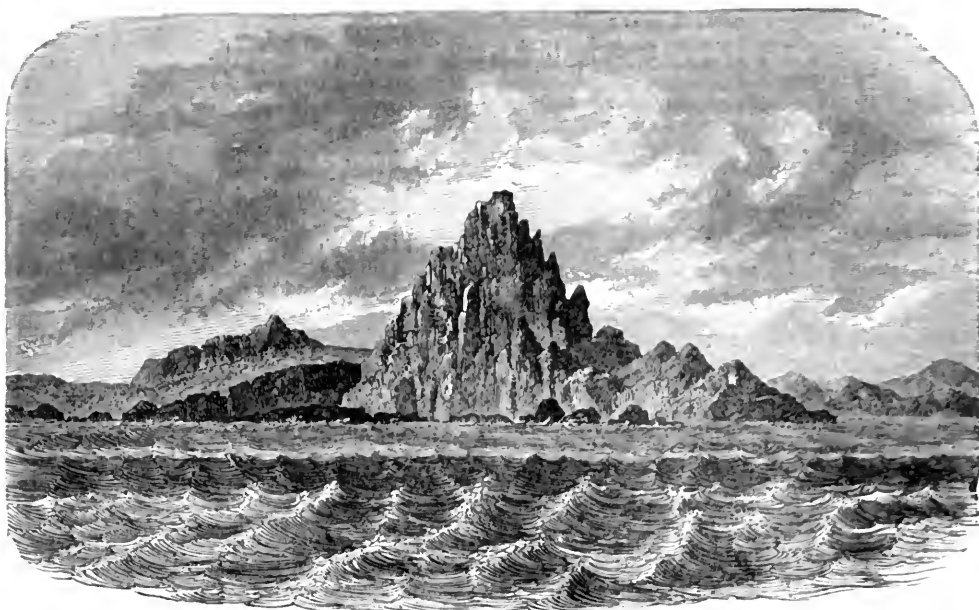
The second voyage of Captain Cook, undertaken in July, 1772, had for its object the discovery of that great southern land which had been for ages supposed by navigators and geographers to exist in the southern part of the Great Pacific Ocean, and which Abel Tasman fancied he had seen when he landed on New Zealand. Two vessels called the *Resolution* and the *Adventure* were put under the command of Captain Cook. The

Marquesas group, returned to Tahiti, and re-visited Tongataboo and the Friendly Islands, where he discovered Savage Island, and Batoa or Turtle Island, belonging to the group of the Feejee Islands; he then re-established several points of New Guinea, and discovered Tanna, Erromango, and several other islands of the group called the New Hebrides, as well as New Caledonia and Norfolk Island. The point of departure for a third exploration of the Antarctic or Southern Seas was New Zealand. Captain Cook endeavoured to reach the south pole in a more easterly direction than formerly. Having arrived at latitude $55^{\circ} 48' S.$, he sailed towards Cape Horn, and continued his route towards the east. In this route he discovered the island of South Georgia, to the east of Tierra del Fuego; and south-east of the former a group of islands which he called Sandwich Land. Here he terminated his voyage toward the southern circumpolar regions. He had circumnavigated the globe in high southern latitudes, and had demonstrated that no southern continent existed in the immense zone which he had explored. The hypothesis of its existence was thrown many degrees nearer the south pole; and the illusion of this problematic continent, so richly endowed by nature, was dissipated for ever!

In this remarkable expedition Captain Cook was absent from

England more than three years; and he arrived at Portsmouth on the 13th of July, 1775. In the interval, some other voyages were made in the South Seas; and the islands of Marion and Crozet, as well as that called Kerguelen Land, were discovered

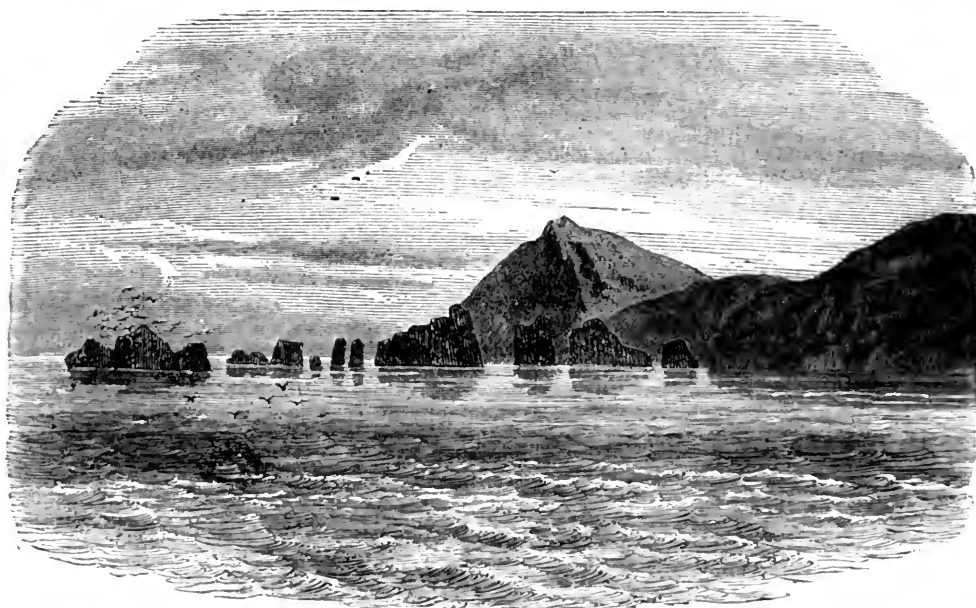
islands of Watehoo and Otakootai, in the same seas. Sailing to the north of Tahiti, he arrived at the Sandwich Islands, where he was taken for a superior being, and as such received by the natives. On the 1st of January, 1778, he made the discovery



CAPE HORN, THE MOST SOUTHERLY POINT OF SOUTH AMERICA, IN LAT. $55^{\circ} 59'$ S., LONG. $67^{\circ} 16'$ W.

by the navigators whose name they bear. Again the indefatigable Cook resumed his voyages of discovery. This time he intended to search for the north-west passage to India, by passing through Behring Strait. He left England on the 12th of

of this important group. Captain Cook then prepared for the accomplishment of the principal object of the expedition. He sailed along the north-western coast of the New World, until he reached a point of land which he called Icy Cape, in latitude



ANOTHER VIEW OF CAPE HORN.

July, 1776, with the ships *Resolution* and *Discovery* under his command. He first visited the islands above mentioned, and then touched at Van Diemen's Land and New Zealand. Soon after he discovered the central Polynesian group Tonbouai, the archipelago of Hervey Islands or Menaian group, and the

$70^{\circ} 27'$. Here a solid mass of ice, ten feet thick, extending to the opposite coast of Asia, presented to him an insuperable barrier. He returned to the Sandwich Islands, where, alas! his fate awaited him. On the island in this archipelago called Owwhyhee, he fell by the hands of a savage; and thus, unfortu-

nately, ended the life of the greatest navigator of modern times. Captain Clerke, who was second in command, took charge of the expedition, and sailed to the north-east in search of the passage to the Atlantic; but the same obstacles compelled him to abandon the enterprise, and he died on the voyage home.

To attempt to describe all the benefits which the discoveries of Captain Cook have conferred on the sciences of geography and hydrography, is more than can be done in this historical sketch of these memorable expeditions. The accuracy with which this illustrious navigator determined the geographical positions of the places which he discovered or visited, rectified numerous errors in the maps and charts of the century in which he flourished, and accelerated the progress of the science to which these remarks form our introduction, in a degree hitherto unknown. Mathematical geography has, since this time, taken her place among the exact sciences.

In concluding this lesson, we may remark that Cook lifted the veil of darkness which hung over the extremities of the Pacific Ocean, and the junction of the continents of Asia and America. His last voyage, by disclosing the vast breadth of America at the latitude of Behring Strait, made the hopes of discovering the north-western passage darker than ever. That continent had, previous to the time of the English navigator, been considered as terminating to the north in a point or cape, after passing which, the navigator would find himself at once in the South Seas, and in full sail to China or Japan. But the discovery of Cook showed that there was found intervening a space of land of nearly three thousand miles in breadth, a very large portion of the circumference of the globe. Hence, geographers viewing the coast running northward from Behring Strait, Hudson Bay, and Baffin Bay, all enclosed by land, received the impression, and constructed their maps accordingly, that an unbroken mass of land reached onwards to the pole, and that all these boundaries were for ever barred against the enterprising navigator.

LESSONS IN ARITHMETIC.—XI.

FRACTIONS (continued).

10. To reduce fractions to equivalent fractions having the same denominator.

RULE.—Find the least common multiple of all the denominators. Multiply the numerator and denominator of each fraction by the quotient obtained from dividing the least common multiple by that denominator.

EXAMPLE.—Reduce $\frac{2}{9}$, $\frac{5}{7}$, $\frac{6}{10}$, $\frac{7}{12}$ to a common denominator. 1260 is the least common multiple of 9, 7, 10, 12 (see page 134), and the quotients of 1260 by these respectively are 140, 180, 126, 105. Multiplying each numerator and each denominator by these numbers respectively, we get $\frac{280}{1260}$, $\frac{900}{1260}$, $\frac{756}{1260}$, $\frac{735}{1260}$, which are fractions equivalent to the given ones, and all of which have the same denominator.

It may be observed that the common denominator found in this case is the *least*. Any common multiple of the denominator of the original fractions would have given fractions with the same common denominator; but the least common multiple gives, of course, the least common denominator.

11. Fractions may also often conveniently be made to have the same denominator by the following method:—Multiply each numerator into all the denominators except its own for a new numerator, and all the denominators together for a common denominator. The reason of this will be clearly seen from an

EXAMPLE.—Reduce $\frac{2}{3}$, $\frac{5}{6}$, $\frac{7}{9}$ to fractions having the same common denominator.

Following the rule, we get for the first fraction—

$$\frac{2 \times 6 \times 5 \times 9}{3 \times 6 \times 5 \times 9}$$

where we have multiplied the numerator 2, and denominator 3, by $6 \times 5 \times 9$, the product of the denominators of the other fractions. The fractions will therefore be—

$$\frac{2 \times 6 \times 5 \times 9}{3 \times 6 \times 5 \times 9}, \quad \frac{5 \times 3 \times 5 \times 9}{3 \times 6 \times 5 \times 9}, \quad \frac{3 \times 3 \times 6 \times 9}{3 \times 6 \times 5 \times 9}, \quad \frac{7 \times 3 \times 6 \times 5}{3 \times 6 \times 5 \times 9}$$

Or, $\frac{540}{810}, \quad \frac{675}{810}, \quad \frac{486}{810}, \quad \frac{630}{810}$

Here, evidently, the common denominator is not the *least*, inas-

much as $3 \times 6 \times 5 \times 9$, the common multiple of 3, 6, 5, and 9, which we have taken, is not the *least* common multiple.

12. We are enabled by this means to find which of two fractions is the greater. For instance, if we wished to know which of the four fractions given in Art. 11 is the greatest, having reduced them to a common denominator, 810, we are able to say that the second fraction, $\frac{5}{6}$, is the greatest, because it contains the greatest number of the 810 parts into which the unit is divided, viz., 675; and in the same way we see that the order of magnitude of the four fractions is $\frac{5}{6}, \frac{7}{9}, \frac{2}{3}, \frac{3}{5}$.

EXERCISE 24.

Place in order of magnitude the following sets of fractions:—

- | | | |
|---|---|--|
| 1. $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{9}$. | 3. $\frac{3}{8}, \frac{5}{10}, \frac{7}{12}, \frac{9}{15}$. | 5. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |
| 2. $\frac{1}{4}, \frac{2}{5}, \frac{3}{6}, \frac{4}{7}$. | 4. $\frac{1}{10}, \frac{2}{15}, \frac{3}{20}, \frac{4}{25}$. | 6. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |

13. Addition of Fractions.

Required to add $\frac{2}{3}$ and $\frac{3}{5}$ together. Reducing the fractions to a common denominator, $\frac{2}{3} = \frac{10}{15}$, and $\frac{3}{5} = \frac{9}{15}$:

Therefore $\frac{2}{3} + \frac{3}{5} = \frac{10}{15} + \frac{9}{15} = \frac{19}{15}$;

or, as it could be written, $1\frac{4}{15}$ (Art. 5). We have here effected the addition, i.e., found a single fraction which is equal to the sum of the two given ones, by reducing the fractions to a common denominator, 15.

The same method will apply to any other two or more fractions. Hence we are able to enunciate the following

Rule for the Addition of Fractions.

Reduce the fractions to a common denominator, add the new numerators so formed for a numerator, and take the common denominator for a denominator. The single fraction so formed will be the sum of the given fractions.

Obs.—It will generally be most convenient to reduce each fraction, before commencing the operation, to its lowest terms, if it is not already in them, and then to take the *least* common denominator.

EXERCISE 25.

Add together the following sets of fractions:—

- | | | |
|---|---|---|
| 1. $\frac{2}{3}$ and $\frac{1}{2}$. | 6. $\frac{5}{8}, \frac{3}{10}, \frac{7}{12}, \frac{9}{15}$. | 11. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |
| 2. $\frac{2}{7}, \frac{3}{8}, \frac{4}{9}$. | 7. $\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{3}{7}$. | 12. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |
| 3. $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}$. | 8. $\frac{1}{10}, \frac{2}{15}, \frac{3}{20}, \frac{4}{25}$. | 13. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |
| 4. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$. | 9. $\frac{21}{10}, \frac{35}{15}, \frac{49}{20}, \frac{63}{30}$. | 14. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |
| 5. $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{9}$. | 10. $\frac{1}{10}, \frac{2}{15}, \frac{3}{20}, \frac{4}{25}$. | 15. $\frac{1}{10}, \frac{13}{20}, \frac{2}{3}, \frac{7}{9}$. |

14. Subtraction of fractions.

The operation of *subtracting* one fraction from another will evidently be effected in the same manner. Thus, to *subtract* $\frac{2}{3}$ from $\frac{3}{5}$, we have, as above,

$$\frac{3}{5} - \frac{2}{3} = \frac{13}{15} - \frac{10}{15},$$

and 9 fifteenths subtracted from 10 fifteenths is 1 fifteenth, i.e., $\frac{1}{15}$.

Hence $\frac{3}{5} - \frac{2}{3} = \frac{1}{15}$.

Hence the following

Rule for the Subtraction of Fractions.

Reduce the two fractions to a common denominator, subtract the less numerator from the greater for a numerator, and take the common denominator for a denominator. The fraction so formed will be the difference of the given fractions.

The same observation with respect to the *least* common denominator, which was made with reference to the rule for Addition, evidently applies equally to that for Subtraction.

N.B.—In all cases a whole number must be treated as a fraction having a denominator unity. For instance, to subtract $\frac{2}{3}$ from 2. $2 = \frac{2}{1} = \frac{2}{3}$.

Therefore $2 - \frac{2}{3} = \frac{6}{3} - \frac{2}{3} = \frac{4}{3} = 1\frac{1}{3}$.

EXERCISE 26.

1. Find the difference between—

- | | | |
|--------------------------------------|---------------------------------------|--|
| 1. $\frac{2}{3}$ and $\frac{1}{2}$. | 5. $\frac{2}{3}$ and $\frac{1}{4}$. | 9. $83\frac{1}{2}$ and $100\frac{1}{10}$. |
| 2. $\frac{2}{7}$ and $\frac{3}{8}$. | 6. $\frac{2}{3}$ and $\frac{3}{4}$. | 10. $230\frac{1}{2}$ and $160\frac{1}{10}$. |
| 3. $\frac{2}{3}$ and $\frac{1}{4}$. | 7. $\frac{2}{3}$ and $\frac{3}{4}$. | 11. 1 and $\frac{2}{3}$. |
| 4. $\frac{1}{2}$ and $\frac{3}{4}$. | 8. $5\frac{1}{3}$ and $\frac{2}{3}$. | 12. 5 and $\frac{2}{3}$. |

2. Simplify the following expressions:—

- $3 - \frac{2}{3} + \frac{2}{3} - \frac{4}{9}$.
- $9\frac{1}{2} - 7\frac{3}{4} - \frac{1}{2}$.
- $127\frac{1}{10} - \frac{2881}{10} + 5786\frac{3}{10} + 1428\frac{7}{10}$.
- $41\frac{1}{2} - \frac{1}{2} + 106\frac{3}{4} - \frac{1}{4} + 300\frac{1}{2} + 41\frac{3}{4} + 47\frac{1}{2} - 230\frac{1}{10}$.

EXERCISE 27.

MISCELLANEOUS EXAMPLES IN FRACTIONS.

1. Reduce the following given fractions to fractions of the same value, and having a common denominator:—

- | | |
|--|---|
| 1. $\frac{1}{2}$ and $\frac{1}{3}$. | 6. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$. |
| 2. $\frac{2}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. | 7. $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. |
| 3. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$. | 8. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. |
| 4. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. | 9. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. |
| 5. $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. | 10. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$. |

2. Which of the two fractions $\frac{2}{3}$ and $\frac{1}{2}$ is the greater; what is the difference between them; and what is their sum?

3. Two persons, A and B, are shareholders in different companies; A has £320,000 of stock in a company worth £560,000; and B has £480,000 of stock in a company worth £840,000; which of them has the largest fraction of the concern to which he belongs?

4. Find the integral or mixed value of the following fractions:— $\frac{15}{4}$, $\frac{17}{3}$, $\frac{23}{5}$, $\frac{45}{8}$, and $\frac{117}{10}$.

5. Find the integral or mixed value of the fractions $\frac{37}{3}$, $\frac{67}{7}$, $\frac{707}{10}$, $\frac{33}{11}$, $\frac{29}{13}$, $\frac{47}{12}$, and $\frac{53}{14}$.

6. Reduce the whole numbers 25, 48, 301, 4000, and 5876934 to improper fractions.

7. Reduce the preceding whole numbers to improper fractions whose denominators shall be 12, 6, 5, 4, and 2 respectively.

8. Reduce the following mixed numbers to improper fractions:— $5\frac{1}{2}$, $7\frac{1}{3}$, $12\frac{1}{4}$, $18\frac{1}{5}$, $101\frac{1}{6}$, and $1234\frac{1}{7}$.

9. Reduce the following mixed numbers to improper fractions:— $15\frac{1}{2}$, $17\frac{1}{3}$, $25\frac{1}{4}$, $49\frac{1}{5}$, $31\frac{1}{6}$, and $211\frac{1}{7}$.

10. Reduce the following compound fractions to simple fractions:— $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$; $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$; and $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$.

11. Reduce the following compound fractions to simple fractions:—

- | | |
|--|--|
| 1. $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$. | 4. $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$. |
| 2. $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$. | 5. $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$. |
| 3. $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$. | 6. $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$ of $\frac{7}{8}$. |

12. Find the sum of the following fractions and mixed numbers:—

- | | |
|--|---|
| 1. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. | 4. $5\frac{1}{2}$, $6\frac{1}{3}$, $7\frac{1}{4}$, and $21\frac{1}{5}$. |
| 2. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. | 5. $11\frac{1}{2}$, $18\frac{1}{3}$, $19\frac{1}{4}$, and $1\frac{1}{5}$. |
| 3. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$. | 6. $635\frac{1}{2}$, $427\frac{1}{3}$, and $1625\frac{1}{4}$. |

13. Find the difference of the following fractions and mixed numbers:—

- | | |
|--|---|
| 1. Between $\frac{1}{2}$ and $\frac{1}{3}$. | 4. Between $4\frac{1}{2}$ and $2\frac{1}{3}$. |
| 2. Between $\frac{2}{3}$ and $\frac{1}{4}$. | 5. Between 1306 $\frac{1}{2}$ and 708 $\frac{1}{3}$. |
| 3. Between 1 and $\frac{1}{2}$. | 6. Between $49\frac{1}{2}$ and $24\frac{1}{3}$. |

LESSONS IN ENGLISH.—VI.

HAVING thus furnished you with some criteria or means of ascertaining what words have their origin in Saxon, or, as it is more correctly called, the Teutonic branch of our language, I must now request, that in all your studies you will constantly ask yourself, whether each word you meet with, is, or is not, of Saxon derivation? Among English writers, no one has a larger portion of Saxon in his compositions than Dean Swift; and no one writes the language more correctly. I shall therefore make use of his writings in this part of my task. William Cobbett's works may be advantageously studied for the Saxon treasures which they contain.

EXERCISES IN PARSING.

It is a miserable thing to live in suspense. To live in suspense, is to live the life of a spider. No wise man ever wished to be younger. An idle reason lessens the weight of good reasons. Complaint is the largest tribute paid to heaven. Complaint is the sincerest part of our devotion. Praise is the daughter of present power. Every man desires to live long. No man is willing to be old. Kings are said to have long hands. Kings ought to have long ears. Vision is the art of seeing things invisible. Good manners is the art of making associates easy. Flattery is the worst and falsest way of showing our esteem. A fine gentleman has both wit and learning. Come into the garden, Maud. He gave me half-a-crown for my trouble. The king's crown is made of solid gold.

The reader may exercise his ingenuity, as well as his grammar, while he discovers the explanation of a riddle of the learned Dean, which is appropriate to my subject:—

"We are little airy creatures,
All of different voice and features;
One of us in glass is set,
One of us you'll find in jet;
T'other you may see in tin,
And a fourth a box within;
If the fifth you should pursue,
It can never fly from you."

An excellent practice in composition is letter-writing. I shall therefore give, in this lesson, some specimens of epistolary correspondence. And I advise my pupils to accustom themselves to express their thoughts in the form of letters. Let the letters be real; I mean, let them be written, not as exercises in composition, but on some business, and to some friend or acquaintance. Your chief want at first, as I have before intimated, is the want of matter. "I don't know what to say," is a complaint with young composers no less true than embarrassing. You will find something to say if you take your pen in hand, and sit down to address a few lines to an absent friend. Only do not attempt anything great or fine. Be simple. Consult your heart, if your head is silent. Just say what occurs to you, without being anxious whether it is very wise or very foolish; whether it is trivial or imprudent. Specially would I advise my pupils to correspond one with another. For instance, say that a young man in Exeter writes a letter to a former companion who has gone to reside at Bristol. B., living at Bristol, replies to his friend A. at Exeter. The two continue to interchange letters. If they have nothing else to write about, they may write about these lessons. Let them endeavour to give each other aid in their study of the English language. Let them freely and kindly criticise each other's letters. Let them ask and give explanations. Let A. correct B.'s exercises, and let B. do the same for A. Let them agree on some book which they will both read, with a view to make in writing and submit to each other remarks on the composition. For this purpose I would suggest to them the *Spectator*, in which they will find many papers by Addison and other eminent writers.

In this counsel I have mentioned young men, by no means intending to exclude young women. Most desirous am I that young women should receive a good education. Most necessary to them, as being the future mothers of our land, is a good education. A far better education ought they to receive than the best which they do receive. But to be well-educated they must be self-educated. Let young women then consider themselves specially addressed in the lessons I supply, and the advice I give.

LETTER I.

FROM DEAN SWIFT TO THE REV. WILLIAM DRAPER.

To the Rev. Mr. William Draper,
Dean, near Basingstoke, Hampshire.

London, April 13, 1713.

SIR,—I am ashamed to tell you how ill a philosopher I am, and that a very ill situation of my affairs for three weeks past made me utterly incapable of answering your obliging letter, and thanking you for your most agreeable copy of verses. The prints will tell you that I am condemned again to live in Ireland; and all that the court and ministry did for me, was to let me choose my situation in the country where I am banished. I could not forbear showing both your letter and verses to our great men, as well as to the men of wit of my acquaintance; and they were highly approved of by all. I am altogether a stranger to your friend Oppian; and am a little angry when those who have a genius lay it out in translations. I question whether "Res angusta domi" (narrow means) be not one of your motives. Perhaps you want such a bridle as translation, for your genius is too fruitful, as appears by the frequency of your smiles; and this employment may teach you to write like a modest man, as Shakespeare expresses it.

I have been minding my Lord Bolingbroke, Mr. Harcourt, and Sir William Windham, to give you a living; as a business which belongs to our society, who assume the title of awarers of merit. They are very well disposed, and I shall not fail to negotiate for you while I stay in England, which will not be above six weeks; but I hope to return in October, and if you are not then provided for, I will move heaven and earth that something may be done for you. Our society has not met of late, else I would have moved to have two of us sent in form to request a living for you from my lord chanceller; and if you have any way to employ my services, I desire you will let me know it; and believe me to be very sincerely,

Sir,
Your most faithful, humble servant,

JONATHAN SWIFT.

LETTER II.

FROM CHARLES LAMB TO SAMUEL TAYLOR COLERIDGE.

[Giving a detailed account of the death of his mother, who was stabbed by his sister, in a fit of delirium.]

October 3rd, 1796.

MY DEAREST FRIEND.—Your letter was an inestimable treasure to me. It will be a comfort to you, I know, to know that our prospects are somewhat brighter. My poor dear, dearest sister, the unhappy and unconscious instrument of the Almighty's judgments on our house, is restored to her senses; to a dreadful sense and recollection of what has passed, awful to her mind and impressive (as it must be to the end of life), but tempered with religious resignation, and the reasonings of a sound judgment, which, in this early stage, knows how to distinguish between a deed committed in a transient fit of frenzy, and the terrible guilt of a mother's murder. I have seen her. I found her, this morning, calm and serene; far, very far from an indecent forgetful serenity; she has a most affectionate tender concern for what has happened. Indeed, from the beginning, frightful and hopeless as her disorder seemed, I had confidence enough in her strength of mind and religious principle, to look forward to a time when *she* she might recover tranquillity.

God be praised, Coleridge, wonderful as it is to tell, I have never once been otherwise than collected and calm; even on the dreadful day, and in the midst of the terrible scene, I preserved a tranquillity which bystanders may have construed into indifference—a tranquillity not of despair. Is it folly or sin in me to say that it was a religious principle that most supported me? I allow much to other favourable circumstances. I felt that I had something else to do than to regret. On the first evening (September 22nd), my aunt was lying insensible, to all appearances like one dying,—my father, with his poor forehead plastered over, from a wound he had received from a daughter dearly loved by him, and who loved him no less dearly,—my mother, a dead and murdered corpse in the next room—yet I was wonderfully supported. I closed not my eyes in sleep that night, but lay without terrors and without despair. I have lost no sleep since. I had been long used not to rest in things of sense,—had endeavoured after a comprehension of mind, unsatisfied with the "ignorant present time," and this kept me up. I had the whole weight of the family thrown on me; for my brother, little disposed (I speak not without tenderness for him) at any time to take care of old age and infirmities, had now, with his bad leg, an exemption from such duties, and I was now left alone.

I mention these things because I hate concealment, and love to give a faithful journal of what passes within me. Our friends are very good. Sam Le Grice, who was then in town, was with me the first three or four days, and was as a brother to me. He gave up every hour of his time, to the very hurting of his health and spirits, in constant attendance and humouring my poor father; talked with him, read to him, played at cribbage with him (for so short is the old man's recollection, that he was playing at cards as though nothing had happened, while the coroner's inquest was sitting over the way)!

Of all the people I ever saw in the world, my poor sister was most and thoroughly devoid of the least tincture of selfishness. I will enlarge upon her qualities, poor dear, dear soul, in a future letter, for my own comfort, for I understand her thoroughly; and, if I mistake not, in the most trying situation that a human being can be found in, she will be found (I speak not with sufficient humility, I fear, but humanly and foolishly speaking), she will be found, I trust, uniformly great and amiable. God keep her in her present mind, to whom be thanks and praise for all His dispensations to mankind!

C. LAMB.

LETTER III.

FROM LADY MARY WORTLEY MONTAGU TO HER SISTER, THE COUNTESS OF MAR.

[Giving a brief description of her journey from Ratisbon to Vienna, and some account of the last-named city.]

Vienna, September 8th, 1716.

I am now, my dear sister, safely arrived at Vienna; and, I thank God, have not at all suffered in my health, nor (what is dearer to me) in that of my child, by all our fatigues.

We travelled by water from Ratisbon, a journey perfectly agreeable, down the Danube, in one of those little vessels, that they very properly call wooden houses, having in them almost all the conveniences of a palace—stoves in the chambers, kitchens, etc. They are rowed by twelve men each, and move with an incredible swiftness, that in the same day you have the pleasure of a vast variety of prospects; and, within a few hours' space of time, one has the different diversion of seeing a populous city adorned with magnificent palaces, and the most romantic solitudes, which appear distant from the commerce of mankind, the banks of the Danube being charmingly diversified with woods, rocks, mountains covered with vines, large cities, and ruins of ancient castles. I saw the great towns of Passau and Linz, famous for the retreat of the Imperial Court when Vienna was besieged.

This town, which has the honour of being the Emperor's residence, did not at all answer my idea of it, being much less than I expected to find it; the streets are very close, and so narrow one cannot observe the fine fronts of the palaces, though many of them very well deserve observation, being truly magnificent, all built of fine white stone, and excessively high. The town being so much too little for the number of people that desire to live in it, the buildings seem to have been projected to repair that misfortune by clapping one town on the top of another, most of the houses being of five, and some of them of six storeys. You may easily imagine that the streets being so narrow, the lower rooms are extremely dark, and what is an inconvenience much more intolerable, in my opinion, there is no house that has so few as five of six families in it. The apartments of the greatest ladies, and even of the ministers of state, are divided but by a partition from that of a tailor or a shoemaker; and I know nobody that has above two floors in any house, one for their own use, and one higher for their servants. Those who have houses of their own, let out the rest of them to whoever will take them; thus the great stairs (which are all of stone) are as common and as dirty as the street. 'Tis true, when you have once travelled through them, nothing can be more surprisingly magnificent than the apartments. They are commonly a suite of eight or ten large rooms, all inlaid, the doors and windows richly carved and gilt, and the furniture such as is seldom seen in the palaces of sovereign princes in other countries—the hangings the finest tapestry of Brussels, prodigious large looking-glasses in silver frames, fine Japan tables, beds, chairs, canopies, and window curtains of the richest Genoa damask or velvet, almost covered with gold lace or embroidery, the whole made gay by pictures and vast jars of Japan china, and almost in every room large lustres of rock crystal.

I have already had the honour of being invited to dinner by several of the first people of quality, and I must do them the justice to say the good taste and magnificence of their tables very well answers to that of their furniture. I have been more than once entertained with fifty dishes of meat, all served in silver, and well dressed, the dessert proportionable, served in the finest china. But the variety and richness of their wines is what appears the most surprising. The constant way is, to lay a list of their names upon the plates of their guests, along with the napkins; and I have counted several times to the number of eighteen different sorts, all exquisite in their kinds.

I was yesterday at Count Schönbrunn, the vice-chancellor's garden, where I was invited to dinner, and I must own that I never saw a place so perfectly delightful as the Fauxbourgs of Vienna. It is very large, and almost wholly composed of delicious palaces; and if the emperor found it proper to permit the gates of the town to be laid open, that the Fauxbourgs might be joined to it, he would have one of the largest and best-built cities of Europe. Count Schönbrunn's villa is one of the most magnificent; the furniture, all rich brocades, so well fancied and fitted up, nothing can look more gay or splendid; not to speak of a gallery, full of rarities of coral, mother-of-pearl, etc., and, throughout the whole house, a profusion of gilding, carving, fine paintings, the most beautiful porcelain, statues of alabaster and ivory, and vast orange and lemon trees in gilt pots. The dinner was perfectly fine and well ordered, and made still more agreeable by the good humour of the count.

I have not yet been to court, being forced to stay for my gown, without which there is no waiting on the empress; though I am not without a great impatience to see a beauty that has been the admiration of so many different nations. When I have had that honour, I will not fail to let you know my real thoughts, always taking a particular pleasure in communicating them to my dear sister.

EXERCISES IN COMPOSITION.

1. Form sentences, each having in it one of the following words:—

Debts; light; sing; come; health; water; sky; home; day; night; lark; rose; Victoria; Mary; Henry; mother; bread; England; wife; buttercup; linnet; daisy; stone.

2. Give brief descriptions of the following objects and places:—

A chair; a wheel of a coach; a kite; a waterpot; an oak-tree; the room in which you write; and the place where you work.

3. Write historical themes on the following subjects:—

1. The patriarch Abraham's visit to Egypt.
2. The battle of Hastings.
3. The conversion of St. Paul.
4. The murder of Thomas à Becket.

4. Write letters on the following subjects:—

1. A letter of condolence to an intimate friend on the death of a near relation.
2. A letter to a friend in town, inviting him to pay you a visit in the country, and describing the scenery of the neighbourhood in which you live.
3. A letter of thanks to a gentleman who has enabled you to obtain a situation in a house of business by his recommendation.

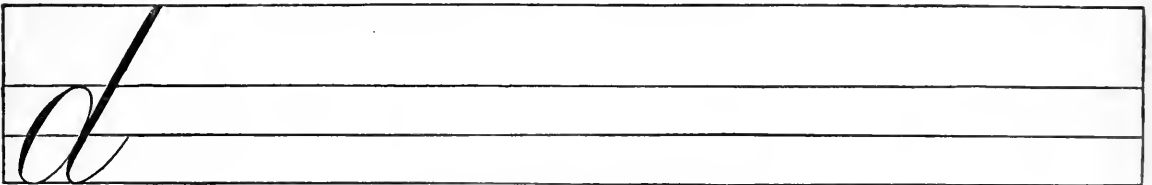
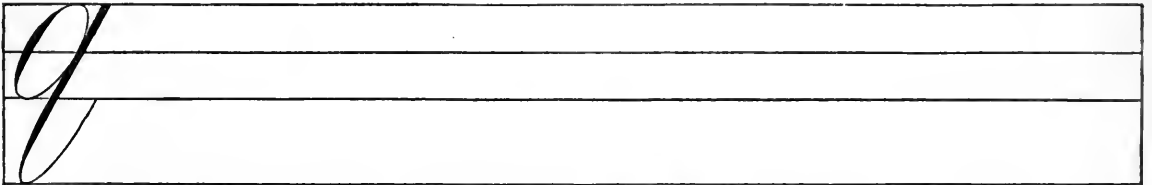
LESSONS IN PENMANSHIP.—XI.

DUE attention to the instructions that have been given in the preceding lessons in the art of Penmanship, and assiduous practice for about an hour a day, will have rendered any one, who is endeavouring to learn to write from our copy-slips, a tolerable proficient in making letters, composed of right or straight lines, or lines that are commenced, or finished, or commenced and finished, as in the case of the top-and-bottom-turn, with a hook or turn.

A great number of copies, consisting of letters of this kind, have been supplied to give the learner a sufficient variety in the words or combinations of letters that he is copying, and to give him confidence in his power to make the four strokes which enter into the formation of by far the greater part of the letters of

present it will be sufficient to deal with those into whose formation it enters without any alteration or modification whatever.

The letter *o* is purely a curved letter, for no portion of it consists of a perfectly straight stroke, as the other letters which have already been brought under the reader's notice. It may be commenced on the straight line *c c*, but it is better to begin and end the letter at the point *x*, a little above the line, as it is from this point that a fine hair-line is carried to the right, when it is necessary to connect the letter *o* with any letter that may follow it, as the learner will see in Copy-slip No. 40. Commencing, then, at the point *x*, the hair-line, of which the right side of the letter consists, is carried upwards to the line *a a*, and then turned to the left and brought downwards. By a gradual pressure on the pen the hair-line is now turned into a thick stroke, which attains its broadest part at the line *c c*, when the pressure

COPY-SLIP NO. 35.—THE LETTER *o*.COPY-SLIP NO. 36.—THE LETTER *o* AND THE "BOTTOM-TURN."COPY-SLIP NO. 37.—THE LETTER *a*.COPY-SLIP NO. 38.—THE LETTER *d*.COPY-SLIP NO. 39.—THE LETTER *q*.

the writing alphabet, before he begins to make the remaining elementary strokes, which are of less frequent occurrence. The practice that he has now had, and the knowledge and amount of skill in writing that he has already acquired, will enable him to advance more rapidly, and we shall proceed as quickly as possible to the end of our elementary lessons in the formation of the small letters of the writing alphabet, as exhibited in large text, giving fewer copies than we have hitherto done, for the sake of affording practice in the formation of each particular letter in combination with others.

In Copy-slip No. 35 the learner's attention is directed to the letter *o*, which is a complete and perfect letter in itself, while, at the same time, it may be considered as a simple elementary form, since it enters into the composition of the letters *a*, *d*, and *q*. It also influences the formation of many other letters of the alphabet, as the learner will see hereafter; but for the

of the pen is relaxed, and the thick down-stroke is gradually narrowed again into a hair-line, which is turned upwards towards the right and joined to the hair-line with which the letter was commenced at the point *x*. The learner will notice that the upper part of the letter *o*, which lies above the line *c c*, is the only portion of the letter that is really new to him, for the lower part of the letter is very nearly the same as that portion of the bottom-turn or top-and-bottom-turn which is below the line *c c*.

In Copy-slip No. 36 the letter *o* and the bottom-turn are given. These strokes, in combination from the letter *a*, as in Copy-slip 37, the bottom-turn being appended to the letter *o* in such a manner that the point where the hair-line forming the right side of the letter cuts the line *c c* lies in a line passing along the centre of the thick down-stroke of the bottom-turn. The letters *d* and *q* are formed by adding modifications of the bottom-turn to the letter *o*, as shown in Copy-slips 33 and 39.

LESSONS IN FRENCH.—XI.

SECTION I.—FRENCH PRONUNCIATION (continued).

IV. NAME AND SOUND OF THE CONSONANTS.

58. **P, p.**—When initial, and in the body of words, *p* is usually sounded; and then it has the sound of *p* in English. When final, it is generally silent. Exceptions will best be found by consulting a French dictionary.

59. **Q, q.**—*Q* is pronounced like the English *k*.

60. **R, r.**—The sound of this letter is somewhat peculiar, having a rolling or jarring sound, produced by vibrating the tip of the tongue against the roof of the mouth, near the upper front teeth. It is never sounded in the French words *messieurs* and *monsieur*.

Its sound in other respects is that of English *r*. It is often dropped, or nearly so, in the body of a word, but especially in the last syllable, in common conversation, namely:—

Nôtre as if printed Nôtr'.
Vôtre " " Vôtr'.

But in solemn and dignified reading or speaking it is sounded very distinctly (when at all), with the rolling sound.

61. **S, s.**—*S* has two distinct sounds, which are determined by its position, viz.:—the sharp, hissing sound of *s* in the English words *dissever* and *kiss*, and the soft sound of *s* in the English word *nose*, equivalent to the English letter *z*. It has the sharp and hissing sound whenever it is initial.

It has the soft sound whenever it occurs between two vowels, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Baptiser	Ba-tee-zay	To baptise.	Désobéir	Day-zo-bay-	To disobey.
Baser	Bah-zay	To base (upon).		eer	
Choisir	Sh'wah-zeer	To choose.	Maison	May-zouh	A house.
Désordre	Day-zordr	Disorder.	Saisir	Say-zeer	To seize.

There are, however, a few exceptions to the above rule. *S* final, before another word commencing with a vowel or *h* mute, has the sound of the English *z*, and is connected with the following word in pronunciation, as if it were its first letter, namely:—

Après avoir diné as if printed Apray zavoir diné.
Dis à mon frère de venir " Di zà mon frère de venir.
Pas excusable " Pa zexusable.
Vous avez " Vou zavaz.
Vous étounez. " Vou zétounez.

S final, under other circumstances, is usually silent, namely:—

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Avis	A-vee	Advertisement.	Legs	Lay	Legacy.
Dès	Dai	From.	Os	Oh	Done.
Divers	De-vayr	Various.	Remords	R'mor	Remorse.
Jacques	Zhahk	James.	Tamis	Pa-mee	A sieve.
Judas	Zhu-da	Judas.	Thomas	Fo-mah	Thomas.
			Vous	Voo	You.

In a few words *s* final is sounded. Refer to the dictionary for these.

62. **T, t.**—*T*, when initial, or in the body of a word, is usually pronounced like English *t*. Sometimes, however, both in the body and in the last syllable of words, it has the sound of English *s* in the word *see*, namely:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Caution	Ko-soonh	Caution.
Démocratie	Day-mo-kray-see	Democracy.
Ineptie	E-nayp-see (first syll. short)	Folly.
Inertie	E-nayr-see (first syll. short)	Inactivity.
Minutie	Me-nu-see	Trifle.
Patience	Pa-se-anhs	Patience.
Primatie	Pre-ma-see	Primacy.
Prophétie	Pro-fay-see	Prophecy.
Satiété	Sa-seny-tay	Satiety.

In a few other words, the *t* in the last syllable of *tie* and *tier* has the common sound of English *t*. Refer to the French dictionary for their pronunciation.

T final is usually silent, and is seldom carried to the next word in pronunciation.

63. **V, v.**—In all situations, *v* has the sound of English *v*.

64. **W, w.**—*W* is not properly a French letter. It is not found in the French alphabet, though it is sometimes used in foreign words, names of persons, places, and things. When thus used it has the sound of English *v*. The proper name *Newton*, however, is printed in French *Newton*; and, with the

exception of the last syllable, which has the nasal sound, the pronunciation of the whole word does not differ from its English pronunciation.

65. **X, x.**—This letter has different sounds in the French language, as in English. It has five different sounds, namely:—

1. Like the English letter *k*, in the following words:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Excès	Ek-sai	Excess.
Exception	Ek-sep-seonh	Exception.
Excite	Ek-see-tay	Excited.

2. Like the English letters *ks*, in the following words:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Axe	Ak-s	Axis.
Axiome	Ak-se-ome	Axiom.
Axiomètre	Ak-see-o-maitr'	Tell-tale (naval term).
Expédier	Eks-pay-deay	To dispatch.
Exprimer	Eks-pre-may	To press out.
Extase	Eks-tahz	Rapture.
Extrait	Eks-tray	Extract.
Luxe	Luks (short v)	Luxury.

Ez, before a consonant, has the sound of *eks*, as in the foregoing examples.

3. Like the English letters *gz*, in the following words:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Exacte	Eg-zakt	Correct.
Exagérer	Eg-za-zhay-ray	To exaggerate.
Exalter	Eg-zal-tay	To exalt.
Excécrable	Eg-zay-krabl'	Execrable.
Exode	Eg-zod	Exodus.
Exorde	Eg-zord	Beginning.

4. Like English *ss*, in the following words, when alone, or when preceding a word beginning with a vowel or *h* mute:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Dix	Deess	Ten.
Six	Seess	Six.
Soixante	S'wahs-sanht	Sixty.

5. Like English *z*, in the following words:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Deuxième	Duh-zyaim	Second.
Dix-huit	Deez-weet	Eighteen.
Dixième	Dee-zyaim	Tenth.

X final is silent in many words, except proper names.

X final, when carried to the next word in pronunciation, has the sound of English *z*, namely:—

Aux hommes as if printed Auz hommes.
Doux et " Douz et.
Jaloux et " Jalouz et.
Voix eu " Voiz eu.

66. **Z, z.**—*Z* is usually sounded like English *z*.

Z final, before a word commencing with a consonant, is silent.

Z final, before a word commencing with a vowel or *h* mute, is carried to the next word in pronunciation, as if it were its first letter, namely:—

Essayez en as if printed Essayez-en.
Laissez un " Laissez-zun.
Songez à " Songez-zà, etc.

SECTION XIV.—LIST OF WORDS FOR EXERCISES IN COMPOSITION (concluded).

17. OUTILS.—TOOLS.

Alène, f., awl.	Fusil, m., gun.
Balance, f., scale.	Hache, f., axe.
Bêche, f., spade.	Hameçon, m., fishhook.
Brosse, f., brush.	Herse, f., harrow.
Brouette, f., wheelbarrow.	Houe, f., hoe.
Cachet, m., seal.	Ligne, f., line.
Carabine, f., rifle.	Lime, f., file.
Charrue, f., plough.	Meule, f., grindstone.
Chevalet, m., easel.	Pelle, f., shovel.
Cire, f., wax.	Pince, f., croubar.
Cognée, f., hatchet.	Pinceau, m., brush, pencil.
Colle, f., glue.	Poulie, f., pulley.
Compas, m., compasses.	Rabot, m., plane.
Echafaudage, m., scaffolding.	Rouleau, m., roller.
Échelle, f., ladder.	Sablère, f., sandbox.
Enclume, f., anvil.	Scie, f., saw.
Étau, m., vice.	Serrure, f., lock.
Faucille, f., sickle.	Tenailles, f. pl., pincers.
Faux, f., scythe.	Truelle, f., trowel.
Fléau, m., flail.	Vis, f., screw.

18. MINÉRAUX ET MÉTAUX, ETC.—MINERALS AND METALS, ETC.

Acier, m., steel.	Fer-blanc, m., tinned iron.
Aimant, m., loadstone, magnet.	Fil d'archal, m., iron wire.
Aïrain, m., brass.	Fil du liton, m., brass wire.
Alun, m., alum.	Marbre, m., marble.
Antimoine, m., antimony.	Mercure, m., quicksilver.
Argent, m., silver.	Or, m., gold.
Arsonic, m., arsenic.	Platine, m., platinum.
Bronze, m., bronze.	Plomb, m., lead.
Chaux, f., lime.	Soufre, m., sulphur.
Craie, f., chalk.	Similor, m., pinchbeck.
Cuivre, m., copper.	Vif-argent, m., quicksilver.
Étain, m., tin.	Vermell, m., silver-gilt.
Fer, m., iron.	Zinc, m., zinc.

19. PIERRES PRÉCIEUSES.—PRECIOUS STONES.

Agate, f., agate.	Jaspe, m., jasper.
Améthyste, f., amethyst.	Onyx, m., onyx.
Corail, m., coral.	Perle, f., pearl.
Cornaline, f., cornelian.	Rubis, m., ruby.
Diamant, m., diamond.	Sanguine, f., blood-stone.
Émeraude, f., emerald.	Saphir, m., sapphire.
Escarboucle, f., carbuncle.	Topaze, f., topaz.
Grenat, m., garnet.	Turquoise, f., turquoise.

SECTION XX.—THE FOUR CONJUGATIONS OF VERBS.

1. The four classes, or conjugations, into which the French verbs are divided, are distinguished by the endings of the present of the infinitive [§ 44]. The first conjugation ends in *er*, as *chanter, to sing; donner, to give; parler, to speak; chercher, to seek.*

The second conjugation ends in *ir*, as *chérir, to cherish; punir, to punish; munir, to provide with; finir, to finish.*

The termination of the infinitive of the regular verbs of the third conjugation is *avoir, as, devoir, to owe; recevoir, to receive; that of the irregular verb is *oir, as, valoir, to be worth.**

The fourth conjugation ends in *re, as rendre, to render; fendre, to split; tendre, to stretch; vendre, to sell.*

2. A verb preceded by another verb (other than the auxiliaries *avoir* and *être*), or by a preposition (other than *en*), is put in the present of the infinitive:—

Il va travailler ou lire, He is going to work or to read.

3. In French, verbs are often connected with others by prepositions not answering literally to those which accompany the same verbs in English. They also often come together without prepositions. The student will find, in § 129, and the following Sections of Part II. of these Lessons, lists of verbs, with the prepositions which they require after them.

4. The following idioms are followed by the preposition *de* when they come before a verb [§ 132]:—

Avoir besoin, to want.	Avoir le temps, to have time, or leisure.
Avoir coutume, to be accustomed.	Avoir peur, to be afraid.
Avoir dessein, to intend, to design.	Avoir raison, to be right.
Avoir envie, to have a wish, a desire.	Avoir regret, to regret.
Avoir honte, to be ashamed.	Avoir tort, to be wrong.
Avoir intention, or l'intention, to intend.	Avoir sujet, to have reason.
Avoir le courage, to have courage.	Avoir soin, to take care.

5. The following are examples of the use of the preposition after the above idioms:—

Cet enfant a besoin de dormir,	That child wants to sleep.
Vous avez honte de courir,	You are ashamed of running.

RÉSUMÉ OF EXAMPLES.

Avez-vous quelque chose à dire?	Have you anything to say?
Je n'ai rien à dire.	I have nothing to say.
Votre sœur n'a-t-elle rien à écrire?	Has your sister nothing to write?
Elle a deux lettres à écrire.	She has two letters to write.
A-t-elle le temps de les écrire?	Has she time to write them?
Elle n'a pas dessein de les écrire.	She does not design to write them.
Elle n'a pas l'intention de les écrire.	She does not intend to write them.
Elle n'a pas envie de les écrire.	She has no desire to write them.
Avez-vous peur de danser?	Are you afraid to dance?
Je n'ai pas honte de danser.	I am not ashamed to dance.
Votre cousin a raison de sortir.	Your cousin is right to go out.
N'avez-vous pas soin d'écrire?	Do you not take care to write?
Avez-vous le courage d'aller à la guerre?	Have you the courage to go to the war?

VOCABULARY.

Acheter, to buy.	Faire, to make.	Mars, m., March.
Champ, m., field.	Fatigué, -e, tired, weary.	Ne—rien, nothing.
Danser, to dance.	Journal, m., newspaper.	Page, f., page.
De bonne heure, early.	Juillet, m., July.	Parler, to speak.
Dormir, to sleep.	Juin, m., June.	Seize, sixteen.
Écrire, to write.	Lire, to write.	Travailler, to work, labour.
Envie, f., wish, desire.	Marcher, to walk.	

EXERCISE 35.

1. Votre belle-mère a-t-elle quelque chose à faire? 2. Elle n'a rien à faire. 3. A-t-elle deux pages à écrire? 4. Non, Monsieur, elle n'en a qu'une. 5. Avez-vous l'intention de lire ce journal? 6. Oui, Madame, j'ai l'intention de le lire. 7. Avez-vous raison d'acheter un habit de velours? 8. J'ai raison d'en acheter un. 9. Votre petite fille a-t-elle besoin de dormir? 10. Oui, Monsieur, elle a besoin de dormir, elle est fatiguée. 11. Avez-vous peur de tomber? 12. Je n'ai pas peur de tomber. 13. Le jardinier a-t-il le temps de travailler dans les champs? 14. Il n'a pas envie de travailler dans les champs. 15. Vos champs sont-ils aussi grands que les miens? 16. Ils sont plus grands que les vôtres. 17. Avez-vous honte de marcher? 18. Je n'ai pas honte de marcher, mais j'ai honte de danser. 19. Quel âge a votre fils? 20. Il a seize ans. 21. Avons-nous le deux Mars ou le cinq Juin? 22. Nous avons le vingt-huit Juillet. 23. Est-il midi? 24. Non, Monsieur, il n'est pas encore midi, il n'est que onze heures et demie. 25. Il est encore de bonne heure.

EXERCISE 36.

1. What has your brother-in-law to do? 2. He has letters to write. 3. Does he want to work? 4. Yes, Sir, he wants to work. 5. Does he intend to read my book? 6. He does not intend to read your book, he has no time. 7. Is your sister ashamed to walk? 8. My sister is not ashamed to walk, but my brother is ashamed to dance. 9. Has your cousin anything to say? 10. My cousin has nothing to say, she is afraid to speak. 11. Is it late? 12. No, Madam, it is not late, it is early. 13. Have you a wish to read my sister's letter (f.)? 14. Have you the courage to go to the war? 15. I have not the courage to go to the war. 16. Is your sister right to buy a silk dress (f.)? 17. Yes, Sir, she is right to buy one. 18. Does that child want to sleep? 19. No, Sir, that child does not want to sleep, he is not tired. 20. Has your brother's gardener a wish to work in my garden? 21. He has a wish to work in (dans) mine. 22. How old is that child? 23. That child is ten years old. 24. What is the day of the month? 25. It is the ninth of March. 26. Are you afraid to walk? 27. I am not afraid to walk, but I am tired. 28. Have you time to read my brother's book? 29. I have time to read his book. 30. Has the joiner a wish to speak? 31. He has a wish to work and to read. 32. Is your son afraid of falling? 33. He is not afraid of falling, but he is afraid of working. 34. What o'clock is it? 35. It is twelve.

OUR HOLIDAY.

GYMNASTICS.—IV.

THE HORIZONTAL BAR.

THIS contrivance, which is also called the "Rack," is one of the most useful within the range of gymnastic appliances. It is also one of the most simple in its character, consisting of two stout upright posts, firmly embedded in the ground, and crossed by a movable round bar, about two inches in diameter. The posts should be about seven feet high, and drilled with holes commencing at a distance of three feet from the ground, and continuing to the top. These holes are for the ready insertion of the bar at any desired height from the ground. For security in its position, each end of the bar should be provided with a cap, screwed on or otherwise fixed after it is placed in the uprights.

1. The exercises upon the bar are commenced from the position shown in our illustration (Fig. 13). From this position a variety of simple movements may be practised, all tending to assist the development of the muscular powers. Thus, the body may first be gently swung to and fro; then the hands may be used in travelling from end to end of the bar; and next the body may be raised by the arms until the bar is below the level of the head. Free movements of the legs are also de-

sirable—kicking forwards, backwards, or in a straddling position; raising the knees and then extending the legs downward, and so on. The position of the hands may be changed, the bar being held with the grasp reversed, or the arms crossed while the same movements are practised. And the learner should include the hanging by either hand alternately among these elementary exercises, to which it is necessary to be perfectly accustomed before attempting the higher rack movements.

The position taken by the body in Fig. 13 is called hanging *sideways*. To hang *crossways* the gymnast must, in starting, turn his back to one of the supports, and grasp the bar either hand over hand, or one hand before the other, while he has the length of the bar in front of him. This distinction between sideways and crossways it will be necessary to bear in mind. While hanging crossways, practise such of the movements previously mentioned as are suited to the altered position.

2. When familiar with the preliminary exercises, the learner will proceed to the more difficult, commencing with the rising and sinking movement, and practising it until he is sufficiently expert to be able to bring the body above the bar, and to rest upon the hands while the bar is level with the thighs. This is called *rising into the rest*, or resting position. A jerk and a spring of the legs will at first be required in the progress upward, and it will be facilitated by pausing in an intermediate position, known as the *drop rest*. This is reached when the bar is level with the pit of the stomach, the arms being bent upward, ready for the completion of the rise. Or the rest may be attained by the help of a swinging movement, first backwards and forwards two or three times, and then taking advantage of the next backward motion to spring upwards towards the resting position. The rise may also be practised with the bar behind the gymnast, but this is a more difficult feat.

3. *Circling the bar* should be performed with the bar at the height of the chest or shoulders. It consists, as will probably be understood from the name, in turning a summersault completely over the bar, and is not difficult when the swinging and rising movements have been well practised. Grasping the bar firmly, the gymnast starts from the ground with a spring, throws the legs upwards, and, bending the arms, turns over by the impetus which the spring and the throw give to the body. He may next turn from the swinging position, without touching the ground, and should practise both the forward and the backward circle.

4. The circling movement is defined by the dotted line in our next illustration (Fig. 14), which also shows one method of practising the next series of exercises, namely, *hanging by the arms*. The gymnast may hang either by the armpits, as in the cut, or by the elbow joints; but in the latter case he will lack the necessary purchase for the performance of such feats as the circle. He should, however, practise each method, in order to strengthen all the muscles of the arm alike.

5. At present, in holding the bar we have exercised the arms exclusively. But the legs also may be employed for this purpose. Commence by hanging crossways with the hands, then swing one leg over the bar, so that it is held firmly in the hock. If it is intended to place the right leg over the bar, the right hand should be held foremost, and *vice versa*. After one leg has been hooked on, the hands may be brought nearer together, and the other leg placed over the bar. Travel, then, along the bar from end to end.

6. Hang crossways with the right hand in front, and bring over the right leg; then advance the left hand nearer to the right, and remove the right hand to the other side of the leg. The position is then *sideways* to the bar, with one leg over it,

and the knee between the hands. This is a convenient position for a variety of movements—swinging, twirling, etc.

7. From the position just described release the left hand, holding firmly on with right arm and leg, and pass the left leg over; then bring up the left hand. The position will then be sideways, both hands and both legs over the bar, and the knees between the hands. From this you may easily rise to the sitting position on the bar, sinking again and again, until you have practised the movement sufficiently.

8. From the sitting posture, perform twirls both backward and forward; for the backward twirl grasping the bar in the ordinary manner, with the knuckles forward; and for the forward twirl, holding it with the grasp reversed.

9. When both legs are over the bar, as described in No. 7, release the hold of the hands, first one and then the other, and hang by the hocks, with the head downwards. Recover from this position by a swing to and fro, to give an impetus, grasping the bar as the body rises. This exercise should only be attempted by the learner who has attained some degree of proficiency in the foregoing movements, and has become familiar with this form of "practice at the bar" generally.

10. The *lever* exercises upon the bar are accomplished in the following manner:—Grasping the bar firmly, with the hands in the position known as the *drop-rest*, and throwing all the weight upon the arms, gradually raise the body until it extends in an horizontal position above the bar. You may then move the body from side to side, as upon a pivot, but being careful to keep the legs close together and fully extended.

11. After the learner can perform the last exercise, resting upon both arms, he may attempt it with one arm only, the other being stretched forward on the same level as the rest of the body. These exercises will try the wrists, but may be safely attempted by the learner who has gone through the preliminary movements.

12. It is an easy matter to descend from the positions last described to that known as *lying upon the bar*. In this the stomach alone must rest upon the bar, the body being properly balanced and fully extended, somewhat as if in the act of swimming. But lying with the back upon the bar is much more difficult, and it is well not to attempt this feat unless, as in a properly-conducted gymnasium, some one or two persons are by to prevent your falling in case of failure. But, with caution, there is very little hazard of injury, and in practising movements of this kind for the first time it is well

to have the bar fixed at a moderate height only from the ground.

Very expert gymnasts—more expert than our readers are likely to desire to be, or, perhaps, than it is advisable they should become—are able, from the last-named positions, to twirl a summersault, alighting easily upon the feet. But no useful end can be served by the practice of hazardous experiments of this kind, and therefore we wish to be understood as in no way recommending them to our readers, although we include them in the list of feats, the accomplishment of which may occasionally be witnessed.

We have now described the principal varieties of the exercises on the horizontal bar; but, to the learner who is partial to practice with this contrivance—and it is a general favourite—many other movements will suggest themselves. Those which are simple in character are frequently the best, for, in increasing the difficulty of performance, there is not necessarily a proportionate advantage in physical development and the accession of bodily strength.

We come next to the Parallel Bars, reserving these exercises for another paper.

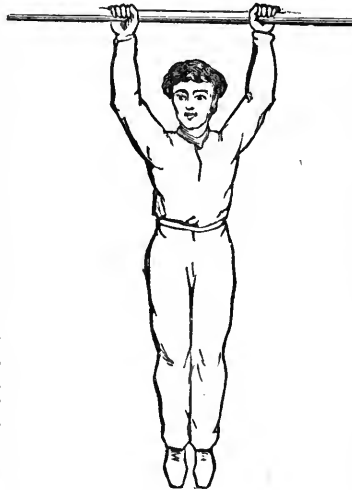


Fig. 13.

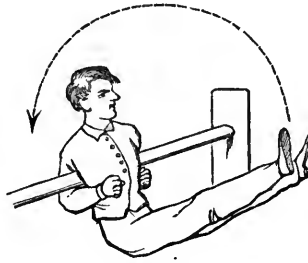


Fig. 14.

HISTORIC SKETCHES.—VI.

WILLIAM SAUTRÉ, HERETIC.

NEARLY five hundred years have elapsed since the subject of the following sketch presented itself, but the interest which it excited, and the principles which it brought into notice, can never die. We are all interested very deeply in the matter of freedom of conscience, freedom to worship God in the way suggested by the light He has given us; and we can never afford to lose sight of the principle then vindicated, even to the death, that it is not competent to a ruler to visit with the punishment of a crime, a man whose sole offence consists in differing from his brethren on points of spiritual belief. The first occasion on

were made to silence him, but he spoke on and spoke out, and, strong in the protection of John of Gaunt, the Duke of Lancaster, brother to the Black Prince, and uncle to King Richard II., managed to weather the several storms which his opinions brought upon him. He was arraigned more than once before spiritual tribunals, and many of his opinions were declared to be erroneous, and many more were condemned as heretical, by an assembly of Church magnates. Ecclesiastical censures, however, were the only weapons with which the spiritual courts could enforce their decrees, and Wycliffe was suffered to die a natural death at his rectory of Lutterworth, in Leicestershire, whither he retired after a life of unceasing toil and labour in aid of what he deemed to be the truth.



JOHN WYCLIFFE, OR WICKLIFFE, THE FIRST ENGLISH REFORMER. BORN ABOUT 1324, DIED 1384.

which this principle was vindicated in England was in 1401, and the man who was the first martyr to the cause of free conscience in England was William Sautré, a harmless, inoffensive man, the rector or curate of St. Osith's Church, London.

William Sautré was one of a numerous body who had been stirred to the very bottom of their hearts by the teaching of John Wycliffe, or Wickliffe, and his followers. Wycliffe had taught with as much boldness as ability—his enemies said with more—that certain doctrines inculcated by the clergy of the day were erroneous, and contrary to the teachings of our Lord and his apostles; he taught that the Bible was the only standard by which men might measure the truth or falsity of their creeds; and he denounced in emphatic and somewhat rough language, the vices and corruptions which had infected the clergy, especially the clergy in monasteries. Upon these topics Wycliffe preached with considerable effect at Oxford, where he was a professor, and in many other places. Attempts

After the death of Wycliffe, the spirit which had animated him passed into the breasts of his disciples, "the poor preachers," who went about with the English Bible (a new and forbidden article) in their hands, and preached so convincingly and cheerfully that, as was seen in the ministry of our Lord, "the common people heard them gladly." The attention of the Church authorities was soon drawn to them, and letters called bulls (on account of the bullæ, or lead seals, which were attached to them) were sent from the Court of Rome, addressed to the Archbishop of Canterbury and the English bishops, to the University of Oxford, and to the king, commanding them each and all to help in suppressing the heretics, and in uprooting the tares (the Latin word for tare is *lokium*, from which the nickname "Lollard" was afterwards derived and affixed to the reformers), which, while men slept, the enemy had sown in the garden of the Lord.

Edward III., who died in 1377, was not the king to busy

himself overmuch in such matters, unless the reformers in religion proved themselves to be reformers in the State also; but to Richard, his grandson, these exhortations of the Pope appeared in the light of a duty. Richard agreed to a law which was passed through a Parliament of which the Upper Chamber was at that time far more powerful than the Lower, and was composed of more spiritual than lay peers, by which it was ordered that preachers of heresy should be apprehended and imprisoned "till they will justify them according to the law and reason of Holy Church." No other punishment of a penal nature was permitted during this reign (1377-1399); but when Henry IV. in 1399 usurped the throne, and wanted the support of the clergy to back his bad title, he consented, as the price of their assistance, to a law called the Statute of Heresy, which was intended to crush out effectually the troublesome Wycliffites, who had increased in numbers and audacity during the late king's reign, and were leading many out of the fold of the Catholic Church. The Wycliffites no more wanted to go out of the Catholic Church than John Wesley wanted to go out of the Church of England; but the Catholic Church said to them as the Church of England in effect said to him, "Holding opinions such as these, you are not of us, and we will have nothing to do with you while you continue to hold them."

Had the Catholic Church stopped there, no one could have complained. Perfect liberty of conscience requires that men shall be free to choose what tenets they will embrace and what reject, but it forbids them to go further and say to those who differ from them: "Think and believe as we do, for if you will not we will burn and hang you." The Church of the day would not act upon the advice given by Gamaliel to the Jews, who wished to persecute the apostles: it could not bear the idea that any one should presume to differ from what almost all Christendom accepted as true. Believing firmly that acceptance of all that the Church taught, and in the system of government which the Church had established, was the only way to salvation, she was grieved beyond measure at the sight of her children going astray, and deemed any means, however violent, to be more than justified by the laudable end of bringing back the wanderers. She hoped to make such an example as would deter fresh truants, and she hoped even for the offenders that God would accept the sufferings she inflicted upon them as an atonement for the sins they had committed against Him, supposing Him to be represented by the Pope and the Roman Church.

How easily does fanaticism of any kind cheat itself into the belief that its cause is God's cause, and that to persecute its own opponents is to do God service. The Church accordingly procured from the king in the year 1400 his assent to a law passed by a Parliament constituted as above described, by which persons who refused to renounce their so-called errors, or relapsing after they had so renounced them, were to be given over by the spiritual authorities to the sheriff, who "the same persons after such sentence promulgate shall receive, and them before the people in an high place see to be burned, that such punishment might strike fear into the minds of others, whereby no such wicked doctrine, and heretical and erroneous opinions, nor their authors, nor fautors (an old English word meaning favourers) in this realm and dominions against the Catholic faith, Christ's law, and determination of Holy Church be sustained or in any wise suffered."

This infamous and dreadful law was the price paid by Henry for the support of the clergy, and the clergy, as has been suggested, believed they were only doing a meritorious thing when they procured the king's signature to the act. For awhile the new power remained like a sword in its sheath; the clergy were almost afraid to handle the new weapon, till taking it out and looking at it with curious and admiring eyes, they perceived that they themselves were not called upon to do any of the dirty work. They were merely to find guilty or not guilty; upon the sheriff devolved the invidious task of execution. So they grew bolder, and the year following that in which the act was passed, the Convocation of the province of Canterbury—an assembly of which all the bishops and abbots were members, and in which the inferior clergy appeared by their representatives—determined to draw the sword against those who disented from their religious opinions.

Some persons who were brought before them were so terrified

at the danger of standing firm that they recanted and renounced their belief rather than go to the stake. Let no man mock them for their weakness, but rather pity them, as men who might excusably fear lest they should be doing wrong in departing from the faith as delivered to them and as taught by the existing Church, which was presumed to have the Holy Ghost for its guide, and as men—many of them fathers and husbands—who feared to wrench asunder the ties which bound them to this world, who looked in their children's faces, and who listened to the entreaty of their wives, and then failed to pronounce the words which would make the children fatherless and the wives widows. Others there were, cast in another mould, who by their nature *could not* accept life as the price of their creed, who looked upon the offer with scorn, and asked if that were all they were to have in exchange for their souls. Equally enthusiastic with their persecutors, though in another direction, they made this matter "very stuff o' the conscience," and resolutely refused to abjure. Not among the physically strong only were these men found; indeed, the delicate and sensitive, and the men with highly strung nerves, were the boldest and most courageous professors of their faith. Such esteemed the claims of wife and child, of kindred and friends, as merely so many temptations, strong temptations no doubt, which must be overcome, and they pointed for their justification to the words of the Saviour, where He declared that the man who loved wife and children and friends more than Him, was not worthy of Him, and they clung exultingly to the assurance, "There is no man that hath left house, or parents, or brethren, or wife, or children, for the kingdom of God's sake, who shall not receive manifold more in this present time, and in the world to come life everlasting."

Of this class was William Sautré, priest of St. Osith's. It is not told us if he was a married man (the rule by which celibacy was the appointed lot of the clergy was not yet of universal application)—indeed, the chroniclers of the time speak very little about him and his case, one of them, Thomas Walsingham, monk of St. Alban's, merely mentioning that "a certain false priest was burnt in Smithfield in the sight of many people." But married or not, he seems to have been a very good and honest man, bold to speak and preach the truth, according to his vision of it, in his parish church of St. Osith, Wood Street, in the City of London. His character, as far as we know it, or can judge of it from his behaviour before his judges and at his execution, would seem to have been not unlike that of the "poor parson of a town," of whom Chaucer wrote in 1380.

"To draw folk to heaven by fairnesse,
By good ensample was his business.

* * * * *
A better priest I trow there nowhere none is.
He waited after no pomp nor reverence,
Ne made him a spiced conscience,
But Christ's lore and II's apostles twelve
He taught, and first he followed it himself."

His opinions, however, openly expressed, were in direct opposition to what the Church authorities permitted, and were in strict accordance with the teaching of Wycliffe. He was cited to appear before his bishop, the Bishop of London, and was ordered to renounce his error; but this proceeding proving ineffectual, and his preaching continuing to attract many, he was summoned before the Convocation of the province of Canterbury, and put upon his trial for heresy, as in a court of justice.

Earnestly the charge was pressed, and boldly was it met, till argument for the defence was answered with invective by the prosecution, and the prisoner stood loaded with obloquy. This, however, was not hard for a man like Sautré to bear; the most difficult and trying part for him, the real temptation, lay in the entreaties of his friends—and they were many—and the friendly prayers even of his judges, that he would be converted and live. But even against such mighty levers the man's mind was proof. "Whether it be right in the sight of God to hearken unto you more than unto God, judge ye," was the answer he gave back, and nothing could persuade him but that he spoke by the inspiration of God.

Faithful as his friends called him, obstinate heretic as his enemies called him, William Sautré was ready to die, if need were, for his religion. Horrible to relate, that sacrifice was required of him. The men who were supposed to represent to

the world our blessed Lord and his apostles, found it in their minds to give sentence against him, a sentence which they well knew consigned him to a dreadful death; and they persuaded themselves, by a delusion at which devils might have smiled, that they were doing the will of Him who refused to condemn any man, and whose vast love made Him lay down His own life, not take that of another, that all mankind might follow the example of His great humility.

Before Sautré was given over to the secular arm, it behoved that he should be degraded from his rank in the Church. This eminently painful operation, accomplished by means of a ceremonial of which every part told with bitterness upon the poor prisoner, was submitted to with a patience worthy of the sufferer. Into the church, wherein were gathered a large company of the bishops and clergy, Sautré was brought, attired in the robes and furniture appertaining to him as a priest. Set in the midst, the observed of all observers, he was gradually denuded of the various emblems of his pastoral authority, prior to being handed over to the tender mercies of the sheriff and his officers.

First, they gave into his hands a chalice and paten,* which were then taken from him, together with the scarlet robe or chasuble which priests only might wear, and in this way his authority as priest was visibly taken away from him. A copy of the Holy Scriptures in Latin, and the deacon's stole or tippet were then taken from him, and he ceased to be a deacon; the alb or surplice, and the maniple were removed, and with them the dignity of sub-deacon; the giving and taking away of a candlestick, a taper, and a small pitcher, showed that the degree of acolyte had been abandoned; and then followed other forms, which signified the completeness of the poor man's degradation. With his book of exorcisms he gave up his power as an exorcist; with his book of daily lessons his task of reader; with a sexton's gown and a church door key his authority as sexton; and then, his priest's cap being removed, the tonsure, or hair lock, was obliterated, and a common hangman's cap was put on his head.

What follows? A scene too awful, too horrible to be minutely described. Let a veil be drawn over the details; let us "provide a charitable covering for the sins of our forefathers." Suffice it to say that, on a gloomy February evening in the year 1401-2, the man we have been describing, the man whose sole crime was that he believed differently from his ecclesiastical masters, and taught men so, was bound with an iron chain to a stake at Smithfield, and burned to death on a spot nearly in front of the present gate of St. Bartholomew's Hospital.

He was the first of a long list of men—ay, and women too were included—who were tried by bigotry in the fiery trial of their faith, and showed themselves superior to their fate. Not all the blame must fall on Catholic shoulders. Unhappily, alas! it is the duty of the historian to record that those who might be supposed to have learned tolerance and kindness, if not from the purer faith which they professed, yet in the hard school of persecution through which they had passed, proved themselves almost equally cruel with their adversaries. If the Catholics burned Sautré and Savonarola, Calvin himself burned Servetus; if Latimer, Ridley, Cranmer, and many more perished for conscience' sake under "bloody Mary," Joan Bocher and Van Paris were burned to death by order of the founder of Christ's Hospital, and "Good Queen Bess" had as long a list as her sister of victims to the cause of freedom of conscience.

The principle which actuated the destroyers of William Sautré in 1401 actuates the intolerant of all kinds in 1868. Law, custom, and modern habits of thought preclude the rekindling of Smithfield fires; but the old hatreds are not dead, the old evil is still alive; and we are prone, in the absence of chain and fagot, to make these hatreds felt with weapons which cut deeper than swords, whose scathe is worse than the fire, and whose bite is as that of the deadly serpent. But what said the apostle of Him in whose name bigotry slew its victims, the apostle of Him who condemned no man? "Be ye kind one to another, tender-hearted, forgiving one another, even as God, for Christ's sake, hath forgiven you."†

* The cup for the wine, and the plate for the bread in the office of Holy Communion.

† For Synopsis of Events in the Life and Reign of Richard II., and List of contemporary Sovereigns, see page 150.

LESSONS IN GERMAN,—XI.

SECTION XX.—POSSESSIVE PRONOUNS.

THE possessive pronouns *mein*, *sein*, etc., as already seen (Sect. XIV.), are rendered absolute possessives by means of the characteristic endings *er* and *es* (§ 58. 4).

1. The possessive pronouns are likewise converted into absolute possessives by prefixing to them the definite article, and affixing the terminations *e* or *ige*, as:—*Mein Hut ist weiß*, *und der sein-ige ist schwarz*; my hat is white, and thine is black. *Der Saab ist roth*, *und das sein-ige ist blau*; her ribbon is red, and his is blue. The termination *ige* is the more common.*

Observe, that the absolute possessives *mein-er*, etc., are inflected like an adjective of

THE OLD DECLENSION; AS,

<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>
N. <i>Mein-er,</i>	<i>mein-e,</i>	<i>mein-es, mine.</i>
G. <i>Mein-er,</i>	<i>mein-er,</i>	<i>mein-es, of mine.</i>
D. <i>Mein-er,</i>	<i>mein-er,</i>	<i>mein-er, to, for mine.</i>
A. <i>Mein-en,</i>	<i>mein-e,</i>	<i>mein-es, mine.</i>

Note, also, that those preceded by the definite article, are, in respect to terminational inflection, varied like *adjectives* (Sect. IX. 2) in the same situation; that is, according to

THE NEW DECLENSION; AS,

<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>
N. <i>Der mein-ige,</i>	<i>die mein-ige,</i>	<i>das mein-ige, mine.</i>
G. <i>Des mein-igen,</i>	<i>ter mein-igen,</i>	<i>tes mein-igen, of mine.</i>
D. <i>Dem mein-igen,</i>	<i>ter mein-igen,</i>	<i>tem mein-igen, to, for mine.</i>
A. <i>Den mein-igen,</i>	<i>die mein-ige,</i>	<i>tas mein-ige, mine.</i>

ABSOLUTE POSSESSIVES AS INFLECTED IN ALL GENDERS OF THE PLURAL.

After the Old Declension.

N. <i>Mein-e,</i>
G. <i>Mein-er,</i>
D. <i>Mein-er,</i>
A. <i>Mein-e,</i>

After the New Declension.

<i>die mein-igen, mine.</i>
<i>ter mein-igen, of mine.</i>
<i>ten mein-igen, to, for mine.</i>
<i>die mein-igen, mine.</i>

2. When the absolute possessive pronouns do not relate to some noun previously mentioned, they refer, in the plural, to one's relatives or family,† and in the neuter singular, to one's property, as:—*Das Meine* or *das Meinige*, my property; *das Seine* or *das Seinige*, thy property; *das Seine* or *das Seinige*, his property; *das Ihre* or *das Ihre*, her property, your property, or their property. *Die Mein-en* or *die Meinigen*, my family, etc.; *die Sein-en* or *die Seinigen*, thy family, etc.; *die Sein-en* or *die Seinigen*, his family, etc.

VOCABULARY.

<i>Allmächtig, adj.</i> al-	<i>Shirt, n.</i> shirt.	<i>Schlüssel, m.</i> key.
<i>mighty.</i>	<i>Kutscher, m.</i> coach-	<i>Sowohl als, as well</i>
<i>Eigenheit, f.</i> peculiar-	<i>man.</i>	<i>as.</i>
<i>ity.</i>	<i>Nehmen, to</i> take.	<i>Stempel, m.</i> stamp.
<i>Fehler, m.</i> mistake,	<i>Wafer, f.</i> wafer.	<i>Waschfrau, f.</i> washer-
<i>error.</i>	<i>Schicksal, n.</i> fate, des-	<i>woman.</i>
<i>General, m.</i> general.	<i>tiny.</i>	<i>Weltmeer, n.</i> ocean.
<i>Gott, m.</i> God.	<i>Schloffer, m.</i> lock-	<i>Wiese, f.</i> meadow.
<i>Hand, f.</i> hand.	<i>smith.</i>	<i>Zwischen, between.</i>

RÉSUMÉ OF EXAMPLES.

<i>Wessen Uhr hat Ihre Mutter?</i>	Whose watch has your mother?
<i>Sie hat die ihrige.</i>	She has hers (or her own).
<i>Haben Sie meine Brillen oder die Ihrige?</i>	Have you my spectacles or yours?
<i>Ich habe die meinige.</i>	I have mine (or my own).
<i>Der Herrmann schätzt das Seinige.</i>	Every man prizes his own (property).
<i>Sieht auch Der Herrmann die Seinigen?</i>	Does every man likewise love his family?

EXERCISE 29.

1. Hat der Capitän kein etes des Generals Schwert? 2. Er hat das seinige. 3. Haben Sie meine Schere? 4. Nein, ich habe die meinige. 5.

* In the same way are treated *Deiner*, *Deine*, *Deines*, *thine*; and *Seiner*, *Seine*, *Seines*, *his*.

† They may likewise refer (when the connection makes the application evident) to dependents, as servants, soldiers, subjects, etc.

Wer hat meinen Stock? 6. Herr S. hat ihn. 7. Hat meine Schwester Ihren Regenschirm? 8. Nein, sie hat den ihrigen. 9. Hat der Schlosser meinen Schlüssel? 10. Nein, er hat den seinigen. 11. Hat die Waisfrau die Hemten meines Vaters und meiner Freunde? 12. Sie hat sowohl die seinigen, als die ihrigen. 13. Alle Menschen haben ihre Fehler und Eigenheiten—ich habe die meinigen, Sie haben die Ihrigen und er hat die seinigen. 14. Gott ist allmächtig; die Schicksale des Menschen sind in seiner Hand, auch das meinige und das deinige. 15. Das Weltmeer ist zwischen mir und den Meinigen. 16. Hat Herr A. Ihr Papier oder das meinige? 17. Er hat das seinige. 18. Mein Bruder hat mein Buch und ich habe das seinige. 19. Hat er Ihre Oblaten und Stempel oder die seinige? 20. Er hat die meinigen. 21. Wessen Wagen hat Ihr guter Freund, Herr G.? 22. Er hat den seines Oheims. 23. Und wessen Pferde hat er? 24. Er hat die meinigen. 25. Wessen Kutscher hat er? 26. Er hat den seinigen. 27. Wessen Schafe sind diese auf der Wiese? 28. Sie sind die unfrigen. 29. Haben diese Deutschen ihre Pferde und ihre Wagen, oder die unfrigen? 30. Sie haben die unfrigen. 31. Wessen Bücher haben diese Schüler? 32. Sie haben die ihrigen. 33. Nehmen Sie immer das Ihrige? 34. Ja, Jedermann nimmt das Seine. 35. Wann haben Sie die Ihrigen gesehen? 36. Ich habe sie vorgestern gesehen. 37. Haben Sie mich und die Meinigen gestern Abend in dem Concert gesehen? 38. Ja, ich habe Sie und die Ihrigen gesehen. 39. Der Feldherr lobte die Seinigen.

EXERCISE 30.

1. The coachman of [tes] Count [Grafen] B. has my spectacles, but not yours. 2. The daughters [Töchter] of the infirm [kranken] general are more proud [stolzer] than mine. 3. I have lost [verloren] my letter-stamp [Brief-Stempel], but here is yours and his. 4. To whom [wem] belong [gehören] these beautiful meadows? Are they yours? 5. No, they are not (the) mine; they are the [das] property [Eigentum] of my friend, the coachman. 6. Have you his key or mine? 7. I have neither his nor my own, but that of [den] my wife. 8. They discovered [entdeckten] the thief [Dieb] by [an] the [dem] shirt which [welches] he wore [trug], and which was not his own. 9. When [wann] did you see your friends? 10. I have not seen them since last [seit jüngstem] summer. 11. He loves too [zu] much [sehr] his [property]. 12. Have you seen me and mine, and Henry and his, last night [gestern Abend] between seven and eight o'clock [Uhr], in the [der] avenue [Avenue]?

SECTION XXI.—RELATIVE PRONOUNS.

In compound sentences, connected by a relative, the verb stands at the end of the last clause, as well when the relative is in the nominative, as when in an oblique case, as:—Das Buch welches ich habe; the book which I have. Das Buch welches hier ist; the book that here is (is here). In compound tenses the main verb immediately precedes the auxiliary, as:—Das Buch welches ich gehabt habe; the book that I had have (have had). Das Buch welches ich haben werde; the book that I have shall (shall have).

The same position of the verb is required when the second of two connected clauses is introduced by a conjunction or an adverb, as:—Ich kaufe es, weil es wohlfeil ist; I bought it, because it is cheap. Er wohnt noch, wo er gewohnt hat; he still resides where he has resided. Er kommt, wenn er nicht krank ist; he will come, if he is not sick (he comes, if he is not sick).

1. Derjenige (that or the one) always points to something specified by a relative in a succeeding clause. It is compounded of the substantive pronoun *der*, *die*, *das*, and *jener* with change of termination. It is frequently used instead of *der*, *die*, or *das* for the sake of greater emphasis, as:—Er liebt nur dasjenige (instead of *das*), was (Sect. LXIX. 2) er achtet; he loves only that which he esteems.

Derjenige is inflected like *der* *meinige* (Sect. XX.), that is, its first component is declined like the definite article, and its last like an adjective of the new declension.

DECLENSION OF *derjenige*, SINGULAR AND PLURAL.

<i>Singular.</i>		
<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>
M. Derjenige,	diejenige,	dasjenige, that (the one).
G. Desjenigen,	derjenigen,	desjenigen, of that.
D. Demjenigen,	derjenigen,	demjenigen, to that.
A. Denjenigen,	diejenige,	dasjenige, that.
<i>Plural, all genders.</i>		
M. Diejenigen, those.		D. Denjenigen, to those.
G. Derjenigen, of those.		A. Denjenigen, those.

2. *Welcher* (relative) usually adopts the genitive of the substantive pronoun *der* (§ 65. 1. 2.).

The genitive of *Welcher* is only used interrogatively in the masculine and neuter singular, and is *Wessen*, whose, of whom, or which.

DECLENSION OF THE RELATIVE *welcher*.

<i>Singular.</i>		<i>Plural.</i>	
<i>Masc.</i>	<i>Fem.</i>	<i>Neut.</i>	<i>All genders.</i>
M. Welcher,	welche,	welches,	welche, who, which, that.
G. Wessen,	deren,	dessen,	deren, whose, of whom, etc.
D. Welchem,	welcher,	welchem,	welchen, to whom, etc.
A. Welchen,	welche,	welches,	welche, whom, which, that.

Examples of *welcher* (interrogative and relative) and *derjenige*.

Welcher Mann ist krank?	Which man is sick?
Derjenige, welcher im Hause ist.	The one who is in the house.
Welche Feder haben Sie?	Which pen have you?
Ich habe diejenige, welche Sie gehabt haben.	I have the one that you have had.
Wessen Buch haben Sie?	Whose book have you?
Ich habe das des Mannes, dessen Stuck Sie haben.	I have that of the man whose stick you have.
Welchen Knaben haben Sie das Geld gegeben?	To which boys have you given the money?
Ich habe es denjenigen gegeben, welchen Sie Brod gaben.	I have given it to those to whom you have given bread.

3. For both *derjenige* and the relative *welcher* the pronoun *der* may be substituted, as:—Der Mann *der* krank ist; the man that (who) is sick. Welches Buch haben Sie? which book have you? Ich habe das (dasjenige), das (welches) Sie gehabt haben; I have that (the one) that (which) you have had.

Der, when substituted for *derjenige*, is in the genitive plural *derer* (instead of *deren*), as:—Hart ist das Schicksal *derer* (*derjenigen*), die sich nicht ernähren können; hard is the fate of those who cannot support themselves.

The use of *derjenige* often corresponds to that of our personal pronoun, as well in the singular as in the plural, as:—Derjenige, den Sie suchen, ist nicht hier; he that (whom) you seek is not here. Diejenigen, die Sie suchen, sind nicht hier; they (those) whom you seek are not here.

VOCABULARY.

Amtmann, <i>m.</i> magistrate.	Häufles, helpless.	Schenne, <i>f.</i> shed, barn.
Arbeiter, <i>m.</i> labourer, workman.	Kapelle, <i>f.</i> chapel.	Stirn, <i>f.</i> forehead.
Einfieler, <i>m.</i> hermit.	Kaufen, to buy.	Verlassen, forsaken, left.
Friede, <i>m.</i> peace, tranquillity.	Sat'terhaft, vicious.	Weinberg,* <i>m.</i> vineyard.
Herz, <i>n.</i> heart.	Reiz, last.	Wohnhaus, <i>n.</i> dwelling.
	Lohn, <i>m.</i> reward.	
	Harbe, <i>f.</i> scar.	
	Oheim, uncle.	

RÉSUMÉ OF EXAMPLES.

Wir lieben Diejenigen, die (welche) uns lieben.	We love those, who (that) love us.
Ich habe den Hut, den ich gestern gehabt habe.	I have the hat, that I (have) had yesterday.
Sie haben die Äpfel, die reif sind, und ich habe diejenigen, die grün sind.	You have the apples that are ripe, and I have those that are green.
Derjenige, den ich suche, ist nicht hier.	He whom I seek is not here.
Derjenige, dessen Stuck ich habe, ist krank.	He whose stick I have is sick.
Diejenige, zu der die Mutter geht, ist krank.	She to whom the mother is going is sick.
Diejenigen, die stolz sind, sind auch narrißig.	They (or those) that are proud, are likewise foolish.

EXERCISE 31.

1. Welches Kind liebt der Oheim? 2. Er liebt dasjenige, welches er lobt. 3. Welches Kind liebt den Oheim? 4. Dasjenige, welches er liebt, liebt ihn. 5. Welchen Hut haben Sie? 6. Ich habe denjenigen, welchen Ihr Herr (Sect. XVI. 5) Bruder gehabt hat. 7. Welchen Knaben liebt der Vater? 8. Er liebt denjenigen, welchen die Mutter lobt. 9. Welcher Knabe liebt die Mutter? 10. Derjenige, welchen der Vater lobt. 11.

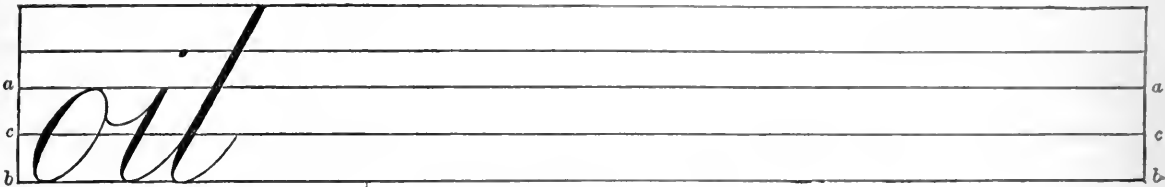
* Literally, "Wine-mountain;" so called because most vineyards in Germany are upon hills or smaller mountains; the sunny sides of these being much more favourable to the growth of the vine.

Welches Pferd hat Ihr Bruder gekauft? 12. Er hat dasjenige gekauft, welches Sie gestern gehabt haben (Sect. XVII. 8). 13. Welchen Mann loben Sie? 14. Ich lobe denjenigen, dessen Sohn Sie lieben. 15. Welche Bücher haben Sie gekauft? 16. Ich habe diejenigen gekauft, welche mein Bruder in den (Sect. XVI. 3) Händen gehabt hat. 17. Wessen Bücher haben Sie? 18. Ich habe die Bücher derjenigen Knaben, deren Hüte Sie haben. 19. Diejenigen, welche lasterhaft sind, haben keinen Frieden des Herzens. 20. Derjenige, welcher die Narbe an der Stirne hat, ist der alte Amtmann. 21. Dasjenige ist gut, was (§ 65. 5.) nützlich ist. 22. Diese Männer sind dieselben, deren Scheunen, Ställe und Wohnhäuser Sie gestern gesehen haben. 23. Der Arbeiter in dem Weinberge desjenigen, welcher den letzten Lohn gibt, sind wenige. 24. Der Geisler jener Kapelle ist ein Freund derer (Sect. XXI. 3), die hilflos und verlassen sind. 25. Der (Sect. XXI. 3) ist weise, der tugenthaft ist.

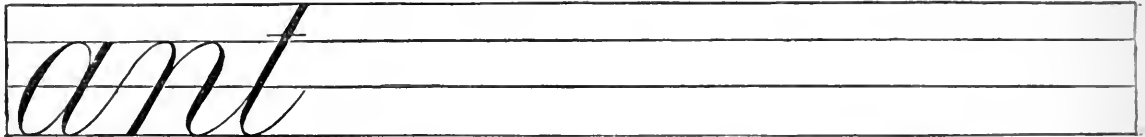
EXERCISE 32.

1. The friend whom I have is faithful [treu]. 2. Whose

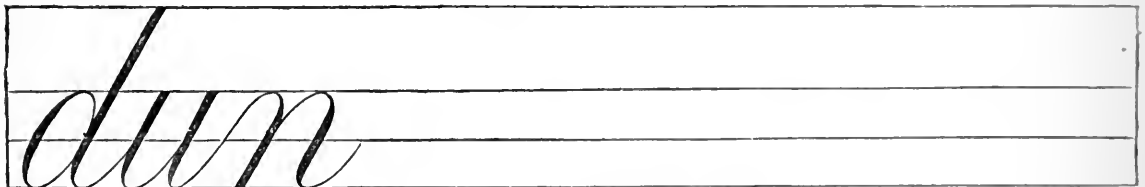
[wessen] key have you? 3. I have that of the woman whose [deren] daughter you know [kennen]. 4. I shall give [geben] this [dieses] book to that (man) who will be first [zuerst] here. 5. Have you seen my book? 6. No, I have not seen the one which you mention [erwähnen]. 7. The joy [Freude] which I shall have. 8. I came, because I had promised [versprochen] it to him. (Translate in the following order:—"Because I it to him promised had.") 9. Where [wo] do you live [wohnen]? 10. I live in the same house in which I lived when you called [besuchten] upon me. 11. Which of these ladies [Damen] is your wife? 12. The one who is talking [spricht] with the old gentleman [Herrn]. 13. The friend whom I have lost was very dear [theuer] to me. 14. I have bought [gekauft] that coat [Rock] which you saw [sahen] in the window [Fenster] of my tailor [Schneiders]. 15. Remember me [Grußchen Sie] to that gentleman who is so very polite [höflich].



COPY-SLIP NO. 40.—THE WORD oil.



COPY-SLIP NO. 41.—THE WORD ant.



COPY-SLIP NO. 42.—THE WORD dun.

LESSONS IN PENMANSHIP.—XII.

In Copy-slip No. 40 the learner will see how the letter **o** is joined to any letter that follows it, namely, by carrying a hair-stroke to the right from the point a little above the central line, in which point the letter is completed, and a junction effected between the hair-strokes with which the letter is commenced and ended. The position of this point is shown in Copy-slip No. 35 by the letter *x*, a little above the line *c c*, to the right of the letter **o**. There are different modes of beginning the hair-stroke by which the letter **o** is joined to the letter that comes after it. Sometimes a dot like a period or full-stop is made at that part of the right side of the letter from which the hair-stroke turns off towards the next letter; sometimes the pen is turned round to form a small curved line, open in the centre, like the line which is called the circumference of a circle, or resembling in general appearance the outline of a comma placed thus, *c*; while in some cases the hair-line is carried on from the letter **o** without any dot or curved line whatever.

The hair-stroke that is used to connect the letter **o** with any letter that follows it, influences in some measure the commencement of the formation of letters that begin with the top-turn or top-and-bottom-turn, such as **m** and **n**, and some other letters as **v** and **y**, which have not yet been brought under the

reader's notice. In our copy-slips up to the present lesson, letters commencing with the top-turn have always been begun from the central line that, in all cases when we have found it necessary to designate it by letters, has been marked *c c*, but when they follow the letter **o** it is manifestly impracticable to commence them at or on this line, and the connecting hair-stroke must be carried to the right and turned with a graceful curve into the hair-stroke of the top-turn about midway between *c c* and the line immediately above it, which we have always marked *a a* in copy-slips to which small italic letters have been appended for the sake of explanation. This will be found to be the case whenever letters beginning with the top-turn are joined to letters such as **b**, **f**, **o**, **r**, **s**, **w**, and **v**, which do not end in a bottom-turn or top-and-bottom-turn, or anything resembling in formation the lower portions of these turns.

The learner may now begin to test his recollection of the forms of the letters he has hitherto been copying from our copy-slips, by selecting words from the **POPULAR EDUCATOR**, into whose composition these letters only enter with which he has already been made acquainted. There are some that he may select even from the lesson that is now before him, such as **top**, **not**, **that**, **dot**, **and**, etc.; although they are not many in number, they are amply sufficient to test his skill in copying words in type, without having the writing alphabet before his eyes.

LESSONS IN FRENCH.—XII.

SECTION I.—FRENCH PRONUNCIATION (continued).

V.—COMPOUND VOWELS.

67. THERE are seven compound vowels, whose different sounds we now proceed to illustrate, viz. :—*ai, au, eau, ei, eu, oi, ou.*

AI.—Name, *ay*; sound, like the letters *ay* in the English word *day*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Ai	Ay	<i>Have.</i>	Connais	Ko-nay	<i>Know.</i>
Aimer	Ay-may	<i>To love.</i>	Dirai	De-ray	<i>Shall say.</i>
Aurait	O-ray	<i>Would have.</i>	Fait	Fay	<i>Fact.</i>

When the last letter *i* of the compound vowel *ai* is under the circumflex accent, thus, *ai*, the character of its sound is not materially changed from that illustrated above; it is merely prolonged.

AU.—Name, *o*; sound, like the letter *o* in the English word *no*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Auprès	O-prai	<i>Near.</i>	Gauche	Goshe	<i>Left hand.</i>
Aussi	O-see	<i>Also.</i>	Pauvre	Povr' (long o)	<i>Poor.</i>
Faute	Fote	<i>Fault.</i>	Raque	Roke	<i>Hoarse.</i>
Fraude	Frode	<i>Fraud.</i>	Saut	So	<i>Jmp.</i>

EAU.—Name, *o*; sound, like the letter *o* in the English word *no*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Bateau	Ba-to	<i>Boat.</i>	Gâteau	Gah-to	<i>Cake.</i>
Chapeau	Shap-po	<i>Hat.</i>	Nouveau	Noo-vo	<i>New.</i>
Beau	Bo	<i>Fine.</i>	Organeau	Or-gan-no	<i>Iron ring.</i>
Cadeau	Kad-do	<i>Gift.</i>	Troupeau	Troo-po	<i>Herd.</i>
Eau	O	<i>Water.</i>			

EI.—Name, *ay*; sound, like the letters *ay* in the English word *day*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Cheik	Shayk	<i>Sheik.</i>	Reine	Rayn	<i>Queen.</i>
Eider	Ay-dair	<i>Eider duck.</i>	Seine	Sayn	<i>Drag-net.</i>
Meistre	Maystr'	<i>Mainmast.</i>	Soreine	S'rayn	<i>Placid.</i>
Neige	Nayzh	<i>Snow.</i>	Treize	Trayz	<i>Thirteen.</i>
Peine	Fayn	<i>Pain.</i>	Veine	Vayn	<i>Vein of marble.</i>

When *e* and *i* stand together, and the *e* is accented thus, *éi*, they are no longer a compound vowel, but each letter has its own distinct vowel sound.

SECTION XXI.—IDIOMS FOLLOWED BY THE PREPOSITION *DE*.

1. The expressions *avoir besoin, to want; avoir soin, to take care; avoir honte, to be ashamed; avoir peur, to be afraid*, require also the preposition *de* before a noun. These idioms mean literally *to have need, to have care, etc.* :—

Avez-vous besoin de votre frère?	<i>Do you want your brother?</i>
J'ai soin de mes effets,	<i>I take care of my things.</i>
Il a honte de sa conduite,	<i>He is ashamed of his conduct.</i>
Elle a peur du chien,	<i>She is afraid of the dog.</i>

2. As these expressions require the preposition *de* before their object, they will, of course, require the same preposition before the pronoun representing that object :—

J'ai besoin de vous,	<i>I want you.</i>
J'ai soin de lui,	<i>I take care of him.</i>
De qui avez-vous besoin?	<i>Whom do you want?</i>
De quoi a-t-elle besoin?	<i>What does she want?</i>

3. When the object is not a person, and has been mentioned before, the pronoun *en* takes the place of the preposition *de*, and that of the pronoun representing the object :—

Avez-vous besoin de votre cheval?	<i>Do you want your horse?</i>
J'en ai besoin,	<i>I want it.</i>

4. The expressions *être fâché, to be sorry; être étonné, to be astonished; être content, to be satisfied*, require the preposition *de* before a noun or pronoun [§ 88] :—

Je suis fâché de son malheur,	<i>I am sorry for his misfortune.</i>
Je suis étonné de sa conduite.	<i>I am astonished at his conduct.</i>
Je suis content de lui,	<i>I am pleased with him.</i>

5. *Être fâché*, in the sense of *to be angry*, requires the preposition *contre* :—

Vous êtes fâchés contre moi,	<i>You are angry with me.</i>
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6. For rules on the government of adjectives, see § 87, and following sections.

RÉSUMÉ OF EXAMPLES.

Avez-vous besoin d'argent?	<i>Do you want money?</i>
J'ai besoin d'argent.	<i>I want money.</i>
Je n'en ai pas besoin. (R. 3.)	<i>I do not want any.</i>
En avez-vous besoin?	<i>Do you want any?</i>
J'en ai besoin, et mon frère en a besoin aussi.	<i>I want some, and my brother wants some too.</i>
Avez-vous besoin de votre frère.	<i>Do you want your brother.</i>
J'ai besoin de lui.*	<i>I want him.</i>
De quoi avez-vous besoin?	<i>What do you want?</i>
J'ai besoin d'un dictionnaire.	<i>I want a dictionary.</i>
Avez-vous soin de votre livre?	<i>Do you take care of your book?</i>
J'en ai soin.	<i>I take care of it.</i>
Avez-vous soin de votre père?	<i>Do you take care of your father?</i>
J'ai soin de lui *	<i>I take care of him.</i>
Votre frère est-il fâché contre moi?	<i>Is your brother angry with me?</i>
Il est fâché contre votre sœur.	<i>He is angry with your sister.</i>
Avez-vous peur de ce chien?	<i>Are you afraid of this dog?</i>
J'en ai peur.	<i>I am afraid of him.</i>
De qui avez-vous honte?	<i>Of whom are you ashamed?</i>
Je n'ai honte de personne.	<i>I am ashamed of nobody.</i>
Avez-vous besoin de quelque chose?	<i>Do you want anything?</i>
Je n'ai besoin de rien.	<i>I want nothing.</i>

VOCABULARY.

Besoin, m., want, need.	Fâché, -e, sorry, angry.	Lire, to read.
Conduite, f., conduct.	Fatigué, -e, weary,	Parler, to speak.
Domestique, m., servant.	tired.	Reposer, to rest.
Effets, m. pl., things, clothes.	Garçon, boy.	Soin, m., care.
Étonné, -e, astonished.	Jeune homme, young man.	Travailler, to work.
		Vieux, old.

EXERCISE 37.

1. Qui a besoin de pain? 2. Personne n'en a besoin. 3. N'avez-vous pas besoin de votre domestique? 4. Oui, Monsieur. j'ai besoin de lui.* 5. Votre jardinier a-t-il soin de votre jardin? 6. Oui, Madame, il en a soin. 7. A-t-il bien soin de son vieux père? 8. Oui, Monsieur, il a bien soin de lui. 9. Votre garçon a-t-il honte de sa conduite? 10. Oui, Monsieur, il en a honte. 11. Avez-vous peur de ce cheval-ci ou de celui-là? 12. Je n'ai peur ni de celui-ci ni de celui-là. 13. Notre domestique a-t-il soin de vos effets? 14. Il en a bien soin. 15. Avez-vous peur de parler ou de lire? 16. Je n'ai peur ni de parler ni de lire. 17. Êtes-vous étonné de cette affaire? 18. Je n'en suis pas étonné. 19. En êtes-vous fâché? 20. Oui, Monsieur, j'en suis bien fâché. 21. Avez-vous besoin de ce garçon? 22. Oui, Madame, j'ai besoin de lui. 23. N'avez-vous pas besoin de son livre? 24. Je n'en ai pas besoin. 25. Avez-vous envie de travailler ou de lire? 26. Je n'ai envie ni de travailler ni de lire, j'ai envie de me reposer, car je suis fatigué.

EXERCISE 38.

1. Do you want your servant? 2. Yes, Sir, I want him. 3. Does your brother-in-law want you? 4. He wants me and my brother.† 5. Does he not want money? 6. He does not want money, he has enough. 7. Is your brother sorry for his conduct? 8. He is very sorry for his conduct, and very angry with you. 9. Does he take good (bien) care of his books? 10. He takes good care of them. 11. How many volumes has he? 12. He has more than you, he has more than twenty. 13. What does the young man want? 14. He wants his clothes. 15. Do you want to rest (vous reposer)? 16. Is not your brother astonished at this? 17. He is astonished at it. 18. Have you a wish to read your brother's books? 19. I have a wish to read them, but I have no time. 20. Have you time to work? 21. I have time to work, but I have no time to read. 22. Does the younger brother take care of his things? 23. He takes good care of them. 24. Is that little boy afraid of the dog? 25. He is not afraid of the dog, he is afraid of the horse. 26. Do you want bread? 27. I do not want any. 28. Are you pleased with your brother's conduct? 29. I am pleased with it. 30. Has your brother a wish to read my book? 31. He has no desire to read your book, he is weary. 32. Is that young man angry with you or with his friends? 33. He is angry neither with me nor with his friends. 34. Do you want my dictionary? 35. I want your dictionary and your brother's.

* The word *en* should be avoided as much as possible in relation to persons.

† Repeat the preposition *de*.

SECTION XXII.—STEMS AND TERMINATIONS OF THE REGULAR VERBS.—PRESENT INDICATIVE.

1. If the ending or distinguishing characteristic of the conjugation of a verb, in the present of the infinitive, be removed, the part remaining will be the stem of the verb:—

Chan-t-er	Fin-ir	Re-c-voir	Re-nd-re.
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2. To that stem are added, in the different simple tenses of a regular verb, the terminations proper to the conjugation to which it belongs [§ 60].

3. PARTICIPLE PRESENT.

Chan-t-ant	Fin-issant	Re-c-avant	Re-nd-ant.
Sing-ing	Fin-ish-ing	Re-ceive-ing	Re-nder-ing.

4. PARTICIPLE PAST.

Chan-t-é	Fin-i	Re-ç-u	Re-nd-u.
Sung.	Fin-ish-ed	Re-ceived	Re-nder-ed.

5. TERMINATION OF THE PRESENT OF THE INDICATIVE.

SINGULAR.

1. Je	chant -o	fin -is	reç -ois	rend -s.
	sing	finish	receive	render.
2. Tu	parl -os	chér -is	aperç -ois	vend -s.
	speakest	cherishes	perceivest	sellest.
3. Il	donn -o	fourn -it	perç -oit	tend
	gives	furnishes	gathers	tends.

PLURAL.

1. Nous	cherch -ons	pun -issons	conc -evons	entend -ons.
	seek	punish	conceive	hear.
2. Vous	port -ez	sais -issez	d -ez	perd -ez.
	carry	seize	owe	lose.
3. Ils	aim -ent	un -issent	déc -oivent	mord -ent.
	love, like	unite	deceive	bite.

6. The present of the indicative has but one form in French, therefore *je chante* may be rendered in English by *I sing, I do sing, or I am singing.*

7. The plural of the present of the indicative may be formed from the participle present by changing *ant* into *ons, ez, ons*. Ex.: *Chantant, nous chantons; finissant, nous finissons; recevant, nous recevons; rendant, nous rendons.*

8. This rule holds good not only in all the regular, but in almost all the irregular verbs.

9. Verbs may be conjugated interrogatively in French (except in the first person singular of the present of the indicative) [§ 98 (4) (5)], by placing the pronoun after the verb in all the simple tenses, and between the auxiliary and the participle in the compound tenses.

Chantez-vous bien ?	Do you sing well ?
Avez-vous bien chanté ?	Have you sung well ?
N'avez-vous pas bien chanté ?	Have you not sung well ?
(Sect. V. 2.)	
Ne chantez-vous pas bien ?	Do you not sing well.
Votre père parle-t-il bien ?	Does your father speak well ?
(Sect. II. 6, Sect. IV. 4.)	

10. The verb *porter* means to *carry*. It means also to *wear*, in speaking of garments. *Apporter* means to *bring*, and *emporter* to *carry away*; *aimer* means to *love, to like, to be fond of*, and takes the preposition *à* before another verb.

Quel habit portez-vous ?	What coat do you wear ?
Je porte un habit de drap noir.	I wear a coat of black cloth.
Votre frère qu'apporte-t-il ?	What does your brother bring ?
(Sect. II. 6.)	
Il apporte de l'argent à son ami.	He brings money to his friend.

11. A noun used in a general sense [§ 77 (1)] takes the article *le, la, l', or les*.

Aimez-vous le bœuf ou le mouton ?	Do you like beef or mutton ?
Je n'aime ni le bœuf ni le mouton.	I like neither beef nor mutton.

RÉSUMÉ OF EXAMPLES.

Chantez-vous une chanson italienne ?	Do you sing an Italian song ?
Nous chantons des chansons allemandes.	We sing German songs.
Portez-vous ce livre à l'homme ?	Do you carry this book to the man ?
Non, je le porte à mon frère.	No, I carry it to my brother.
Emportez-vous tout votre argent ?	Do you carry away all your money ?
J'en emporte seulement une partie.	I carry away only a part of it.
Finissez-vous votre leçon aujourd'hui ?	Do you finish your lesson to-day ?
Nous la finissons ce matin.	We finish it this morning.

N'aimez-vous pas les enfans attentifs ?	Do you not like attentive children ?
Je les aime beaucoup.	I like them much.
Ne recevez-vous pas beaucoup de lettres ?	Do you not receive many letters ?
Nous en recevons beaucoup.	We receive many letters.
Vendez-vous beaucoup de marchandises ?	Do you sell many goods ?
Nous en vendons beaucoup.	We sell many.
Votre frère aime le bœuf et le mouton.	Your brother likes beef and mutton.

VOCABULARY.

Obs.—We shall hereafter put a hyphen between the stem and the termination of the verb placed in the vocabularies. The number indicates the conjugation.

Aim-er, 1, to love, to like, to be fond of.	Donn-er, 1, to give.	Non seulement, not only.
Autre, other.	Fin-ir, 2, to finish.	Lecture, f., reading.
Assez, enough.	Fourn-ir, 2, to furnish.	Paille, f., straw.
Chapeau, m., hat.	Gard-er, 1, to keep.	Perd-re, 4, to lose.
Chér-ir, 2, to cherish.	Guère, but little.	Port-er, 1, to carry, wear.
Cherch-er, 1, to seek, to look for.	Habits, m. pl., clothes, garments.	Re-c-voir, 3, to receive.
Compagnon, m., companion.	Mais, but.	Souvent, often.
Dame, f., lady.	Maison, f., house.	Toujours, always.
De bonne heure, early.	Marchand, m., merchant.	Travail, m., labour.
De-voir, 3, to owe.	Marchandises, f. pl., goods.	Trouv-er, 1, to find.
	Nevou, m., nephew.	Vend-re, 4, to sell.

EXERCISE 39.

1. Votre mère aime-t-elle la lecture ? (Sect. XXII. 11.) 2. Oui, Mademoiselle, elle l'aime beaucoup plus que sa sœur. 3. Quel chapeau votre neveu porte-t-il ? 4. Il porte un chapeau de soie, et je porte un chapeau de paille. 5. Cette dame aime-t-elle ses enfans ? 6. Oui, Monsieur, elle les chérit. 7. Fournissez-vous des marchandises à ces marchands ? 8. Je fournis des marchandises à ces marchands, et ils me donnent de l'argent. 9. Vos compagnons aiment-ils les beaux habits ? (Sect. XXII. 11.) 10. Nos compagnons aiment les beaux habits et les bons livres. 11. Cherchez-vous mon frère ? 12. Oui, Monsieur, je le cherche, mais je ne le trouve pas. 13. Votre frère perd-il son temps. 14. Il perd son temps et son argent. 15. Perdez-vous toujours notre temps ? 16. Nous le perdons très souvent. 17. Devez-vous beaucoup d'argent ? 18. J'en dois assez, mais je n'en dois pas beaucoup. 19. Vendez-vous vos deux maisons à notre médecin ? 20. Je n'en vends qu'une, je garde l'autre pour ma belle-sœur. 21. Recevez-vous de l'argent aujourd'hui ? 22. Nous n'en recevons guère. 23. Votre menuisier finit-il son travail de bonne heure ? 24. Il le finit tard. 25. A quelle heure le finit-il ? 26. Il le finit à midi et demi. 27. Nous finissons le nôtre à dix heures moins vingt minutes.

EXERCISE 40.

1. Does your companion like reading ? 2. My companion does not like reading. 3. Does your father like good books ? (Sect. XXII. 11.) 4. He likes good books and good clothes.* 5. Do you owe more than twenty dollars ? 6. I only owe ten, but my brother owes more than fifteen. 7. Are you wrong to finish your work early ? 8. I am right to finish mine early, and you are wrong not to (*de ne pas*) finish yours. 9. Do you receive much money to-day ? 10. I receive but little. 11. Do we give our best books to that little child ? 12. We do not give them, we keep them because (*parceque*) we want them. 13. Do you sell your two horses ? 14. We do not sell our two horses, we keep one of them. 15. Do you finish your work this morning (*matin*) ? 16. Yes, Sir, I finish it this morning early. 17. Does your brother-in-law like fine clothes ? 18. Yes, Madam, he likes fine clothes. 19. Do you seek my nephew ? 20. Yes, Sir, we seek him. 21. Does he lose his time ? 22. He loses not only his time, but he loses his money. 23. How much money has he lost to-day ? 24. He has lost more than ten dollars. 25. Does your joiner finish your house ? 26. He finishes my house and my brother's. 27. Do you sell good hats ? 28. We sell silk hats, and silk hats are good. (Sect. XXII. 11.) 29. How old is your companion ? 30. He is twelve years old, and his sister is fifteen. 31. Does your brother like meat ? 32. He likes meat and bread. 33. Do you receive your goods at two o'clock ? 34. We receive them at half after twelve. 35. We receive them ten minutes before one.

* Repeat the article.

LESSONS IN BOTANY.—VI.

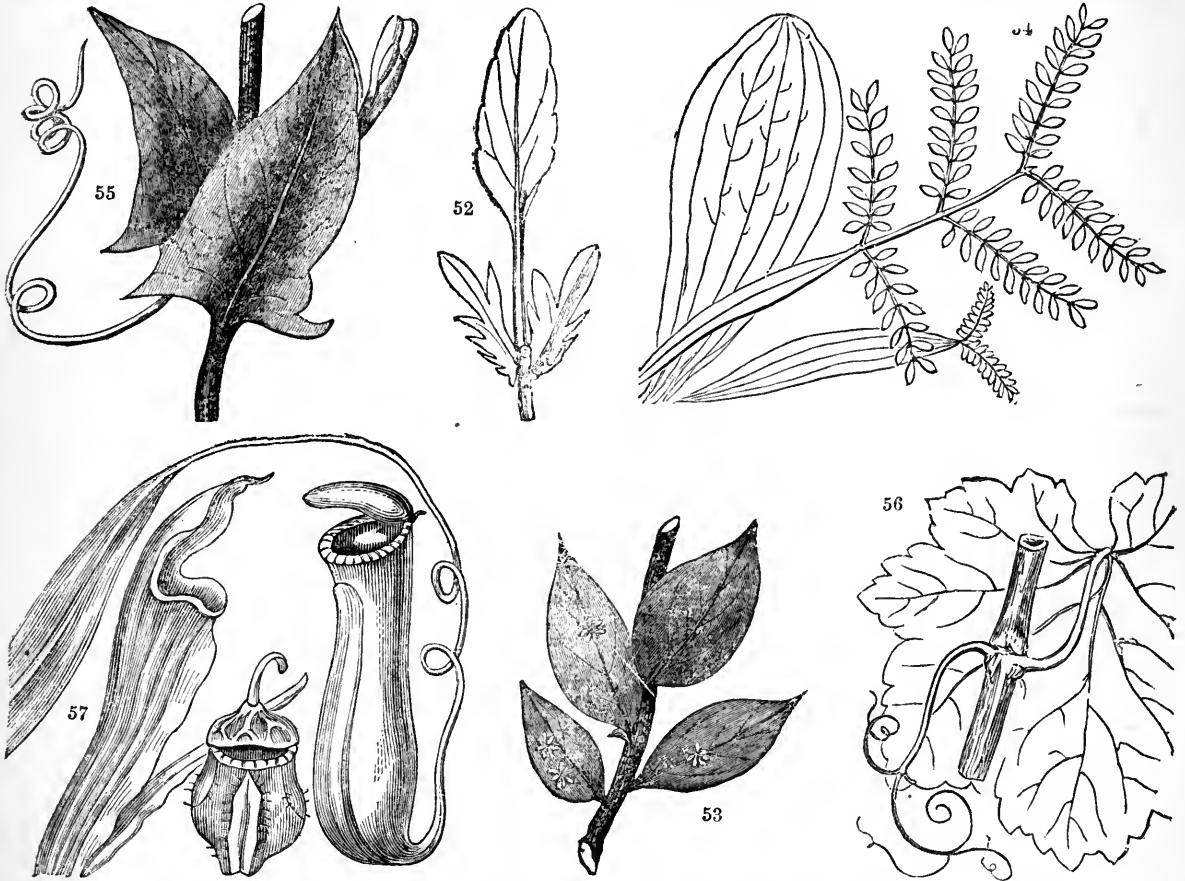
SECTION IX.—ORGANS WHICH LOOK LIKE LEAVES, BUT WHICH ARE NOT LEAVES.

We already discovered, at a very early period in our investigations, that Nature plays some strange tricks in the construction of plants, causing one thing to look like another, as though for the express purpose of deceiving us. We discovered that neither pine-apples, nor strawberries, nor figs, were merely fruits. We shall now discover that certain things which appear like leaves are not leaves.

What would the reader think as regards many of the cactus tribe? Would he not think these curious plants were all leaves?

Botanists denominate an enlarged and flattened organ of this kind by the term *phylloodium*, a word derived from the Greek *φυλλον* (pronounced *ful'-lon*), a leaf, and *ειδος* (*i'-dos*), form, and which therefore means having the form or semblance of a leaf.

One example more of a portion of a plant resembling a leaf, but which is not a leaf, and we have done. It might have been mentioned whilst we were treating of the cactus, to the condition of which the phenomenon about to be mentioned is similar. Perhaps the student has occasionally seen growing in the hedges the shrub called the butcher's-broom, *Ruscus aculeatus*. Like the cactus, this plant seems to present the curious appearance of flowers springing from the surface of a leaf. Flowers, however, never grow in that position. The part resembling a leaf



52. STIPULATE LEAF—LEAF OF PANSY. 53. BRANCH OF THE BUTCHER'S-BROOM. 54. LEAVES OF THE AUSTRALIAN ACACIA. 55. LATHYRUS APHACA. 56. VINE TENDRIL. 57. PITCHER PLANTS.

The fact is, they are totally without leaves, the leaf-like portions being merely flattened stems which fulfil the functions of leaves. What would he think, again, of those two little leaf-like expansions recognisable in the pansy, of which we give a drawing (Fig. 52)? These are not separate leaves, but leaf appendages which botanists denominate *stipules*. Hence the leaf of the pansy is said to be *stipulate*; and the reason why we did not represent the pansy leaf amongst the other leaves a short time back was, because the term *stipulate* had not been explained. The word *stipule* is derived from the Latin *stipula*, the husk round straw, because the stipules stand out from the stem of the real leaf in much the same manner as the leaves of wheat or barley spring from the stalk at intervals.

Occasionally the *petiole*, or leaf-stalk, itself becomes expanded into a leaf-like form, and the real leaves are stunted. This peculiarity characterises many of the acacias which grow in Australia. The appended diagram (Fig. 54) will render the peculiar condition more evident.

is no leaf at all, but only a flattened branch. The accompanying diagram (Fig. 53) represents a sprig of butcher's-broom, in which this peculiar conformation is very evident.

SECTION X.—METAMORPHOSES OR CHANGES TO WHICH LEAVES ARE SUBJECT.

Just as certain parts of vegetables not leaves may assume the general appearance of leaves, so, on the other hand, leaves occasionally lose their own specific appearance, and look like things they are not.

For example, who at first glance would think that the prickles on common furze were leaves? Nevertheless, they are; the ordinary flat leaf-like appearance being lost.

Again, many of those tendrils which shoot from slender plants, enabling them to lay hold of neighbouring objects and derive support, are nothing more than modified leaves. This is the case with the plant *Lathyrus Aphaca*, a representation of which we give above (Fig. 55).

The student is not, however, to imagine that all tendrils are

modified leaves. In certain plants—for example, the cucumber—stipules undergo this metamorphosis, in others it is the petioles or the branches themselves which change; such for example, are the tendrils of the vine (Fig. 56).

But the most curious modification of the leaf is seen in the pitcher-plants, some of which are represented in the diagram (Fig. 57). In one of these the leaf tapers into a stalk, at the extremity of which the pitcher is situated, the arrangement being such that the pitcher shall always retain its upright position. The pitcher is covered by a well-fitting lid.

In another kind, also figured in our plate, the pitcher is made up of the whole leaf, and there is no lid, so that the orifice is constantly wide open; and there are also other varieties.

We must not quit the subject of leaves without devoting a passing word to the gigantic leaf of the *Victoria regia*, one of the tribe of *Nymphaeaceæ*, or water-lilies, and a native of Central America.

A specimen of this truly wonderful plant is now flourishing in great vigour at Kew Gardens. Its leaves are from fifteen to eighteen feet in diameter, and its flowers and capsule, or seed-case, proportionately large. Fig. 58 is an engraving of this wonderful plant. A child is represented standing on one of its floating leaves, which, on account of its size, acts the part of a boat, and supports the child on the surface of the water.

While we are calling attention to the enormous leaves and beautiful flowers of the *Victoria regia*, we may direct the student to another giant flower, the largest indeed known, *Rafflesia Arnoldi* (Fig. 58b), which was discovered by a botanist of repute, Dr. Arnold, in 1818, when on an excursion into the interior of Sumatra with Sir Thomas Stamford Raffles and some other friends. The following is Dr. Arnold's account of the discovery of this monster plant and the general appearance of its blossoms. The plant was found on the banks of the Manna river, not far from Pulo Leblan:—

"Here," says Dr. Arnold in a letter to a friend, "I rejoice to tell you I happened to meet with what I consider as the greatest prodigy of the vegetable world. I had ventured some way from the party, when one of the Malay servants came running to me with wonder in his eyes, and said, 'Come with me, sir, come! a flower, very large, beautiful, wonderful!' I immediately went with the man about a hundred yards into the jungle, and he pointed to a flower growing close to the ground, under the bushes, which was truly astonishing. My first impulse was to cut it up and carry it to the hut. I therefore seized the Malay's parang (a sort of instrument like a woodman's chopping-hook),

and finding that it sprang from a small root which ran horizontally (about as large as two fingers or a little more), I soon detached it and removed it to our hut. To tell you the truth, had I been alone and had there been no witnesses, I should, I think, have been fearful of mentioning the dimensions of this flower, so much does it exceed every flower I have ever seen or heard of; but I had Sir Stamford and Lady Raffles with me, and Mr. Palgrave, a respectable man resident at Manna, who, though all of them are equally astonished with myself, yet are able to testify to the truth.

"The whole flower was of a very thick substance, the petals and nectary being in but few places less than a quarter of an inch thick, and in some places three-quarters of an inch; the substance of it was very succulent. When I first saw it a swarm of flies was hovering over the mouth of the nectary, and apparently laying their eggs in the substance of it. It had precisely the smell of tainted beef.

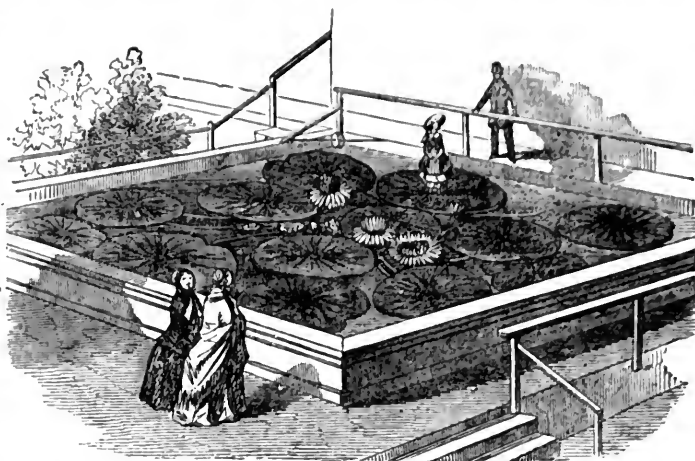
The calyx consisted of several roundish, dark-brown, concave leaves, which seemed to be indefinite in number, and were unequal in size. There were five petals attached to the nectary, which were thick, and covered with protuberances of a yellowish-white, varying in size, the interstices being of a brick-red colour. The nectarium was cyathiform (cup-shaped), becoming narrower towards the top. The centre of the nectarium gave

rise to a large pistil, which I can hardly describe, at the top of which were about twenty processes, somewhat curved, and sharp at the end, resembling a cow's horn; there were as many smaller, very short processes. A little more than half-way down, a brown cord, about the size of common whipcord, but quite smooth, surrounded what perhaps is the germen, and a little below it was another cord, somewhat moniliform (shaped like a necklace).

"Now for the dimensions, which are the most astonishing part of the flower. It measures a full yard across; the petals,

which were subrotund, being twelve inches from the base to the apex, and it being about a foot from the insertion of the one petal to the opposite one. The nectarium, in the opinion of all of us, would hold twelve pints; and the weight of this prodigy we calculated to be fifteen pounds."

This curious plant forms one of a distinct order called *Rafflesiaceæ*, which will be noticed in a future lesson. Like our mistletoe it is a parasite, and grows on the prostrate stems and roots of plants; but unlike the mistletoe, the plant is peculiar in having no leaves, or any organ like the phylodium, or enlarged petiole of the Australian acacia, that resembles a leaf,



58. THE VICTORIA REGIA WATER-LILY, IN THE CONSERVATORY AT CHATSWORTH.

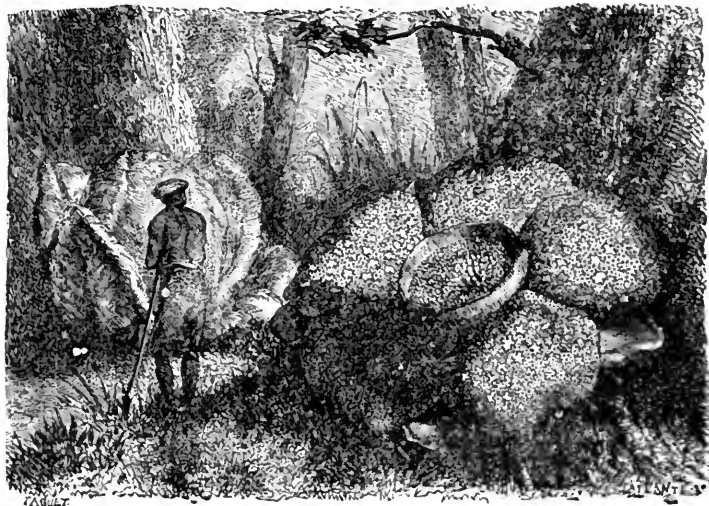


Fig. 58b. RAFFLESIA ARNOLDI.

LESSONS IN ARITHMETIC.—XII.

FRACTIONS (continued).

15. Multiplication of Fractions.

To multiply $\frac{2}{3}$ by $\frac{4}{5}$.
This means to take four-fifths of the fraction $\frac{2}{3}$; that is, it is the same thing as finding the value of the complex fraction $\frac{\frac{4}{5}}{\frac{3}{2}}$ of $\frac{2}{3}$.

Now, if $\frac{2}{3}$ be divided into five equal parts, i.e., if $\frac{2}{3}$ be divided by 5, we get $\frac{2}{15}$; because, to divide a fraction by a whole number, we multiply the denominator by that number (Art. 5); and taking four of these fifth parts of $\frac{2}{3}$ —viz., four times $\frac{2}{15}$ —we get as the required result $\frac{8}{15}$.

This result is plainly got by multiplying the numerators together and the denominators together of $\frac{2}{3}$ and $\frac{4}{5}$, to form a numerator and denominator respectively. The same method would evidently apply to any other two or more fractions. Hence the following

Rule for the Multiplication of Fractions.
Multiply together all the numerators for a numerator, and all the denominators for a denominator.

Obs.—In multiplying fractions we can often simplify the operation by striking out or *cancelling* factors (as we are at liberty to do, Art. 6) which are common to the numerator and denominator of the fraction formed by multiplying the numerators and denominators together.

EXAMPLE.—Multiply together $\frac{2}{3}$, $\frac{5}{11}$, $\frac{8}{13}$, $\frac{55}{108}$. Their product is equal to—

$$\frac{2 \times 5 \times 6 \times 55}{3 \times 8 \times 11 \times 108} = \frac{\cancel{2} \times \cancel{5} \times \cancel{2} \times \cancel{2} \times 11 \times \cancel{5}}{\cancel{3} \times \cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{11} \times 108}$$

And 2 occurs twice in both numerator and denominator,

11 " once " " " "
3 " once " " " "

Therefore the product = $\frac{5 \times 5}{2 \times 108} = \frac{25}{216}$.

16. Division of Fractions.

To divide $\frac{2}{3}$ by $\frac{4}{5}$.

Dividing by a whole number is finding how many times the divisor is contained in the dividend. Now, a seventh is contained in unity 7 times, and therefore a seventh is contained in $\frac{2}{3}$, $\frac{2}{3} \times 7$ times; 5 sevenths will be contained therefore in $\frac{2}{3}$ one-fifth of this number of times, and therefore the quotient of $\frac{2}{3}$ by $\frac{5}{7}$ is $\frac{2}{3} \times \frac{7}{5}$, that is, $\frac{14}{15}$, and the same method will be true for any other two fractions. Hence the following

Rule for the Division of Fractions.

Invert the divisor, and then proceed as in multiplication, i.e., multiply the numerators together for a numerator, and the denominators for a denominator.

Obs.—In performing the process, the *Obs.* of Art. 15, with reference to *cancelling* factors which are common to both numerator and denominator, must be attended to.

17. By this and the foregoing rules we are able to simplify complex fractions.

EXAMPLE.—To $\frac{\frac{1}{235} - \frac{1}{339}}{\frac{7}{16}} \div \frac{\frac{11}{24} - \frac{7}{40}}{\frac{8}{17}}$, add $\frac{6}{113}$, and multiply the result by $\frac{7}{16}$.

In a case like this it will be better to simplify each portion separately before performing the operation indicated. Now—

$$\frac{1}{235} - \frac{1}{339} = \frac{339 - 235}{235 \times 339} = \frac{113}{235 \times 339} = \frac{1}{2 \times 339}$$

$$\frac{11}{24} - \frac{7}{40} = \frac{55 - 21}{120} = \frac{34}{120} = \frac{17}{60}$$

(120 being the L.C.M. of 24 and 40).

Therefore $\frac{\frac{1}{235} - \frac{1}{339}}{\frac{7}{16}} \div \frac{\frac{11}{24} - \frac{7}{40}}{\frac{8}{17}} = \frac{1}{2 \times 339} \times \frac{10}{113} \times \frac{17}{8} = \frac{10}{113 \times 17}$

Hence $\frac{10}{113 \times 17} + \frac{6}{113} = \frac{10}{113 \times 17} + \frac{6 \times 17}{113 \times 17} = \frac{112}{113 \times 17}$

And $\frac{7 \frac{11}{16}}{8 \frac{17}{17}} = \frac{113}{16} \times \frac{17}{144} = \frac{17}{144}$

And therefore the required result will be given by the following—

$$\frac{7}{144} \times \frac{112}{16} \times \frac{17}{144} = \frac{7}{144} \text{ Answer.}$$

EXERCISE 28.

EXAMPLES IN MULTIPLICATION AND DIVISION OF FRACTIONS, ETC.

1. Find the following products:—

- | | | |
|--------------------------------|--|---|
| 1. $\frac{3}{5} \times 15.$ | 6. $\frac{1}{2} \times \frac{3}{4}.$ | 11. $\frac{1}{2} \times \frac{3}{4} \times \frac{5}{6} \times \frac{7}{8} \times \frac{9}{10}.$ |
| 2. $\frac{1}{3} \times 8.$ | 7. $\frac{2}{3} \times \frac{4}{5}.$ | 12. $3\frac{1}{2} \times \frac{1}{3}$ of 68. |
| 3. $\frac{5}{6} \times 27.$ | 8. $\frac{3}{4} \times \frac{7}{8}.$ | 13. $\frac{2}{3}$ of $65\frac{1}{2} \times 46\frac{1}{2}.$ |
| 4. $12\frac{3}{4} \times 8.$ | 9. $\frac{5}{6} \times \frac{7}{8} \times \frac{9}{10} \times \frac{11}{12}.$ | 14. $\frac{2}{3}$ of $16\frac{1}{2} \times \frac{7}{8}$ of $9\frac{1}{2}.$ |
| 5. $250\frac{1}{5} \times 50.$ | 10. $\frac{1}{2} \times \frac{3}{4} \times \frac{5}{6} \times \frac{7}{8} \times \frac{9}{10} \times \frac{11}{12}.$ | |

2. Perform the following divisions:—

- | | | |
|------------------------------------|--------------------------------------|--|
| 1. $\frac{1}{2} \div \frac{3}{4}.$ | 4. $\frac{7}{8} \div \frac{3}{4}.$ | 7. $8\frac{3}{4} \div 3\frac{1}{2}.$ |
| 2. $\frac{5}{6} \div 7.$ | 5. $\frac{10}{12} \div \frac{1}{3}.$ | 8. $55\frac{1}{2} \div 16\frac{3}{4}.$ |
| 3. $\frac{7}{8} \div 29.$ | 6. $\frac{9}{10} \div \frac{3}{4}.$ | 9. $46\frac{3}{4} \div 68\frac{3}{4}.$ |

3. Divide $\frac{2}{3}$ of $\frac{3}{4}$ by $\frac{2}{3}$.

4. Divide $\frac{1}{2} + 1\frac{1}{2} + \frac{2}{3}$ by $\frac{1}{2} + \frac{1}{3} - \frac{1}{3}$.

5. Divide $\frac{1}{2} + 2\frac{1}{3} + \frac{1}{6} + \frac{5}{11}$ by $\frac{1}{2} + \frac{1}{3} - \frac{1}{3}$.

6. Reduce to their simplest forms $2\frac{1}{2} + \frac{1}{3\frac{1}{2} + \frac{1}{4}}$ and $\frac{2}{3 + \frac{4}{5 + \frac{2}{3}}}$.

7. Divide $2\frac{1}{2} + 1\frac{1}{2} + 3\frac{1}{2}$ by $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{1}{4}$.

8. Find the difference of $2\frac{1}{2} \times \frac{1}{3}$ and $\frac{2}{3} \times \frac{1}{2}$.

9. Simplify $6\frac{2}{3} \times 1\frac{1}{2}$ of $(1\frac{1}{11} - \frac{1}{2})$.

10. What is that number $\frac{2}{3}$ of which is 27?

11. If a certain number be multiplied by $2\frac{1}{2}$ the result is 52. What is the number?

12. By what must $29\frac{1}{2}$ be multiplied to obtain $67\frac{1}{2}$?

13. Express the difference of the first two of the following fractions as a fraction of the difference of the last two: $\frac{1}{2}, \frac{109}{239}, \frac{113}{247}.$

14. Perform the same operation on $\frac{1}{33}, \frac{99}{101}, \frac{17}{174}.$

15. Of what quantity is $\frac{1}{2} - \frac{1}{3}$ of $\frac{1}{4}$ seven-tenths?

16. Find the products of the following fractions:—

- | | |
|---|---|
| 1. $\frac{1}{2} \times \frac{3}{4} \times \frac{5}{6} \times \frac{7}{8}.$ | 4. $\frac{7}{8} \times \frac{1}{2} \times \frac{3}{4} \times \frac{5}{6} \times \frac{7}{8} \times \frac{9}{10} \times \frac{11}{12}.$ |
| 2. $\frac{2}{3} \times \frac{4}{5} \times \frac{6}{7} \times \frac{8}{9} \times \frac{10}{11} \times \frac{12}{13} \times \frac{14}{15} \times \frac{16}{17} \times \frac{18}{19}.$ | 5. $\frac{1}{2} \times \frac{3}{4} \times \frac{5}{6} \times \frac{7}{8} \times \frac{9}{10} \times \frac{11}{12} \times \frac{13}{14} \times \frac{15}{16} \times \frac{17}{18} \times \frac{19}{20}.$ |
| 3. $\frac{1}{2} \times \frac{3}{4} \times \frac{5}{6} \times \frac{7}{8} \times \frac{9}{10} \times \frac{11}{12} \times \frac{13}{14} \times \frac{15}{16} \times \frac{17}{18} \times \frac{19}{20}.$ | 6. $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{7}{8}$ of $\frac{9}{10}$ of $\frac{11}{12}.$ |

17. Find the products indicated by the following expressions:—

- | | | |
|------------------------------|--------------------------------|-----------------------------|
| 1. $79 \times \frac{2}{3}.$ | 3. $1423 \times \frac{1}{17}.$ | 5. $\sqrt{7} \times 476.$ |
| 2. $86 \times \frac{1}{10}.$ | 4. $\frac{1}{7} \times 112.$ | 6. $\frac{1}{17} \times 2.$ |

18. Find the products indicated in the following expressions:—

- | | | |
|--|--|--|
| 1. $4\frac{1}{2} \times 4\frac{1}{2}.$ | 3. $49\frac{1}{10} \times 68\frac{1}{11}.$ | 5. $1000\frac{1}{2} \times 111\frac{1}{12}.$ |
| 2. $7\frac{1}{3} \times 8\frac{1}{4}.$ | 4. $225\frac{1}{5} \times 32\frac{1}{7}.$ | 6. $4768\frac{1}{2} \times 376\frac{1}{3}.$ |

19. Divide the following fractions by each other, according to the indicated expressions:—

- | | | |
|------------------------------------|------------------------------------|------------------------------------|
| 1. $\frac{3}{4} \div \frac{5}{6}.$ | 3. $\frac{4}{5} \div \frac{6}{7}.$ | 5. $\frac{2}{3} \div \frac{4}{5}.$ |
| 2. $\frac{1}{2} \div \frac{3}{4}.$ | 4. $\frac{2}{3} \div \frac{4}{5}.$ | 6. $\frac{1}{2} \div \frac{3}{4}.$ |

20. Find the quotients indicated by the following expressions:—

- | | | |
|---------------------------|---------------------------|----------------------------|
| 1. $\frac{1}{2} \div 9.$ | 3. $\frac{5}{6} \div 11.$ | 5. $\frac{1}{2} \div 37.$ |
| 2. $\frac{2}{3} \div 12.$ | 4. $\frac{1}{3} \div 52.$ | 6. $\frac{2}{3} \div 400.$ |

21. Find the quotients indicated by the following expressions:—

- | | | |
|----------------------------|------------------------------|----------------------------|
| 1. $12 \div \frac{2}{3}.$ | 3. $5 \div \frac{1}{100}.$ | 5. $1 \div \frac{1}{100}.$ |
| 2. $172 \div \frac{1}{2}.$ | 4. $1000 \div \frac{1}{10}.$ | 6. $75 \div \frac{1}{2}.$ |

22. Find the quotients indicated by the following expressions:—

- | | | |
|-----------------------------|-------------------------------|------------------------------|
| 1. $112 \div 7\frac{1}{2}.$ | 3. $1000 \div 1\frac{1}{2}.$ | 5. $1 \div \frac{1}{3}.$ |
| 2. $160 \div 9\frac{3}{4}.$ | 4. $800 \div 800\frac{1}{2}.$ | 6. $2 \div 2000\frac{1}{2}.$ |

23. Find the quotients indicated by the following expressions:—

- | | | |
|------------------------------|-----------------------------------|-------------------------------|
| 1. $17\frac{3}{4} \div 7.$ | 3. $14008\frac{1}{2} \div 9.$ | 5. $1000\frac{1}{2} \div 18.$ |
| 2. $100\frac{1}{2} \div 12.$ | 4. $4783965\frac{1}{2} \div 112.$ | 6. $1\frac{1}{2} \div 800.$ |

24. Find the quotients indicated by the following expressions:—

- | | | |
|--|---|--|
| 1. $7\frac{1}{2} \div 5\frac{1}{2}.$ | 3. $407\frac{1}{2} \div 55\frac{1}{2}.$ | 5. $1000\frac{1}{2} \div 10\frac{1}{2}.$ |
| 2. $98\frac{1}{10} \div 17\frac{1}{10}.$ | 4. $1423\frac{1}{2} \div 5\frac{1}{2}.$ | 6. $1\frac{1}{2} \div 21\frac{1}{2}.$ |

DECIMALS.

1. FRACTIONS, the denominators of which are 10 or any power of 10, are called *Decimal Fractions*, or, more shortly, *Decimals*. Thus $\frac{3}{10}$, $\frac{4}{100}$, $\frac{9}{1000}$, are Decimal Fractions.

Such fractions are represented by a method of notation which is an extension of that employed for whole numbers.

In whole numbers the figures increase in a tenfold ratio from right to left; or, what is the same thing, *decrease* in a tenfold ratio from left to right. If we extend this method of representation towards the right beyond the units' place, any figure one place to the right of the units' place will be one-tenth of what it would be if it were in the units' place, and will thus really denote a decimal fraction; any figure two places to the right of the units' place will be one-hundredth of what its value would be if it were in the units' place; and so on for any number of figures and places.

Hence, if we choose some means of indicating the point in any row of figures at which the units' place occurs, we can write down any decimal fraction without the trouble of expressing the decimal denominators. This is done by putting a dot, or *decimal point*, as it is generally called, between the figure in the units' place and the figure in the place to the right of it, which we may call the *tenths' place*. Thus, 1.4 would mean $1 + \frac{4}{10}$; .3 would mean $\frac{3}{10}$; 3.1459 would mean

$$3 + \frac{1}{10} + \frac{4}{100} + \frac{5}{1000} + \frac{9}{10000}$$

2. We generally speak of any figure in a decimal as being in *such a place of decimals*. Thus, in the last example we should say that the 5 is in the fourth place of decimals, the 9 in the fifth place, and so on, reckoning from left to right.

Observe that the denominator of the fraction corresponding to the figure in any decimal place is unity followed by the same number of ciphers as the decimal place; or, what is the same thing, that the *power of 10*, which is the denominator, is the same as the number of the decimal place.

3. The figures 1, 2, 3, 4, 5, 6, 7, 8, 9 in a decimal are sometimes called *significant figures*, or *digits*. Thus in such a decimal as .0002356, we should say that 2 is the first significant digit, because it is the first figure which indicates a number, the ciphers only serving to fix the place in which the 2 occurs.

4. To express a Decimal as a Vulgar Fraction.

$$.347 = \frac{3}{10} + \frac{4}{100} + \frac{7}{1000}$$

Or (reducing the fractions to a common denominator, 1000)

$$= \frac{300 + 40 + 7}{1000} = \frac{347}{1000}$$

$$.0237 = \frac{2}{100} + \frac{3}{1000} + \frac{7}{10000} + \frac{7}{100000}$$

Or (reducing the fractions to a common denominator, 10000)

$$= \frac{0 + 200 + 30 + 7}{10000} = \frac{237}{10000}$$

$$\text{Again } 43.25037 = 43 + \frac{2}{10} + \frac{5}{100} + \frac{0}{1000} + \frac{3}{10000} + \frac{7}{100000}$$

Or (reducing the fractions to a common denominator, 100000)

$$= \frac{4300000 + 20000 + 5000 + 0 \times 100 + 30 + 7}{100000} = \frac{4325037}{100000}$$

Hence we see the truth of the following

Rule for expressing a Decimal as a Vulgar Fraction.

Write down the figures which compose the decimal (both integral and decimal part, if there is an integral part) for the numerator, omitting the decimal point; and for the denominator put 1, followed by as many ciphers as there are decimal places in the given decimal.

5. Conversely, if we have a fraction with any power of 10 for its denominator, we can express it as a decimal by placing a decimal point before as many right-hand figures in the numerator as there are ciphers in the denominator. Thus—

$$\frac{53459}{100000} = 5.3459$$

If the figures in the numerator be fewer than the ciphers in the denominator, we must place before the left-hand figure of the numerator ciphers equal in number to the excess of the number of ciphers in the denominator over the number of figures in the numerator, and then prefix the decimal point. For example—

$$\frac{00000235}{100000} = .00235$$

Obs.—It will be perceived from the foregoing remarks that placing ciphers on the right of a decimal does not alter its value, for this does not alter the place of any of the *significant figures*. Thus, .23, .230, .2300 are all equal in value, for, expressed as fractions, they are respectively $\frac{23}{100}$, $\frac{230}{1000}$, $\frac{2300}{10000}$. But prefixing

ciphers between the decimal point and the first significant figure does alter the value of the decimal, because this alters the places of the significant digits. Thus .23, .023, .0023 have all different values, being respectively equal to $\frac{23}{100}$, $\frac{23}{1000}$, $\frac{23}{10000}$.

MECHANICS.—V.

PARALLEL FORCES.—CENTRE OF GRAVITY.

BEFORE proceeding to the subject of the Centre of Gravity, I must direct your attention to two consequences which flow directly from the principles established in the last lesson, and furnish the basis on which the properties of that centre rest. You have seen there that the centre of a system of parallel forces is found by cutting in succession certain lines which join certain points in certain definite proportions, namely, inversely as the forces acting at their extremities. Now, such cutting can give for each line, and therefore for all, as final result, *only one point*. For example, the centre of two parallel forces of six and four pounds acting at two points, A B, of a body, as in the last lesson, is got by dividing A B into ten parts, and counting off four parts next to A, or six to B, and the result evidently can be only one point. If we now suppose a third parallel force of five pounds added, acting at some other point, c, of the body, and join the point last found with c, and divide the joining line into fifteen parts, taking ten next to c, here again only one point is the result. And so on for any number of forces it can be shown that there is *but one centre*.

But, lest it should be thought possible that, on cutting these lines in a different order of the points, A B C, etc., a second centre should turn up, let us think that possible, and apply forces at these points parallel to each other, *but not parallel to the line joining these two centres*. Their resultant then passes through both of these points, and therefore must act in the line joining them, which is *impossible*; since, as I have proved, it must be parallel to its components.

Furthermore, you will observe that all these lines are cut only in reference to the *magnitudes* of the forces; no account is taken of their *direction*. Whether they pull upwards or downwards, or obliquely to left or to right, so long as the magnitudes remain the same, or even keep the same proportion—say that of six, four, and five—the centre cannot change. Of course, the points are supposed not to change. Whatever be the number of points and forces this is true; as for three, so for any other number. And mark, moreover, that it makes no difference how this change of direction is produced, whether, leaving the body in one fixed position, you make the forces change directions as at a and b (Fig. 17), or, preserving the direction, you turn the body round, as from a to c in the same Fig. In neither case does the centre change. These results may be summed up in the two following propositions:—

1. A System of Parallel Forces acting at given points in a body, has ONE Centre of Parallel Forces, and *only one*.

2. The Centre of Parallel Forces does not change its position when the *direction* of the forces is changed in reference to the body.

THE CENTRE OF GRAVITY.

The centre of gravity is the particular case of the centre we have been last considering, in which the forces are those by which bodies on the earth's surface are drawn by attraction towards its centre. The smallest body, particle, or atom, is drawn in proportion to its mass, equally with the largest; and it is to the tendency of these bodies so to move downwards in obedience to this attraction, that we give the name of "weight." The term "gravity," carries a similar meaning, being derived from the Latin *gravis*, heavy.

Now, since every particle of matter is thus drawn to the earth's centre, it is evident that the weight of all large masses, such as of a block of marble, beam of timber, or girder of iron, is the joint effect, or the *resultant*, of the attractions of the separate atoms. But these attractions are all so many parallel forces; for, pulling, as they do, towards the earth's centre, which is nearly 4,000 miles away down in the ground, they incline, even in the largest objects, so little towards one another that practically they may be considered *not to meet*, that is, to be parallel. Hence you see that all the principles we have proved about parallel forces hold good of the earth's attraction of these atoms, and that we may affirm that—

1. A body has *one* Centre of Gravity, and *only one*.
2. The Centre of Gravity is not changed by the body being turned round after any manner in any direction.

It thus appears that the weights of all the separate atoms of any mass of matter are equal to a single weight supposed to act at some point *within* that mass, or, as sometimes happens (and we shall see), *even without*, equal to their sum. There is great

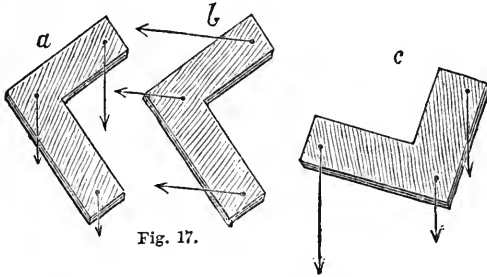


Fig. 17.

advantage in this simplification; for, instead of having to consider millions of diminutive forces acting at all its points, we direct our attention to *only one force*, acting at *only one point*.

You can now understand how it is that a piece of card or thin board may be supported on the point of a rod, wire, or needle. All that is necessary is to bring the point under the centre of gravity of the board; then, the resultant of all the forces by which its several parts are pulled downwards passing through that centre, will be resisted by the rod, and there will be equilibrium; the card will be *balanced*.

Another consequence follows. Let the body be of any shape, regular or irregular; and suppose that, having determined its centre of gravity, we fix or support that point in some way so that the body may freely turn round it, as on a pivot, in every direction. Then, since, as I have shown, the centre of gravity cannot change as the body turns round, whatever position I place it in, the centre remains supported, and the resultant weight, $G P$, passing through it, will be resisted by its supports, and the body will be in equilibrium, as in Fig. 18, where G is the supported centre of gravity.

Now suppose that instead of this centre we make the body pivot round some other one of its points, O (as in Fig. 19). Then, if I place it so in the position $O A B$, that the centre of gravity, G , may lie exactly under O , as a plumb-line would hang, the weight acting along the line, $O G$, may be taken to have O for its point of application, by which, as it is fixed, it will be resisted. In such case there will be equilibrium, G being under

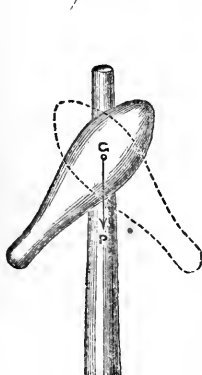


Fig. 18.

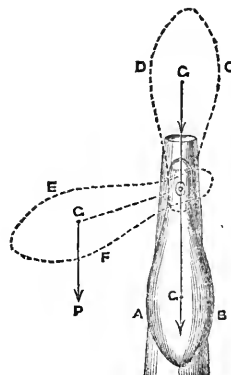


Fig. 19.

O . And so, also, if G were exactly above O , as in $O C D$, in the vertical line produced upwards, the weight would press downwards on O , and be there resisted. But if I put it in any other position, $O E F$, where G will not be either above or below O , the weight acting downwards, in the direction $G P$, will not be *opposite* to the line $O G$ of resistance of O , and there cannot be equilibrium. There are thus two positions in which the body

may be at rest, both on the vertical line through O ; but one in the *lowest* position it can attain and the other in the *highest*. We thus learn that—

1. If a body be suspended by or supported at its centre of gravity, it will be at rest, whatever be the position in which it is placed.

2. If the body be suspended by or supported at any other point, it will be at rest when the centre of gravity is in its highest or lowest possible position on the vertical line through the point of suspension or support.

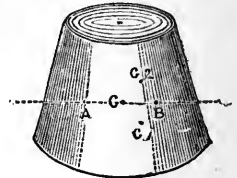


Fig. 20.

If two points A, B (Fig. 20), are fixed, all the points of the line $A B$ are fixed, but the body is free to turn round that line; and if in that case the centre of gravity is somewhere on $A B$, as G , it also is fixed, and the weight there concentrated will be borne by the two points of support, $A B$, divided between them in two portions inversely proportional to their distances, $A G, B G$, from the centre of gravity. The body will, therefore, be in equilibrium in every position into which it can be turned round the line $A B$. But if, when two points are fixed, this centre is not on the line $A B$, it is *free* to move round it. There are, therefore, two positions, G_1, G_2 , in a plane vertically passing through this line—one below, the other above, in which it may rest, and the result is similar to that stated in the above propositions. Familiar examples of this are furnished by all pieces of machinery in which bodies move round fixed axles, such as the fly-wheel of a steam-engine, or the smaller wheels round which the bands pass, which set the printing presses at work in the machine-room—all the points along the line which runs down the centre of the axle are at rest. A trap-door, which opens both downwards and upwards, is another instance; in that case the centre of gravity is under or above the axle-line of the hinges when the door hangs in equilibrium.

But bodies may be kept in equilibrium in other ways than that of fixing points within their substance. A horse poised in the air, as it is about to be lifted into a transport ship, by a rope which descends from the top of a crane and is attached to a belt which goes round his body, is an instance. Here the centre of gravity of the lifted animal is under the point of support and on the line of direction of the rope which transmits its weight to the crane above. But observe, in this case, there is *only one* position of equilibrium—namely, the lowest. The rope not being rigid, you cannot wheel the horse half round, heels up in the air (Fig. 21) until he reaches the highest position the chain would allow him to reach, and make his weight thence press downwards on the crane. To do this a rigid bar should take the place of the rope.

But bodies are most commonly kept at rest by being supported *from below* by the earth, either on the ground itself, or on some floor, table, etc. What conditions will secure a steady equilibrium? First, there must be some base or bottom to the body on which it may rest, such as the bottom of a teapot or candlestick. Secondly, it must be broad enough to keep the body steady, to prevent its upsetting or rocking. A candlestick resting on the socket into which the candle is put, would soon over-

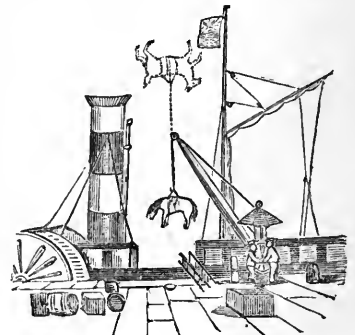
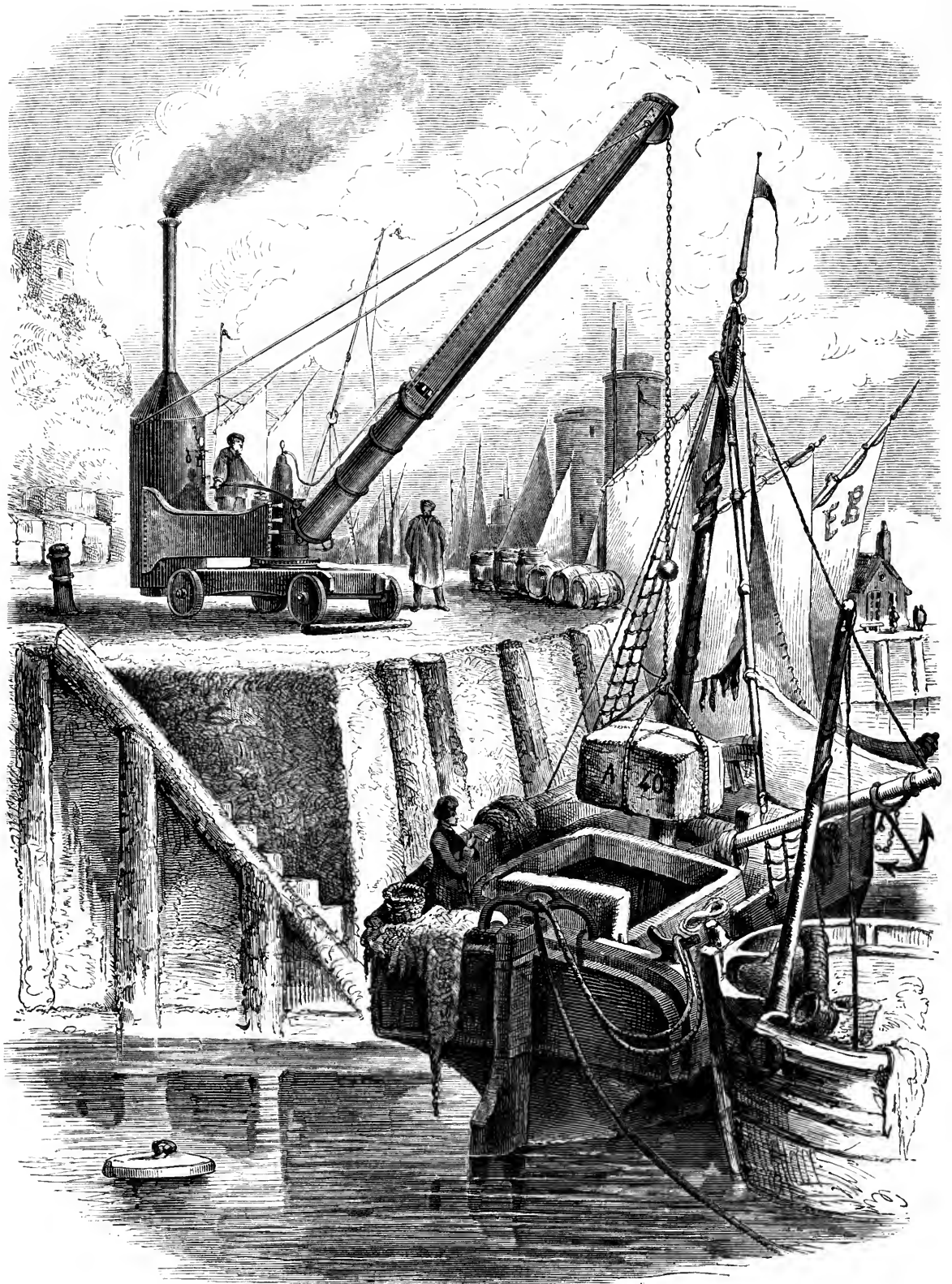


Fig. 21.

turn, and the slightest touch would set an egg rocking.

Now, in order to ascertain the equilibrium and stability of bodies so placed, let us suppose two of the forms in Fig. 22 to rest on a level table, touching it on the two perfectly flat bases $x x z, x_1 x_1 z_1$, there represented. Let G be the centre of gravity of that to the right, and $G P$ the perpendicular to the table through that point. Let, moreover, G_1 and $G_1 P_1$ be the



corresponding centre and perpendicular of the body to the left. Now, since the table, by its resistance distributed equally over the base $x y z$ of the first body, prevents its moving downwards, and this resistance at every point is perpendicular to the floor, these resistances, taken together, are a system of parallel forces, and have a parallel centre somewhere in that base. Let this centre be o . Join now $o P$; and, as the same reasoning holds good of the body to the left, let $o_1 P_1$ be the corresponding line in it. Moreover, let $x, x_1,$ be the points in which the lines $o P, o_1 P_1$ cut the circumference, or boundary of the bases $x y z, x_1 y_1 z_1$. The body to the right is thus acted on by two forces; the resistance at o upwards

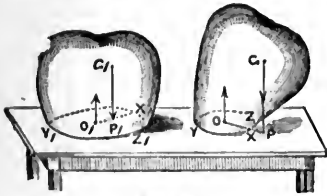


Fig. 22.

supporting it, and the weight at G pulling downwards. But, as the point P falls, in this case, outside the base $x y z$, there is nothing to prevent the body obeying it by turning over on its edge at x .

But, in the other case, where P is within the base, the weight at G tends to make the body fall inwards, turning on its edge at x . But then, there is the resistance of the table at o , acting upwards to prevent that motion; and consequently the body remains at rest, or is in equilibrium.

And this statement holds equally good when the plane on which the body rests is sloped or inclined to the horizontal plane; as is evident from Fig. 23, where the cylindrical body on the slope $A B$ must upset if $g P$ falls outside the base $x y z$. We may, therefore, conclude generally both as to horizontal and inclined planes that a body will rest in equilibrium on a plane, if the vertical line, passing through its centre of gravity, meets the plane within the base. If it meets it outside the base, the body will overturn.

Between these two, it should be observed that there is an intermediate case, in which the perpendicular meets the plane neither within nor without the base, but on its circumference. When this happens, the body is equally disposed to stand or upset; but, in fact, it will overturn; for in such an unsteady position the slightest touch or shake would send it over. It is a case of *unstable equilibrium*.

In interpreting and applying this principle to practice, you must be on your guard as to the meaning of the word "base;" else you may imagine some day you have discovered that a body does not upset when the vertical from the centre of gravity falls outside the base. Suppose the base to be bent inwards into a horse-shoe form, as in the cone, a (Fig. 24), or into the form of the semi-circular wall, b , in which latter case the centre of gravity is *without* the substance of the body; then the point P is on the floor, outside the spaces along which the bodies are in contact with it. Still, neither body will upset; for the advanced spurs of the bases at x and z will act as

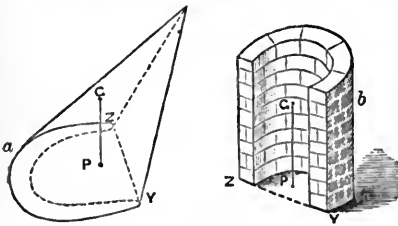


Fig. 24.

props, and in order to upset they must turn over the line $x y z$ joining them. This shows that the real base includes all the open space within $x y z$; and you learn that, whenever the base of contact bends inwards, you must measure the base of support from one projecting point to another all round, making no account whatever of the inward bends. A common table touches the floor only at four points, and a round table at three; but in both the base of support is

all the space within the oblong or triangle got by joining these points.

There is another class of cases to be noticed, those which are round all over their surface like a ball, or egg, or sea-shore pebble, and have no flat bases to rest on—that is, which can be supported at only one point of their surface; or, where there are hollows on them, along a line of points surrounding the hollow.

This latter case we need not consider, for such bodies rest, like those we have already examined, so far as the hollows are concerned (as in d , Fig. 25), on wide bases.

Confining attention, therefore, to cases in which there are no hollows, or the surface is *convex all round*, if you place such a body, say an oval, in the position represented at a (Fig. 25), the perpendicular, $g P$, from its centre of gravity, g , on the plane will fall outside its base, or point of support, o , and it will roll over until, after rocking for a few turns, it settles into the position b , in which o is above o . Now move it further from this until it reaches the position c , in which again g will be over the point of support, o ; and again you will have a possible equilibrium, that is, possible in imagination, for the body is supported from below. But *actually* to produce equilibrium in this case is the celebrated problem of Columbus, which that great navigator solved after so summary a fashion. So *unsteady* is it, that the body drops immediately into the position b .

Of this unsteady, or unstable equilibrium, we shall have more in the next lesson; my object here is to point out the fact that in both positions, b and c , the line $g o$ is perpendicular to the surface of the body. It is evidently perpendicular to the plane on which the oval rests; but, since the latter's surface touches, or coincides at o , with that plane, $g o$ must be perpendicular also to that surface. Hence we learn that, whatever be the number of points at which a *convex* body can rest, steady or unsteady, on a horizontal plane, for every one of these points the lines connecting them with the centre of gravity must pierce its surface at right angles; or—

The number of positions of equilibrium of a *convex* body, supported on a horizontal plane, is equal to that of the *perpendiculars* to its surface which can be drawn from its centre of gravity.

A few instances in illustration of the principles explained in this lesson will now be useful. When a man stands upright, the base by which he is supported is so much round under him as is covered by his feet, together with the space between them. If he widens that space to left and right, he makes himself more steady as to being thrown sideways, but is more easily cast on his face. If he puts one foot before the other, he becomes steadier at front and back, but less so to his sides. A two-wheeled gig, or Hansom, to be properly balanced, should have its centre of gravity over the line joining the points at which the wheels touch the ground. If it be in advance of that line, it will throw a weight on the horse's back; if behind it, the gig will upset backwards should the belly-band break.

A body may be made to roll up an incline by loading it at one side. Take a round ball of cork, for instance, and put some lead into a hollow scooped out near its surface, closing the hole so as to leave the ball perfectly round. The centre of gravity will then no longer be at the centre of the ball, but to one side, let it be at g (in a , Fig. 26). Put the ball now on the incline, with the loaded side looking up the slope; the perpendicular $g P$ will meet the incline above o , and the ball will roll upwards until o comes over the point of support.

This experiment may be tried in another form without the use of the lead, by simply scooping a hollow on one side, or as in the following example:—Get a round cylinder of cork—a

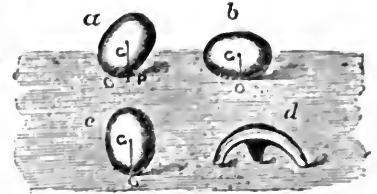


Fig. 25.

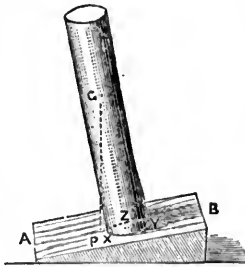


Fig. 23.

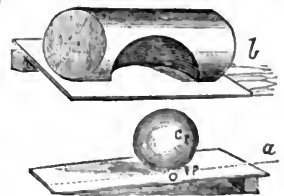


Fig. 26.

common bottle cork—and scoop out its substance on one side, as represented at *b*, Fig. 26, preserving carefully the roundness of the two circular faces at its ends. Put this cylinder on the incline, with the scooped part facing down the slope, and you will find that it will also run upwards, as did the ball. The reason of this you will easily discover, but be careful, in making the experiment, that the incline be not great. The following are other common instances which you can try, as

EXAMPLES FOR PRACTICE.

1. A man walking up a hill stoops forward; why? And why, also, when coming down, does he lean backward?
2. A person rising from a chair leans his body forwards, and draws his feet close to the chair; why?
3. Carrying a bucket of water, he leans to the side opposite.
4. Why does a corpulent person generally hold his head up and throw his shoulders backward?
5. A horse and rider are more apt to fall coming down a hill than on the level road; why?
6. An omnibus, or coach, is safer for travelling when it is well filled inside, than when outside.

ANSWERS TO THE QUESTIONS IN LESSON IV.

Polygon of Forces.

1. The resultant is a little over 13 lbs., and makes an angle of nearly 45° degrees with the force *O A*.
2. The force which supports the roller on the slope is 56 lbs., and the pressure 97 lbs. nearly.
3. The strain on the three-foot cord is 48 lbs., and on the four-foot cord 36 lbs.
4. The point of meeting of the three cords is below the pulleys, at the distance of six feet from the top of that over which the 4 lb. weight hangs, and of 8 feet from the top of the other pulley.

Parallel Forces.

1. The required parallel centre in this case is on the line joining any vertex of the triangle with the middle point of the side opposite, at a distance of two-thirds of that line from the vertex, or one-third from the side.
2. The required centre is distant one-third of the length of the beam from the end at which the three-pound force acts.
3. The required centre is 8 inches distant from the end of the rod at which the three-and-a-half pound weight acts.
4. The strain on the upper hinge is 29 lbs. 3 oz. nearly, and on the lower 39 lbs. 13 oz. In doing this question the student must first find the centre of parallel forces for the 23 lbs. and 37 lbs. This point will be found by cutting the 7 feet of height of door into 60 parts (the sum of 23 and 37), and counting off 23 of these from the bottom. The resultant then acts at the end of the 23rd subdivision. But as the hinges bear the drag of this force, it is divided between them in the inverse proportion of their distances from this point. Divide then the 60 lbs. into two parts, which have this proportion, and the above strains will be found. It is better to do this question by *arithmetically* calculating the position of the point and magnitudes of strains. The strain caused by the weight of the door is not here taken into consideration.

READING AND ELOCUTION.—VI.

PUNCTUATION (*continued*).

IX. THE DASH (*continued*).

56. THE dash sometimes precedes something unexpected; as when a sentence beginning seriously ends humorously.

Examples.

Good people all, with one accord, lament for Madam Blaize: who never wanted a good word—from those who spoke her praise.

The needy seldom passed her door, and always found her kind; she freely lent to all the poor—who left a pledge behind.

She strove the neighbourhood to please, with manner wondrous winning; and never followed wicked ways—except when she was sinning.

At church, in silks and satin new, with hoop of monstrous size; she never slumbered in her pew—but when she shut her eyes.

Her love was sought, I do aver, by twenty beaux, and more; the king himself has followed her—when she has walked before.

But now her wealth and finery fled, her hangers-on cut short all; her doctors found, when she was dead—her last disorder mortal.

Let us lament, in sorrow sore; for Kent Street well may say, that had she lived a twelvemonth more—she had not died to-day.

57. The dash is sometimes used with other pauses to lengthen them.

Examples.

God, whom you see me daily worship, whom I daily call upon to bless both you and me and all mankind; whose wondrous acts are recorded in those Scriptures which you constantly read,—God, who created the heavens and the earth; who appointed his Son Jesus Christ to redeem mankind;—God, who has done all these great things, who has created so many millions of men, with whom the spirits of the good will live and be happy for ever;—this great God, the Creator of worlds, of angels, and of men, is your Father and Friend.

It is not, therefore, the use of the innocent amusements of life which is dangerous, but the abuse of them;—it is not when they are occasionally, but when they are constantly pursued; when the love of amusement degenerates into a passion; and when, from being an occasional indulgence, it becomes an habitual desire.

In every pursuit, whatever gives strength and energy to the mind of man, experience teaches to be favourable to the interests of piety, of knowledge, and of virtue;—in every pursuit, on the contrary, whatever enfeebles or limits the powers of the mind, the same experience ever shows to be hostile to the best interests of human nature.

From the first hour of existence to the last,—from the cradle of the infant, beside which the mother watches with unslumbering eye, to the grave of the aged, where the son pours his bitterest tears upon the bier of his father,—in all that intermediate time, every day calls for exertion and activity, and moral honours can only be won by the steadfast magnanimity of pious duty.

They say they have bought it.—Bought it! Yes;—of whom?—Of the poor trembling natives, who knew that refusal would be vain; and who strove to make a merit of necessity, by seeming to yield with grace, what they knew they had not the power to retain.

It is not the lifeless mass of matter, he will then feel, that he is examining,—it is the mighty machine of Eternal Wisdom: the workmanship of Him, in whom everything lives, and moves, and has its being.

When suffering the inconveniences of the ruder parts of the year, we may be tempted to wonder why this rotation is necessary;—why we could not be constantly gratified with vernal bloom and fragrance, or summer beauty and profusion.

Then a spirit passed before my face; the hair of my flesh stood up: it stood still, but I could not discern the form thereof: an image was before mine eyes.—There was silence, and I heard a voice—Shall mortal man be more just than God?

58. The dash is sometimes to be read as a note of interrogation.

Examples.

Is it not enough to see our friends die, and part with them for the remainder of our days—to reflect that we shall hear their voices no more, and that they will never look on us again—to see that turning to corruption, which was but just now alive, and eloquent, and beautiful with all the sensations of the soul?

He hears the ravens cry; and shall he not hear, and will he not avenge, the wrongs that his nobler animals suffer—wronges that cry out against man from youth to age, in the city and in the field, by the way and by the fireside?

Can we view their bloody edicts against us—their hanging, heading, hounding, and hunting down an ancient and honourable name—as deserving better treatment than that which enemies give to enemies?

Are these the pompous tidings ye proclaim, lights of the world, and demi-gods of fame? Is this your triumph—this your proud applause, children of truth, and champions of her cause?

Was there ever a bolder captain of a more valiant band? Was there ever—but I scorn to boast.

And what if thou shalt fall unnoticed by the living—and no friend take note of thy departure?

Seest thou yon lonely cottage in the grove—with little garden neatly planned before—its roof deep-shaded by the elms above, moss-grown, and decked with velvet verdure o'er?

What shall we call them?—piles of crystal light—a glorious company of golden streams—lamps of celestial ether burning bright—suns lighting systems with their joyous beams.

59. The dash is sometimes to be read like a note of exclamation.

Examples.

What dreadful pleasure! there to stand sublime, like shipwrecked mariner on desert coast, and see the enormous waste of vapour, tossed in billows lengthening to the horizon round, now scooped in gulfs, with mountains now embossed—and hear the voice of mirth and song rebound, flocks, herds, and waterfalls, along the hoar profound!

The chain of being is complete in me; in me is matter's last gradation lost, and the next step is spirit—Deity! I can command the lightning, and am dust!

Above me are the Alps, the palaces of Nature, whose vast walls have

pinnacled in clouds their snowy scalps, and throned Eternity in icy halls of cold sublimity, where forms and falls the avalanche—the thunderbolt of snow!

How has expectation darkened into anxiety—anxiety into dread—and dread into despair! Alas! not one memento shall ever return for love to cherish. All that shall ever be known is, that she sailed from her port, and was never heard of more.

A measure of corn would hardly suffice me fine flour enough for a month's provisions, and this arises to above six score bushels: and many hogheads of wine and other liquids have passed through this body of mine—this wretched strainer of meat and drink! And what have I done all this time for God and man? What a vast profusion of good things upon a useless life and a worthless liver!

X. THE HYPHEN.

60. The hyphen is a mark resembling a dash, but not so long.

61. The hyphen is used to separate the syllables of a word; or to make one word of two; as, semi-circle, sea-water.

62. When there is not room enough in the line for the whole of a word, some of its syllables are put into the line with a hyphen, and the remainder are put into the next line.

63. When a hyphen is placed over the vowels, it shows that they have their long sound.

Examples.

Extraneous, sea-water, semi-circle, demi-gods, plane-trees, bed-side, over-canopied, toil-hardened, grey-haired, to-morrow, Sabbath-day, Sardanapalus, ill-requited, thunder-cloud, European, Epicurean, pine-covered, clay-cold, snow-clad, parish-clerk, night-steed, moon-eyed, azure, all-wise, edict, fellow-creatures, icy, well-founded, omega, fellow-feeling, uniform, prophesy, earth-born, far-wandering, storm-clouds, hymeneal, chamber, either, fairy, lever, apiary, culinary.

XI. THE ELLIPSIS.

64. Ellipsis means an omission of some word or words. Sometimes a sentence is unfinished, or some parts of it are purposely omitted; and the mark which indicates an ellipsis is put in the place of that which is left out.

65. An ellipsis is sometimes indicated by a long straight line, thus, _____, which resembles a lengthened dash.

66. Sometimes the ellipsis is denoted by asterisks, or stars, thus, * * * * *

67. Sometimes the ellipsis is marked by small dots, or periods, thus,

68. Sometimes the ellipsis is indicated by hyphens, thus, - - - - -

69. The ellipsis sometimes so closely resembles a dash in its effects, that it is scarcely distinguishable from it.

70. The voice is generally suspended at an ellipsis; but the falling inflection is frequently used when the ellipsis follows a question or exclamation. In some of the following examples the dash and ellipsis are both used.

Examples.

Hast thou _____ But how shall I ask a question which must bring tears into many eyes!

The air breathes invitation; easy is the walk to the lake's margin, where a boat lies moored beneath her sheltering tree.—

Forth we went, and down the valley, on the streamlet's bank, pursued our way, a broken company, mute or conversing, single or in pairs.

What man is there so vile, that will not love his country? If any, let him speak; for him have I offended.—I pause for a reply _____ Now! then none have I offended.

It is in vain to explain:—the time it would take to reveal to you _____ Satisfy my curiosity in writing them.

Indeed he is very ill, sir, _____ Can't help it. _____ We are very distressed, _____ Can't help it. _____ Our poor children, too, _____ Can't help that, neither.

Now, if he had married a woman with money, you know, why, then The suppliant turned pale, and would have fainted.

I have been, my dear S. on an excursion through the counties which lie along the eastern side of the Blue Ridge.

You have my answer: * * * —let my actions speak. No, no, Dionysius; remember that it was I alone who displeased thee: Damon could not _____

If he were all _____ Remember haughty Henry, the nephew of his wife, whose word could speed a veteran army to his kinsman's aid.

I would not wound thee, Douglas, well thou knowest; but thus to hazard on a desperate cast thy golden fortunes _____

Still must I wonder; for so dark a cloud _____ Oh, deeper than thou think'st I've read thy heart.

Your grace will pardon me for obeying _____ Say no more, my child; you are yet too raw to make proper distinctions.

Let them or suppose I address myself to some particular sufferer—there is something more confidential in that manner of communicating one's ideas—as Moore says, Heart speaks to heart—I say, then, take especial care to write by candle-light.

That spare manual labour—this would relieve from mental drudgery, and thousands yet unborn But hold! I am not so sure that the female sex in general may quite enter into my views on the subject.

LESSONS IN GEOMETRY.—VI.

PROBLEM VI.—To bisect a rectilinear angle, that is, to divide it into two equal parts.

Let A B C (Fig. 11), be the rectilinear angle to be bisected. From B as centre, with any convenient radius B A, describe the arc A C, and from the points A, C, as centres, describe arcs intersecting each other in D; then join B D, and it will bisect the angle A B C, that is, it will divide it into the two equal angles A B D, C B D, as required.



Fig. 11.

By this method of construction an angle may be divided into any number of equal parts denoted by the series 2, 4, 8, 16, 32, 64, 128, etc.

PROBLEM VII.—To draw an angle equal to a given rectilinear angle, at a point in a given straight line.

Let A B C (Fig. 12) be the given rectilinear angle, D F the given straight line, and D the point in it. From the point B as a centre, with any convenient radius B A, describe the arc A C; from the point D, in the straight line D F, draw the indefinite arc F E, with the same radius; and from the point F as a centre, with radius equal to the distance A C, describe an arc intersecting the arc F E, in the point E; then, through the points D, E, draw the straight line D E; the angle E D F will be equal to the given angle A B C.

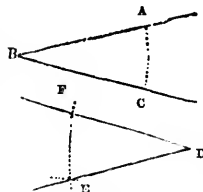


Fig. 12.

If any of our students should not see the preceding construction clearly, we add the following one. Let L K I (Fig. 13), be the given angle, A B the given straight line, and A the point in it. From the point K as a centre, with any radius K L, describe the arc L I; from the point A as a centre, with the same radius, describe the indefinite arc B D; draw the chord L I, and with the point B as a centre, with radius equal to the chord L I, describe an arc intersecting the arc B D in the point C; then join A C, and the angle B A C is the angle required; that is, it is equal to the given angle L K I.

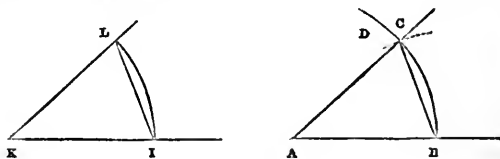


Fig. 13.

If the chord B C be drawn, then the two triangles L K I, C A B are two equal isosceles triangles. Hence, if an isosceles triangle L K I be given, this construction shows how to make an isosceles triangle D A B equal to the given one.

PROBLEM VIII.—To draw a triangle equal to a given triangle, or in other words, to describe a triangle of which the three sides are given.

Let A B C be the given triangle. A triangle is to be drawn, having its three sides equal to the three straight lines A B, B C,

c , A , the sides of the given triangle $A B C$. Draw a straight line $D E$ equal to $A B$, and from the points D, E , as centres, with radii respectively equal to the straight lines $A C, B C$, describe arcs intersecting each other in the point F ; then join $F E, F D$; and the triangle $D E F$ is the triangle required; that is, it has its three sides equal to the three sides $A B, B C, C A$ of the given triangle $A B C$; or it is equal to the triangle $A B C$.

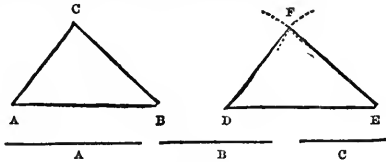


Fig. 14.

The mode of construction is the same if it be required to draw a triangle having its sides equal to three given straight lines such as the straight lines A, B, C , in Fig. 14.

PROBLEM IX.—To draw a straight line through a given point, that shall be parallel to a given straight line.

Let $B C$ (Fig. 15), be the given straight line, and A the given point, through which a straight line parallel to $B C$ is to be drawn. Take any point E in the straight line $B C$, join $E A$; and from the point B , as centre, with the radius $E A$, draw the arc $A F$, cutting $B C$ in F . Then from the point A , as a centre with radius $A E$, draw the indefinite arc $E O$; and from the point E as centre, with radius $E D$ equal to the distance $A F$, describe an arc cutting the arc $E O$, in the point D ; then join $A D$, and it will be parallel to $B C$, as required.

Another way.—Another mode of constructing this problem may be inserted here. Let $A B$ (Fig. 16) be the given straight line, and c the given point through which a straight line parallel to $A B$ is to be drawn. Take any point o , at a convenient distance from the straight line $A B$, but nearer to it than to the point c ; join $o c$, and from o as centre, with radius $o c$, describe the circle $C D E G$, intersecting the straight line $A B$, in the points D, E ; join $C D$, and then from E as a centre, with radius or distance equal to $D C$, describe an arc cutting the circle $C D E G$ in the point F ; and through the points c, F draw the straight line $c F$. The straight line $c F$ is parallel to the given straight line $A B$, and it is drawn through the given point c , as required.

There are various other ways of drawing a straight line parallel to a given straight line, by means of the single ruler and compasses; but these are about the easiest. But parallel straight lines are most easily drawn by means of the parallel rulers described in a former lesson. Such instruments, however, are not always at hand; hence the utility of knowing how to work the preceding problem.

The only exercises or questions that could be given on the preceding problems, would be simply to desire the student to draw all the figures above described according to the rules of construction laid down in the different problems, which we earnestly advise our self-educating students to do accordingly, by means of the single ruler and compasses.

PROBLEM X.—To draw a straight line parallel to a given straight line at a given distance from it.

Let $A B$ be the given straight line, and c the given distance at which it is required to draw a straight line parallel to $A B$. Take any two points, D and E , in the straight line $A B$, and from these points as centres, with a radius equal to the given distance c , describe the arcs $F G H, K L M$. Draw $G L$ touching these arcs, but not cutting them. The straight line $G L$ is parallel to the given straight line $A B$.

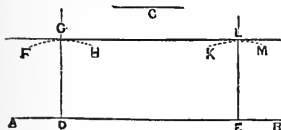


Fig. 17.

Another way.—From any two points $D E$, in the straight line $A B$, draw the straight lines $D G, E L$, perpendicular to $A B$; then from the same points as centres, with a radius equal to the given distance c , draw the arcs $F G H, K L M$, cutting the perpendiculars $D G, E L$ in the points G and L . Join $G L$, and produce it as far as may be required at either end. The straight line $G L$ is parallel to $A B$.

PROBLEM XI.—To trisect a right angle, or to divide a right angle into three equal parts.

Let $B A C$ be the right angle that is to be divided into three equal parts. Take any point D in $A B$, and from the centre A at the distance $A D$, describe the arc $D E$, cutting $A C$ in E . Then from the points D, E as centres, with the radius $D A$ or $E A$, draw arcs, cutting the arc $D E$ in the points $F G$. Join $A F, A G$. The right angle $B A C$ is divided into three equal parts by the straight lines $A F, A G$.

If the angles $B A F, F A G, G A E$ be bisected by Problem VI., the right angle $B A C$ will be divided into six equal parts, and by continued bisection it may be divided into any number of equal parts denoted by the series 6, 12, 24, 48, 96, 192, etc.

PROBLEM XII.—To divide a given straight line into any number of equal parts.

Let $A B$ be the given straight line. From its extremity A draw the straight line $A C$, forming with $A B$ the angle $C A B$, and from the extremity B draw $B D$ parallel to $A C$, and forming with it the angle $D A B$, which is equal to the angle $C A B$. Set off along the straight line $A C$ as many equal parts, less one, as the number of parts into which $A B$ is to be divided: that is to say, if $A B$ is to be divided into six equal parts, set off five equal parts, $A E, E F, F G, G H, H K$ along the straight line $A C$, and the same number of equal parts, $B L, L M, M N, N O, O P$, along the straight line $B D$. Join the straight lines $P E, O F, N G, M H, L K$, cutting the straight line $A B$ in the points Q, R, S, T, U . The parts $A Q, Q R, R S, S T, T U, U B$, into which the straight line $A B$ is thus divided, are equal to one another, and the straight line $A B$ is divided into the number of equal parts required.

PROBLEM XIII.—To find a mean proportional between two given straight lines.

Let A and B be the two given straight lines to which it is required to find a mean proportional—that is to say, if A be the shorter of the two lines, a line to which A bears the same proportion as the line required bears to B .

Draw the straight line $C X$, and on $C X$ set off $C D$ equal to A , and $D E$ equal to B ; bisect $C E$ in G , and from the centre G at the distance $G C$ or $G E$ describe the semicircle $C F E$. From D draw the straight line $D F$ perpendicular to $C E$, and cutting the semicircle $C F E$ in F , the straight line $D F$ is a mean proportional to A and B —that is, A is to $D F$ as $D F$ is to B .

If we know the length of A and B we can find the mean proportional to them by multiplying the numbers representing the length of the lines together and extracting the square root of the product. Thus, if A measure three feet, and B measure twelve feet, the mean proportional to A and B measures six feet, for $3 \times 12 = 36$; and the square root of 36, or the number which when multiplied by itself gives 36, is 6.

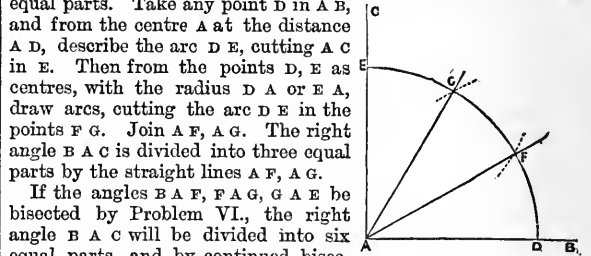


Fig. 18.

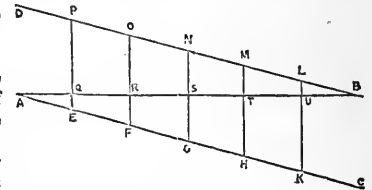


Fig. 19.

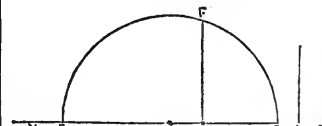


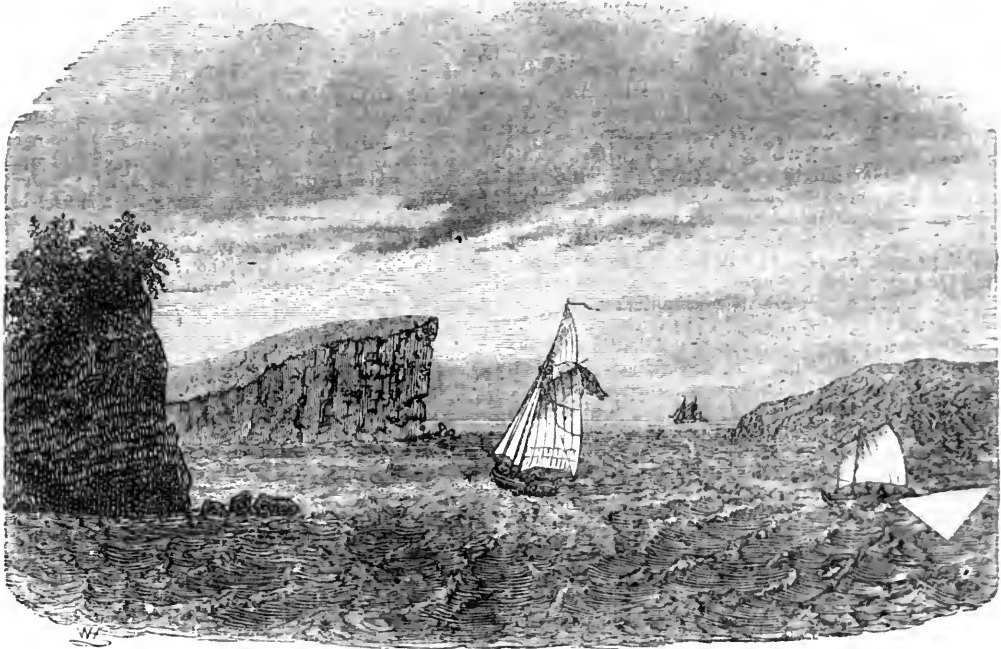
Fig. 20.

LESSONS IN GEOGRAPHY.—VII.

DISCOVERIES OF THE EIGHTEENTH AND NINETEENTH CENTURIES.

FRANCE, desirous of taking her share in the progress of maritime discovery, fitted out, in 1786, a new expedition under the command of La Perouse, an able and intrepid officer. The principal theatre of the explorations of this little French squadron was the north-west coast of America, and the shores of Tartary and Japan. Their vessels, *La Boussole* and *L'Astrolabe*, visited Easter Island, then the Sandwich Isles, and reached latitude 59° N. on the north-west coast of America. The expedition explored with great care a large extent of this line of coast. During their hydrographical operations, a sad accident befell them, which cost twenty-one persons their lives, while making an attempt to land. These operations being finished, they traversed the Pacific, determined on their way the position of the Ladrone Islands, and arrived at Macao on the 2nd of January, 1787. At the outset of his second expedition, La

so disastrously, he purposed to explore the Tonga Isles, the south part of New Caledonia, the Louisiade Archipelago, New Guinea and other islands, the Gulf of Carpentaria, and the coast of Australia from this gulf to Van Diemen's Land. He left the shores of New Holland full of hope and enterprise; but his task, so courageously self-imposed, was left unfinished; his career came to a close. From that moment he was never more heard of; for two years, expectation was kept on the stretch, looking for news of the squadron. La Perouse and his companions were lost to their country. The cruel uncertainty which remained in France regarding the fate of the expedition, caused the National Assembly to pass a decree in February, 1791, by which it entreated the king, Louis XVI., to solicit the assistance of the other sovereigns of Europe in the search for La Perouse. This decree also directed the organisation of an expedition, which had the double object of endeavouring to find some trace of the unfortunate navigator, and of completing the discoveries which had been left unachieved. This expedition took place under the command of Admiral D'Entrecasteaux, but without



ENTRANCE TO PORT JACKSON, NEW SOUTH WALES.

Perouse went along the coast of Corea, and discovered Cape Nota on the coast of Japan. The officers of the expedition applied themselves particularly to the determination of the latitudes and longitudes of the places which they visited. In latitude 45°, they discovered a harbour which they called the Bay of Ternay. They next discovered the strait which separates the island of Jesso from Tchoka or Saghalien, and which is called the Strait of La Perouse. The expedition then sailed for Kamtschatka, where it was hospitably received. At this point M. Lesseps, who had accompanied La Perouse as interpreter of the Russian languages, was sent overland to France. This intrepid young man, to whom had been entrusted the journals and charts of the voyage, traversed the old continent through its whole extent from east to west, and happily arrived at Paris with the valuable observations which had been made during the expedition. La Perouse returned to Oceania, to meet severe trials. At Maonna, one of the Navigators' Islands, his companion, De Langle, the captain of *L'Astrolabe*, and twenty of his attendants, were cruelly murdered by the natives. Lamanon, the naturalist of the expedition, perished in this attack. After a short stay at Botany Bay, on the east coast of New Holland, now called Australia, La Perouse prepared for his third and last expedition. In this new voyage of discovery, which ended

success. It was almost as unfortunate as that of La Perouse, although it was useful in making those coasts better known which had been carefully explored in search of him. The place of his shipwreck, in fact, was not discovered till 1827, by Captain Dillon, who ascertained that he and his unfortunate companions were lost on the rocks of one of the Feejee Islands, and found the remains of the vessel and part of the articles that belonged to him. The singular voyage of Captain Bligh, who, owing to the mutiny of his crew, was obliged to traverse an immense extent of ocean in an open boat, led to the discovery, in 1789, of some of the southern islands of the Feejee Archipelago. The surprising explorations, also, of Captain Flinders and Surgeon Bass, who attempted to effect the circumnavigation of New Holland, in a sorry boat, ended in the discovery of the strait which separates that continent from Tasmania, then called Van Diemen's Land, and which still retains the name of Bass; and, at the same time, in the delineation of an immense line of coast on the same continent. Flinders especially has a right to the remembrance of geographers, for the steadiness with which he pursued, during many years, his difficult and dangerous labours, almost always in an open boat or frail skiff which the smallest storm would have foundered in a moment. To him we owe the discovery of Kangaroo Island, the hydrography of Van

Diemen's Land, the exploration of the southern and eastern coasts of New Holland, and the determination of numerous points in Torres Strait and the Gulf of Carpentaria. The expedition to the same coasts under the French captain, Baudin, was productive of little utility in a geographical point of view, after the labours of Flinders.

The voyage of Vancouver preceded the French expedition above mentioned, and added to the knowledge of the Australian continent. He discovered the harbour of King George in the south-western extremity of New Holland, and completed the labours of Cook at New Zealand. To the east of the latter, Captain Broughton, commander of the tender, discovered Chatham Island, and the expedition proceeded to Tahiti to prepare for exploring the north-western coast of America. Vancouver, in company with a Spanish expedition, which he met, under the command of Captain Quadra, discovered the island which for some time was called Vancouver and Quadra Island, in commemoration of its discoverers, and which is now known only as Vancouver Island, and is the most important of our colonies on the west coast of North America. He then explored the river Columbia as far as the expedition could ascend its streams. A rest at the Sandwich Islands, and new expeditions on the American coasts detained Vancouver till the winter of 1794, when he returned to the same archipelago. Having, in a new hydrographical expedition, explored another part of the coast of the New World, including Cook's Inlet, Vancouver returned to England, laden with geographical information, and signalled by not a few discoveries. These regions were scarcely re-visited until the voyage of Kotzebue, which took place in 1815-1818. This Russian navigator discovered to the north of Behring Strait, between latitudes 67° and 68° N., and in longitude 163° 37' W., a great bay or sound to which he gave his name. His object was to find a passage to the Atlantic, and to ascertain first whether icy Cape was an island; but illness prevented him from carrying his designs into execution. He discovered several unimportant islands in the Pacific, particularly the eastern part of the Caroline group.

As to the northern passage between the Atlantic and the Pacific, it seemed to elude all the skill and vigilance of navigators. Captain Phipps, in 1773, had reached latitude 80° 37' N. from the Atlantic side; Captain Cook, as we have seen, attempted it from the Pacific side; Pickersgill and Young succeeded no better by sailing through Baffin's Bay; and Lowenorn, Egede, and Rothe, in 1786-1787, attempted, but without success, to explore the eastern shore of Greenland, which is said to be unapproachable in consequence of the accumulation of ice since the early part of the fifteenth century. At the beginning of the present century, northern expeditions were revived; and they have been pursued with more or less ardour till the present day. In 1818 two expeditions were fitted out for the north. The one was placed under the command of Captain Ross, who sailed from England towards the end of April of that year, accompanied by Lieutenant Parry, who commanded under his direction the ship *Alexander*. Between latitudes 76° and 77° 40' N. they discovered land which they called the Arctic Highlands. This country occupied a space of 120 miles in the north-east corner of Baffin's Bay. On the 30th of August they reached the entrance of Lancaster Sound, and as it was fifty miles broad from north to south, and as the soundings were 750 fathoms, they fancied they had discovered the north-west passage; but they soon perceived their mistake by observing land in their course at a distance of thirty miles from the entrance of the sound. Having reached latitude 70° N., the expedition returned and explored the coasts as far as Cape Walsingham, in Cumberland Island, whence it sailed for England. The other expedition to the north was undertaken by Captain Buchan and Lieutenant Franklin; but it was productive of no new discovery, as they were compelled to return when they had reached Spitzbergen, glad to escape the alarming dangers of sailing in the midst of floating icebergs. Captain Parry continued the exploration begun by Captain Ross. In a new expedition, he discovered a passage called Prince Regent Inlet, south of Lancaster Sound, Wellington Inlet, farther north in the same sound, and the islands of Cornwallis, Griffith, Bathurst, Byam Martin, Melville, and others, all included under the name of the North Georgian Islands. He also discovered Banks Land, south of Melville Island, and North Somerset, which forms the north-west point of Prince Regent Inlet, and wintered, in 1819-1820,

in Melville Bay, where, during the long months from the 4th of November till the 3rd of February following, they lived in continued darkness, and in an atmosphere whose temperature was below the freezing point. In a second voyage executed in 1821-1822, Captain Parry discovered Melville Peninsula, north of Southampton Island, in the northern part of Hudson Bay. He passed through the strait which he named after his two vessels, the *Fury* and *Hecla*, and which separates Melville Peninsula from Cockburn Island, on the north. Captain Scoresby, at the same period, explored a part of the east coast of Greenland. Parry made a third voyage, in 1823, to the same regions he had formerly visited; but the *Fury* was shipwrecked, and the expedition failed. During the period from 1823 to 1826, Lieutenant Beechy sought for the passage between the two oceans by Behring Strait, and reached latitude 71° 23' N., and longitude 154° 3' W. The indefatigable Parry attempted a fourth expedition to the north in search of the same passage; but it entirely failed, because he disregarded the experience of former navigators, as well as his own in preceding voyages.

The illustration that accompanies this lesson affords an excellent and accurate representation of the entrance to Port Jackson, a magnificent harbour about nine miles to the north of Botany Bay, on the coast of New South Wales, where the ill-fated La Perouse stayed for about three weeks with the vessels under his command before he sailed on the expedition which terminated in his death, and on the shore of which there was erected, in 1825, a column to the memory of this unfortunate French navigator. Botany Bay, it will be remembered, was so called by Captain Cook from the number of plants and herbs that were found on its coast, when he first visited it in 1770. In January, 1778, just before La Perouse reached this spot, the first batch of convicts sent from England to Australia had arrived there, under Captain Arthur Phillip, the first governor of the colony of New South Wales. Botany Bay, however, was not found to be a suitable spot for the settlement (which was subsequently transferred to Port Jackson), and is now known as Sydney, the metropolis of Australia.

LESSONS IN ENGLISH.—VII.

DERIVATION.—PREFIXES.

THE Saxon may be called the native English stock. The Latin portion of our language is of foreign growth, it is an exotic. As being of foreign growth its elements are not easily understood, and must therefore receive the greater attention. In entering on the necessary course of instruction, I am met by a distinction already spoken of, namely, the distinction of simple and compound words. Compound words are made up of parts. Those parts are either simple words or particles, that is, fragments of simple words. *Country-house* is a compound term consisting of two simple words, namely, *country* and *house*. *Departure* is a compound word which comprises these three particles, namely, *de-part-ure*—that is—

de	part (pars)	ure.
from	part	a termination.

Of these three particles, *part* is the most important, inasmuch as it determines the specific meaning; as you may learn by comparing with *debuture*, a word exactly the same in the first and third particle:—

de	part	ure.
de	bent	ure.

In the second word the substitution of *bent* for *part* has entirely changed the meaning. The reason is that *part* and *bent* are the roots of the two words. Every word has a root. Sometimes the word, especially in Saxon terms, is its own root, at least in the actual state of the language, as *heart*, *think*, *wise*. The root is not always the middle portion as it is in *departure* and *debuture*. In *contradict*, the root (*dictum*) is at the end, and in *mental* the root is at the beginning. It is, however, clear that in compound words three things have to be considered—namely, 1, the root; 2, that which is put before the root; 3, that which comes after the root. That which is put before the root is in grammar called a *prefix* (from the Latin *præ*, *before*; and *figo*, *I fix*), and that which is put after the root is called a *suffix* (from the Latin *sub*, *under*; and *figo*, *I fix*). Here, then, are three subjects to be considered—namely, *roots*,

prefixes, and suffixes. Suffixes are sometimes called *offices* (ad, to; and figo, I fix). They may also be designated *terminations*, especially when they are not so much fragments of words as *letter-addings*, or additions forming the specific parts of speech in each case. Thus *right* becomes *righteous*, and *righteous* becomes *righteousness*, and *righteously*; where *eous*, *ness*, and *ly* are terminations; the first modifying the adjective, the third converting the adjective into an adverb, and the second changing the adjective into a noun.

Of these three classes, the roots are by far the most numerous. The roots also undergo very various modifications from the prefixes and the suffixes. On these accounts, it seems desirable to study the prefixes and suffixes before we study the roots.

Before entering into the requisite details, I wish to make another distinction.

Take the word *truthfulness*. Analyse the word. Obviously it consists of three elements: 1, *truth*; 2, *full*; 3, *ness*. *Truth* is the primitive word. By the addition of *full* (or *ful*), *truth* becomes *truthful*, an adjective; and the adjective *truthful* is made into a noun by the annexation of the syllable *ness*. Instead of a noun, I might have formed an adverb by subjoining *ly*; thus, *truthfully*. I have said that *truth* is the primitive word. *Primitive* is here used in opposition to the word *derivative*. In relation to its derivatives *truthful*, *truthfully*, and *truthfulness*, the word *truth* is a primitive word, for it is their source. It is another question whether *truth* may not be reduced to a simpler form. In the same way, *truthful* is a primitive term when viewed in relation to its derivative *truthfully*. As with human beings, each word is in turn child and parent. Still there must be a common stock. But genealogies in language are scarcely less obscure than other genealogies. In linguistic genealogies, authority must receive great deference. Now the word *truth* can be reduced to a simpler form, and yet remain a word. From *truth* take *th*, and you have *tru*—that is, *true*. So from *strength* take *th*, and you have *strug*, an old form of *strong*. But *fovel* is not a derivative word, because you cannot reduce it to another word in a simpler form; for, if you remove the *l* or the *vl*, the remainder is no word at all. Words, then, which appear to be *primitive*, may be *derivative*; and the rule by which to ascertain whether a noun is primitive or derivative is this: words which, on the removal of one or more of their letters, have a distinct meaning, are *derivatives*; and words which, on the removal of one or more of their letters, have no distinct meaning, are *primitives*. By the application of this rule, we learn that *kingdom* is a derivative, and *addition* a derivative; while *pen* and *head* are primitives.

The prefixes and the affixes in the English language are numerous. Without a correct acquaintance with their import, the exact force of words can scarcely be understood. But these prefixes and affixes are of Latin and of Saxon origin. Consequently, in our attempt to ascertain their meaning, we must borrow aid from the Latin and from the Saxon. A few prefixes come from the Greek, the signification of which is to be found in the Greek. I shall treat first of prefixes, and, for the sake of facility of reference, take them up in alphabetical order.

PREFIXES IN THE ENGLISH LANGUAGE.

A (*an*), of Saxon origin, has the force of *in* or *on*; as *along*, *alongside*, *aback*, *ahead*, *abed*. In this sense it is used in connection with present participles, as, *a hunting*; that is, *in* or *at hunting*. The form occurs in our common version of the Scriptures, in John xxi. 3, being a relic of the language in its older state, such as in part it is now found in colloquial diction. The phrase may be exemplified, and its meaning shown by comparing together the renderings of different versions of this passage:—

- Common Version. Simon Peter saith unto them, I go a fishing.
 Wickliffe (1380). Symount Petir seith to hem, I go to fische.
 Tyndale (1534). Simon Peter sayde vnto them, I goo a fysshinge.
 Cranmer (1539). Simon Peter sayeth vnto them, I will go a fissinghe.
 Geneva (1557). Simon Peter sayd vnto them, I go a fysshing.
 Rheims (1582). Simon Peter saith to them, I goo to fish.
 Authorised (1611). Simon Peter saith vnto them, I goo a fishing.

Not only are these instances curious as exhibiting varieties of spelling, but they seem to show how thoroughly a part of the language is this prefix in the sense now illustrated. Yet is the usage disallowed, and by some regarded as a vulgarism. I

trust that the healthful sympathies of the people will do something to restore the original idioms of the English tongue.

A, of Saxon origin, is also used as an intensive. An intensive (*in*, *on*, and *tendo*, *I stretch*) is that which increases the force of a word, expanding, as it were, its essential power. *A*, as an intensive, is of frequent use, and is exemplified in these words, *ashamed*, *afraid* (old form *afearod*), *arise*, *amain* (a and *mogen*, *to be able*); *maelit*, *power*, in the German; compare the Latin *agnus*, *great*). Thus Dryden—

"She said; her brinful eyes that ready stood,
 And only wanted will to weep a flood,
 Released their wat'ry store, and poured amain,
 Like clouds, low-hung, a sober shower of rain."

A, of Latin origin, meaning *from*, is found in the forms *a*, *ab*, *abs*—e.g., *abatement* (French, *abattre*, *to beat down*), *a beating from* or *down*; *abbreviation* (Latin, *brevis*, *short*), a shortening; *abstraction* (Latin, *traho*, *I draw*), *a drawing from*, or *away*.

"But man the abstract
 Of all perfection which the workmanship
 Of Heaven hath modelled, in himself contains
 Passions of several qualities."—Ford.

A, of Greek origin, found chiefly in scientific words, has a negative or primitive force; that is, it reverses the meaning, or denies what is implied in the term, as *acephalous* (Greek, *κεφαλη*, pronounced *kef-a-le*, *head*), *without head*; a term applied in anatomy to the young of any animal born, from original defect of organisation, *without a head*. To avoid an hiatus (Latin, *hiatus*, *gaping*), a becomes an before a vowel; as *anarchy*, the absence of government; government in Greek being *αρχη*, pronounced *ar'-key*.

Ad, of Latin origin, *to*, passes into the forms *ac*, *af*, *og*, *al*, *an*, *ap*, *ar*, *as*, *at*—that is, the terminating consonant of the prefix is, for the sake of ease in pronunciation, changed into the initial (Latin, *initium*, *beginning*) consonant of the noun; e.g.:—

Ad. "An adjournment is no more than a continuance of the session from one day to another, as the word (*jour*, French, *day*) itself signifies."—Blackstone.

Ac. "The greatness of sins is by extension and accumulation."—Jeremy Taylor.

Af. "Tis most true
 That musing meditation most affects
 The pensive secrecy of desert-cell
 Far from the cheerful haunts of men and herds."—Milton.

Ag. "Corporations aggregate consist of many persons united together into one society, and are kept up by a perpetual succession of members, so as to continue for ever."—Blackstone.

Al. "Then by libel (*libellus*, a little book), or by articles drawn out in a formal allegation, set forth the complainant's ground of complaint."—Blackstone.

An. "This god-like act
 Annuls thy doom."—Milton.

Ap. "God desires that in his church, knowledge and piety, peace and charity, and good order should grow and flourish; to which purposes he hath appointed teachers to instruct and governors to watch over his people."—Barrow.

Ar. "Arrogant is he that thinketh he hath those beauties in him that he hath not."—Chaucer.

As. "Are you discontent
 With laws to which you gave your own assent?"—Pope.

At. "The most wise God hath so attempted the blood and bodies of fishes, that a small degree of heat is sufficient to preserve their due consistency and motion, and to maintain life."—Ray.

Amb, of Latin or rather Greek origin, found in the Greek *αμφι* (pronounced *am'-fi*), *around*, and in the Latin *ambo*, *both*, signifies *on both sides*, as *ambidextrous* (Latin, *dexter*, the *right hand*), literally, *having a right hand on both sides*; that is, one who uses his left hand equally well with the right.

"Should I that am a man of law
 Make use of such a subtle claw,
 In London or in Exeter;
 And be of both sides, as you were,
 People would count me then, I fear,
 A knavish ambodexter."—Brome.

Amb is found in the form of *amph*, as *amphitheatre*, a theatre of two sides or circus; *amphibious*, double-lived, that is, living on land and in water.

Ana, of Greek origin, *up*, *back*, as in *anachronism* (Greek, *χρονος*, pronounced *kron'-os*, *time*), an error in date by which an

event is placed too high up or too far back; generally a deviation from the order of time.

"The dresses and buildings of the time are preserved, though by frequent *anachronisms*."—*Walpole*.

The *ana* is found also in *anagram* (Greek, *γραμμα*, pronounced gram'-ma, a letter), which is a word produced by the transposition of its letters, having a meaning different from the original.

"And see where Juno, whose great name
Is Unio in the *anagram*,
Displays her glittering state and chair."—*Ben Jonson*.

Ante, of Latin origin, *before*, as *antedate*, to date before time, to anticipate—

"Andromache, my soul's far better part,
Why with untimely sorrows heaves thy heart?
No hostile hand can *antedate* my doom,
Till fate condemns me to the silent tomb."—*Pope's Homer*.

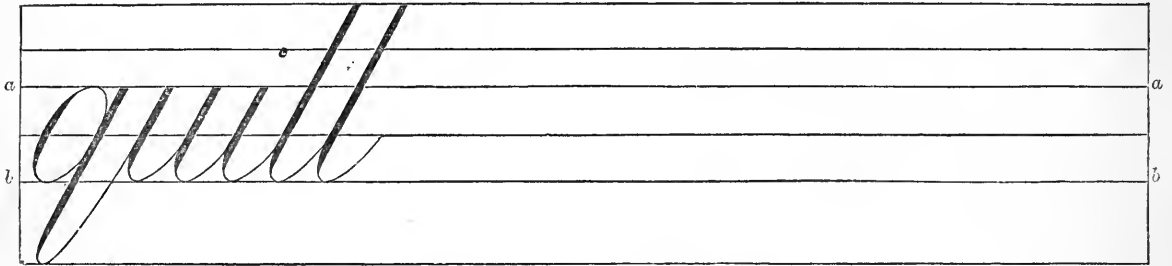
Anti, of Greek origin (*avti*, pronounced an'-te, *against*), in *opposition to*, as in *antichrist*, *opposed to Christ*—

"If once that *antichristian* crew,
Be crush'd and overthrown,
We'll teach the nobles how to crouch,
And keep the gentry down."—*Quarles*.

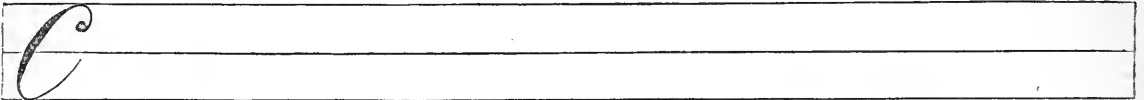
In theology, *antitype* stands correlatively over against *type*, as the counter-pattern to the pattern, the corresponding and completing form.

"The Mosaic law was intended for a single people only, who were to be shut in, as it were, from the rest of the world, by a fence of legal rites and *typical* ceremonies; and to be kept by that means separate and unmixed until the great *antitype*, the Messiah, should appear, and break down this fence and lay open this inclosure."—*Atterbury*.

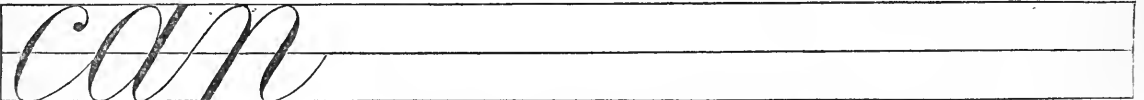
The *i* in *anti* is sometimes dropped before a vowel, as in *antarctic*, which means opposite to or over against the north.



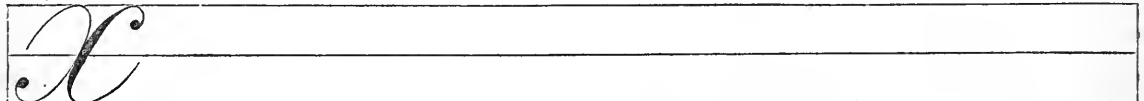
COPY-SLIP NO. 43.—THE WORD **quill**.



COPY-SLIP NO. 44.—THE LETTER **c**.



COPY-SLIP NO. 45.—THE WORD **can**.



COPY-SLIP NO. 46.—THE LETTER **x**.

LESSONS IN PENMANSHIP.—XIII.

In Copy-slip No. 43 the learner is shown how the letter **q** is connected with the letter **u**, which may be justly termed its inseparable companion, as there is no word in the English language in which **q** appears without being immediately followed by **u**. It is just possible, however, to give a word which forms an exception to this rule; and to satisfy those who may be curious on the point, and to make some slight addition to their stock of geographical knowledge, we may at once tell our readers that if they will take the trouble to search the map of France, they will find it in the name of a little country town called *Acs* or *Ax*, which is situated in the department of *Arriège*, near the foot of the *Pyrenees*, and noted for the hot springs that are found in its neighbourhood. In writing the word **quill**, the learner will find a useful exercise in carrying letters above and below the lines *a*, *b*, in the same word, the practice afforded being similar to that which was given by the words **put** and **pull** in Copy-slips 30 and 34.

In a former lesson (see page 173) it was remarked that there were some letters of the writing alphabet whose form is based on that of the letter **o**. These letters, which are **c**, **x**, **e**, and **s**, may be fairly termed modifications of the letter **o**, in the same way that we have the letters **t** and **l** as modifications of the pot-hook or bottom-turn. The first of them, the letter **c**, is commenced about the same distance above the line *c c* as the letter **o**, but instead of beginning with a hair-line, a dot is first formed from which a hair-line is carried round to the left, and the rest of the letter is formed in the same way as the letter **o**, with this exception, that the fine turn at the bottom of the letter is carried to the right and joined to the letter that follows it, as may be seen in Copy-slip No. 45. The dot with which the letter **c** is commenced is made (the self-teacher must carefully note this), not exactly in the same spot in which the letter **o** is usually commenced, but about a hair's breadth to the left of it, and the hair-line is carried on from the *bottom* of the dot, and not from the top of it, in a direction which turns first to the *right* and then upwards, after which the letter is completed as described above.

LESSONS IN GERMAN.—XII.

SECTION XXII.—THE VERB TO BE, ETC.

Sein, like the corresponding English verb, is very irregular in conjugation; its different parts having been derived from words now obsolete.

It is used as the auxiliary to many active intransitive verbs, such as *femmen, gehen, etc.*, where *haben* cannot (like *have* for *be* in English) be substituted, as:—*Er ist gekommen, he is come. Er ist gegangen, he is gone.* (§ 71. 3. 4.)

Sein is employed as the auxiliary in its own conjugation; as:—*Ich bin gewesen, I have been; literally, I am been.* For complete conjugation, see § 72. 2.

CONJUGATION OF THE PERFECT TENSE OF sein, femmen, AND gehen.

Ich bin gewesen, I have been; wir sind gewesen, we have been.
Du bist gewesen, thou hast been; ihr seid gewesen, you have been.
Er ist gewesen, he has been; sie sind gewesen, they have been.

Ich bin gekommen, I have come; wir sind gekommen, we have come.
Du bist gekommen, thou hast come; ihr seid gekommen, you have come.
Er ist gekommen, he has come; sie sind gekommen, they have come.

Ich bin gegangen, I have gone; wir sind gegangen, we have gone.
Du bist gegangen, thou hast gone; ihr seid gegangen, you have gone.
Er ist gegangen, he has gone; sie sind gegangen, they have gone.

VOCABULARY.

Berlin', n. Berlin.	Räsig, m. cage.	Schnee, m. snow.
bleiben, to remain.	kennen, to know, to	Schreiben, to write.
bringen, to bring.	bo acquainted	Sprechen, to speak.
Da, there.	with.	Vogel, m. bird.
Dresden, n. Dresden.	kommen, to come.	Wetter, n. weather.
fliegen, to fly.	laufen, to run.	Wien, n. Vienna.
Friedrich, m. Frederick	Markt, m. market.	Wissen, to know.
glauben, to believe.	Nachricht, f. news.	Wohnen, to reside, to
Jemand, somebody.	Preußen, n. Prussia.	dwell.
anybody.	Rintfleisch, n. beef.	

RÉSUMÉ OF EXAMPLES.

Die Werke Gottes sind man'nigfaltig; seine Liebe ist unendlich und an allen Orten sichtbar.	The works of God are manifold; his love is infinite and in all places visible.
Ich war in der Stadt, als der König da war.	I was in the city when the king was there.
Der Kronprinz ist vorgestern hier gewesen.	The crown-prince was here the day before yesterday.
Wer ist mit der Schwester auf das Land gegangen?	Who has gone to the country with your (the) sister?
Dieselbe, die vorgestern mit ihr hieher' gekommen ist.	The same that came here (hither) with her the day before yesterday.
Gehen Sie heute auf das Land?	Do you go to the country to-day?
Nein, weil ich eben von dem Lande gekommen bin.	No, for I have just come from the country.

EXERCISE 33.

1. Ist dieser junge Mann krank? 2. Nein, aber er ist gestern krank gewesen. (Soct. XVII. 8.) 3. Wer ist in dem Garten Ihres Vaters gewesen? 4. Niemand ist in dem Garten gewesen, aber Jemand ist in seinem Hause gewesen. 5. Wie lange bleibt der alte Bauer noch in der Stadt? 6. Ich kenne den alten Bauern nicht, und weiß nicht, wie lange er bleibt. 7. Ist Ihr alter Freund, der Kaufmann, nach Wien gegangen? 8. Ich glaube, er ist nach Berlin zu seinem Bruder gegangen. 9. Von wem haben Sie heute diese Nachricht gehört? 10. Ich habe einen meiner Freunde gesprochen, welcher von Dresden gekommen ist, und mir einen Brief von meinem Vater gebracht hat. 11. Ich wohne bei meinem Oheim, und gehe mit ihm nach dem kleinen Dorfe. 12. Mein schöner Vogel ist aus dem Käfig geflogen, und mein kleines Pferd ist nach dem Walde gelaufen. 13. Was hat Ihr Herr Vater Ihnen geschrieben? 14. Er hat mir einen langen Brief geschrieben. 15. Wann sind Sie auf dem Markte gewesen? 16. Ich bin vorgestern Abend da gewesen, und habe Rintfleisch gekauft. 17. Wir haben diesen Nachmittags schönes Wetter gehabt. 18. Diese Schüler sind faul und jene fleißig gewesen. 19. Der Schnee ist vorgestern sehr tief gewesen. 20. Ich bin nie krank gewesen. 21. Friedrich der Große war ein König von Preußen.

EXERCISE 34.

1. Is your sister who gave me those flowers [*Blume*] at home? 2. No, she has gone into the country. 3. There has been somebody in the garden. 4. Do you reside in Berlin? 5. No, I reside in Dresden. 6. The Queen has returned [*zurückgekommen*] from Belgium [*von Belgien*]. 7. Do you know the merchant who came from Vienna? 8. Yes, I know him. 9. You have had little pleasure [*wenig Vergnügen*] on your journey [*Reise*]; you have not been far [*weit*]. 10. You had more pleasure than we had, but we have been as much pleased [*ebenso vergnügt*] as you.

SECTION XXIII.—VARIOUS IDIOMS.

The word *Haus*, without the article, when preceded by *nach*, answers to our "home" after verbs of motion, as:—*Er geht nach Hause, he is going home.*

Zu Hause answers to our "at home," as:—*Er ist zu Hause, he is at home.*

Bei (with) is commonly used with verbs of rest, and signifies (with a pronoun following) at one's house or place of business, as:—*Er wohnt bei uns, he lives at our house. Ich kaufte es bei meinem Vetter, I bought it at my cousin's.*

Mit (with) is chiefly used with verbs of motion, as:—*Ich gehe mit ihm, I am going with him.*

Zu Semanten gehen signifies, frequently, to go to the house or residence of some one, as:—*Ich gehe zu meinem Oheim, I am going to my uncle's. Wollen Sie heute Abend zu uns kommen? will you come to our house this evening?* (§ 112. 3. 7. 8. 13.)

1. *Derfelbe* (the same) is compounded of *ter* and *selber*. It is inflected precisely like *derjenige*.

DECLENSION OF *ter, tie, tas-selbe*.

	<i>Singular.</i>		<i>Plural.</i>	
	<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>	<i>All genders.</i>
N. Derfelbe,	derfelbe,	derfelbe,	derfelbe,	derfelben, the same.
O. Demselben,	demselben,	demselben,	demselben,	demselben, of the same.
D. Demselben,	demselben,	demselben,	demselben,	demselben, to the same.
A. Demselben,	demselben,	demselbe,	demselben,	demselben, the same.

2. *Derfelbe* is often used in place of a personal pronoun, to avoid repetition or ambiguity, as:—*Haben Sie dieselbe (sic) gesehen? Have you seen (the same) her? Der Mann lobt den Knaben, weil derselbe seine Mutter ehrt; the man praises the boy, because the same (he) honours his mother. Er liebt seinen Bruder, aber nicht die Kinder derselben; he loves his brother, but not his children (he loves his brother, but not the children of the same).*

The genitive of the substantive pronoun *ter* is also thus used, as:—*Er liebt seinen Bruder, aber teffen Kinder nicht; he loves his brother, but not (that one's) his children.*

VOCABULARY.

Wai, n. le...d.	Laden, m. shop, store.	Taschenuhr, f. watch.
Brauchen, to require, to need.	Lamm, lame.	Truppen, troop.
Eltern, parents.	Ring, m. ring.	Un'antbar, unthankful.
Krieg, m. war.	Schiken, to send.	Weil, because.
	So, so, as.	

RÉSUMÉ OF EXAMPLES.

Wo ist der Fremde, der vorgestern bei uns war?	Where is the stranger who was at our house the day before yesterday?
Er ist gestern nach Wien gerich't.	He went yesterday to Vienna.
Ist dieses Buch daselbe, welches Sie gestern Abend gesehen haben?	Is this book the same that you read last evening?
Ich liebe diesen Schüler, weil er so fleißig ist.	I love this scholar, because he is so diligent.
Meine Freundin aus Amerika war gestern hier; haben Sie dieselbe schon gesehen?	My friend from America was here yesterday; have you seen her yet?
Ich habe des Lehrers Buch, aber nicht das Messer derselben.	I have the teacher's book, but not his knife.

EXERCISE 35.

1. Wo ist das Wai, welches Sie gekauft haben? 2. Es ist noch im Laden, wo ich es gekauft habe. 3. Haben Sie dieselbe Feder, welche ich gekauft habe? 4. Wem werden Sie diese goldene Taschenuhr schicken? 5. Ich werte sie demselben Manne schicken, welcher sie mir geschickt hat. 6. Wie viel Geld braucht dieser alte Soldat? 7. Er braucht viel, weil er immer krank ist. 8. Ist es derselbe, welcher gestern hier war? 9. Nein.

jener ist heute sehr lahm. 10. Wem schicken Sie den schönen Ring? 11. Ich schicke ihn dem Manne, welchen Sie so sehr gelobt haben. 12. Haben Sie die Freunde meines Bruders gelobt? 13. Ja, ich habe sie gelobt. 14. Haben Sie dieselben nicht geliebt? 15. Ich habe eine kleine Schwester, welche ich liebe; lieben Sie dieselbe? 16. Der Oheim liebt seinen Neffen, aber derselbe ist untanbar. 17. Der Vater liebt seinen kleinen Sohn, wieviel derselbe gut ist. 18. Warum sind so viele Truppen in der Stadt? 19. Weil sie aus dem Kriege gekommen sind. 20. Warum lieben uns unsere Eltern? 21. Weil wir ihre Kinder sind. 22. Zu wem gehen Sie? 23. Ich gehe zu meinem Vetter. 24. Mit wem gehen Sie? 25. Ich gehe mit meinem Bruder.

EXERCISE 36.

1. Is your brother at home? 2. Yes, but he is ill. 3. Where have you bought this watch? 4. I bought [gekauft] it of the watchmaker. 5. These rings are beautiful, will you give me one of them? 6. The troops which went to Leipsic returned yesterday. 7. The teacher loves the boy, because he writes beautifully. 8. Do you go to your parents? 9. I go with my brother. 10. These children love their teacher, because he is good to them. 11. Do you require my books any longer? 12. I will give you them back [zurück] to-morrow.

LESSONS IN ARITHMETIC.—XIII.

DECIMALS (continued).

6. It is evident, also, from the explanations given in Lesson XII, that to multiply a decimal by any power of 10, we need only move the decimal point as many places to the right as there are ciphers in the multiplier. For example:—

$$\begin{aligned} & \cdot 34567 \times 100 \text{ is } 34567. \\ \text{For } & \cdot 34567 \times 100 = \frac{34567}{100000} \times 100 = \frac{34567}{1000} = 34.567. \end{aligned}$$

Similarly, to divide a decimal by any power of 10, we must move the decimal point as many places to the left as there are ciphers in the divisor. If there are more ciphers in the divisor than there are places in the decimal, we must prefix a sufficient number of ciphers (Art. 5). For example:—

$$\begin{aligned} & 456329 \div 100 \text{ is } 4563.29. \\ \text{For } & \frac{456329}{1000 \times 100} = \frac{456329}{100000} = 4.56329. \\ & \cdot 329 \div 100 \text{ is } \cdot 00329. \\ \text{For } & \frac{329}{100 \times 100} = \frac{329}{10000} = \cdot 00329. \end{aligned}$$

Here, in order to move the decimal point two places to the left, we must place two ciphers before 3, the first significant digit of the dividend.

EXERCISE 29.

1. Express as decimals:—

1. $\frac{3}{10}, \frac{3}{100}, \frac{33}{10}$
2. $25\frac{7}{10}, 4\frac{7}{10}, 9\frac{7}{1000}$
3. $7\frac{99}{1000}, 43\frac{2143}{10000}, 3\frac{322847}{1000000}, 9\frac{7522457}{100000000}$

2. Express as fractions, or mixed numbers:—

1. $\cdot 32, \cdot 246, 3624.$
2. $\cdot 03637, \cdot 00046.$
3. $42\cdot 068, \cdot 007006, 1\cdot 100492, \cdot 0000008.$

3. Multiply and also divide each of the decimals in the preceding examples by 100 and by 10000.

4. Divide $\cdot 1$ and $40\cdot 0059$ by 10000 and also by 10000000.

5. Express as fractions or mixed numbers the following decimals:—

·82344	90·0104	2·396343	1·13004
·13236	12·633	1·710263	9·203167
·46274	20·064	2·463125	9·2000076
·00963	35·0072	6·004534	8·0403342
·00009	67·4008	9·000028	4·3008094
17·401	9·0007	8·001249	7·4627350
23·07	6·00754	0·100010	1·0006003
81·4339	3·0468	4·306702	5·8490001

6. Write the fractional part of the following mixed numbers in decimals:—

1. $30\frac{63}{100}$
2. $72\frac{3}{10}$
3. $6\frac{39}{1000}$
4. $13\frac{7}{10000}$
5. $41\frac{21}{10000}$
6. $8\frac{1}{10000000}$

7. Addition of Decimals.

To add together 28·35, 345·3294, ·0018, and 6·4.

Write the units under units, tenths under tenths, etc.; or,

what is the same thing, write the decimal points under one another, and then proceed to add thus:—8 ten thousandths and 4 ten thousandths are 12 ten thousandths, i.e., 1 thousandth and 2 ten thousandths; write down 2 under the ten thousandths' place, and carry the 1 to the next column of figures, as in simple addition. The same method will evidently apply for all the columns, since the value of each place of figures increases tenfold from left to right. The decimal point in the answer will clearly fall under the column of decimal points.

We may also exhibit the process thus:—

$$28\cdot35 = \frac{2835}{100}, \quad 345\cdot3294 = \frac{3453294}{10000}, \quad \cdot 0018 = \frac{18}{10000}, \quad 6\cdot4 = \frac{64}{10}$$

And therefore reducing all these fractions to a common denominator, 10000, and adding them, we get for their sum:—

$$\frac{283500 + 3453294 + 18 + 64000}{10000} = \frac{3800812}{10000} = 380\cdot0812.$$

Hence we get the following

Rule for the Addition of Decimals.

Write the decimals under one another, so that the decimal points may fall under each other. Begin at the right hand, or column of the lowest order, and add as in simple addition, placing the decimal point in the row of figures so obtained under the other decimal points.

EXERCISE 30.

1. Find the sum of the following decimals:—

1. 25·7, 8·339, 23·056, and 57·145.
2. ·00162, ·1701, 325, 2·7031, and 3·009701.
3. 1·03041, 6·578034, 2·4178, and 4·72103.
4. 467·9004, 23·78249, 1·29468, and 3·78241.
5. 293·0072, 89·00301, 29·84567, 924·00369, and 72·39602.
6. 394·61, 81·923, 3624·8103, 640·203, and 51216291·30002.
7. 36·258, 2·0675, 382·45, and 7·3984.
8. 32·764, 5·73, 16·0037, and 49·3046.
9. 4·25, 6·293, 4·612, 33·07, 2·056, 3·248, and 1·62.
10. 35·7603, 47·0076, 129·03, 100·007, and 29·32.
11. 24·6434, 800·7, 29·461, 1·7506, and 3·45.
12. 45·001, 163·4234, 23·3945, 634·2104, and 234·90213.
13. 1·721341, 8·620047, 51·720345, 2·684, and 62·304607.
14. 1·293062, 3·00042, 9·7003146, 3·600426, 7·0040031, and 8·7200489.

2. Add together the following, after writing them as decimals:

1. 45 thousandths, 6 millionths, 9 tenths, and 11 ten millionths.
2. 25 hundredths, 8 tenths, 65 thousandths, 16 hundredths, 142 thousandths, and 39 hundredths.
3. 9 tenths, 92 hundredths, 162 thousandths, 489 thousandths, and 92 millionths.
4. 29 hundredths, 7 millionths, 62 thousandths, and 12567 ten millionths.
5. 95 thousandths, 61 millionths, 6 tenths, 11 hundredths, and 265 hundred thousandths.
6. 1 tenth, 2 hundredths, 16 thousandths, 7 millionths, 26 thousandths, 95 ten millionths, and 7 ten thousandths.
7. 96 hundred thousandths, 92 millionths, 25 hundredths, 45 thousandths, and 7 tenths.

8. Subtraction of Decimals.

It is evident, from the remarks we have made with respect to the addition of decimals, that the process of subtraction will be performed in exactly the same way as in simple subtraction.

Thus, to subtract 3·275 from 6·14, we write the decimal points under each other, as in the margin, adding a cipher to 6·14 for convenience, to make the number of decimal places correspond with that of the number to be subtracted. We then say—borrowing 1 (really $\frac{10}{100}$, or $\frac{100}{1000}$) from the next highest order of figures, as in simple addition—5 from 10 leaves 5, then 8 from 14 leaves 6, and so on, the decimal point in the row of figures obtained falling under the other decimal points.

We may also exhibit the process as follows:—

$$6\cdot14 = \frac{6140}{1000}, \quad 3\cdot275 = \frac{3275}{1000}$$

$$\text{Therefore } 6\cdot14 - 3\cdot275 = \frac{6140 - 3275}{1000} = \frac{2865}{1000} = 2\cdot865.$$

Obs.—The methods of simple addition and subtraction apply to decimals, because the only condition upon which their truth depends is, that the places of figures should increase in value in a tenfold ratio from right to left, which is the case with decimals.

EXERCISE 31.

1. Find the difference in the following pairs of decimals:—

- | | |
|----------------------------|---------------------------|
| 1. 3.405 and 2.179. | 13. 10 and '0000001. |
| 2. 9 and '79999. | 14. 9 and '999999. |
| 3. 450'0546 and 354'3123. | 15. 4636 and '4651. |
| 4. 1490'39 and 32'756218. | 16. 25'6059 and 567'392. |
| 5. 21'67 and '882349. | 17. 76'2784 and 29'84234. |
| 6. 81'6823401 and 9'163. | 18. '0000001 and '0001. |
| 7. 109'536 and 19'3723. | 19. '0000004 and '00004. |
| 8. '076345 and '009623478. | 20. 32 and '00032. |
| 9. 1 and '99. | 21. 24681 and '87623. |
| 10. 10 and '000001. | 22. 25 and '25. |
| 11. 65'00001 and '9682347. | 23. '00045 and 45. |
| 12. 3'29 and 999. | 24. '0000009 and 99. |

2. Subtract the less from the greater of the following numbers:—

1. 7 hundred and 7 hundredths.
 2. 46 hundredths and 46 thousandths.
 3. 95 thousandths and 909 ten thousandths.
 4. 1 billionth and 1 trillionth.
 5. 1 thousandth and 1 millionth.
 6. 29 thousand and 92 thousandths.
 7. 256 millions and 256 thousandths.
 8. 2874 millionths and 211 billionths.
 9. 6231 hundred thousandths and 154 millionths.
3. Find the value of $34'203 - '0049 + '175 - 17'5$.
4. Find the value of $356'001 - 219'123 - '0305 + 1'00007$.

ESSAYS ON LIFE AND DUTY.—II.

JUSTICE.

THERE is a sense of accountability in every human breast. Savage and civilised races alike manifest its existence. The degree of its intensity, as a power, may differ, but it is as much an integral part of the moral nature of man, as the eye and the ear are parts of his physical economy. All injustice is contrary to our moral sense. It may be indulged to gratify passion, pride, ambition, covetousness; but it is condemned by the high court of judicature within, and sooner or later injustice brings its terrible penalty with it. Naboth's vineyard may be unjustly secured by covetous pillage, but neither the groves nor the grapes can minister lasting happiness: the gnawing sense of wrong will be awakened. That which a man sows he is sure to reap. This fine and delicate sense, it is admitted, may be dimmed by ignorance, darkened by superstition, and sometimes, by long neglect, it may but slumber in the breast; but it never dies out. All nations have more or less honoured the God-given sentiment of justice. The Greeks had their *Justitia*, called *Astræa* and *Themis*; the Romans had a goddess, which was at one time an abstraction rather than a deity possessing personality. The coins, however, that have been preserved, represent Justice as a maiden wearing a diadem, holding a sword and scales. Sometimes she is represented as holding in the one hand a cup, and in the other a sceptre. Nor can we forget that in the earlier ages of history, three years before Xerxes invaded Greece, the Athenians hastened to call to their political councils, and to the command of their armies, one who had before received the memorable cognomen of Aristides the Just. It need scarcely be said that the Scriptures also are full of honours paid to the just.

Nothing is so mean as injustice. Lacking the element of justice in character, no other qualification will be of much avail. Generosity is only a misnomer where justice is set at naught. If we give prodigally to some whilst we are defrauding others, we are not generous but merciless. Injustice, however, does not merely relate to our dealings in material commodities. It appertains to our estimates of each other, to our expressions concerning each other, and to all the aspects of our common life. We may do the very greatest injustice to others even by the *suppressio veri*, or the mere keeping back of truth concerning them. Justice is of immense importance to nations. The preservation of treaties, the payment of bonds and interests on national loans is of the highest moment to the reputation of any people, and the infraction of just principles is sure to work out national punishment in the loss of credit and prestige. As it is with nations, so it is with individuals. Men come to shrink with disdain from the wilfully unjust, and the old

proverb receives its fulfilment in human history, "When God loathes aught, men come presently to loathe it too."

Justice in the administration of the law is a glory to any people. It is well known that in the degenerate days of Rome the judges were in the guilty habit of receiving bribes, and it is needless to say that at this period the national character had degenerated, when other things beside the crimes of justice were dragged in the dirt. English law is above suspicion for purity and honour in its administration. Trial by jury answers to a very large extent the high ends of justice, whilst the Courts of Equity, now so much more used than in olden days, save the cause of truth from being lost by mere legal quibbles and technicalities.

Justice in commercial life is the very cement of society. When it is infringed upon by wrong-doing, depression settles down on trade and commerce, and for this single reason, that in civilised states of society all bartering and exchanging is carried on upon credit, which is only another word for confidence: if, therefore, that be damaged, it is easy to see how all the interests of the nation must suffer with it. Then only are we safe from paltry jobbery and trickery, when we can honestly say, "I hate oppression and robbery."

We are not to be just only because it will be rewarded here and hereafter: we are to do right because it is right. At the same time we cannot conceal from ourselves the fact that in the system of things in which we live there are rewards accompanying an upright life such as no wealth can purchase. To be looked upon as unimpeachable for integrity, and unquestionable concerning justice, is to have that atmosphere of respect around us which can only be ensured by persistent continuance in well-doing.

Injustice, whatever form it assumes, apart from its inner penalties, will bring coldness and suspicion with it, and we shall lose two of the sweetest enjoyments of life—the sense of an approving conscience, and the good name which, we are told on the highest authority, is rather to be chosen than silver or gold.

Only quibblers ask, "What is justice?" They try to set aside its claims by casuistical questions concerning its nature. Justice is, in a word, the practice of those essentially Christian maxims, doing unto others as we would they should do unto us, and loving our neighbour as ourselves. We have treated of justice first amongst the moral principles in our consideration of life and duty, because we have in it the basis of national, as it is of individual, prosperity and honour. Above all, let us remember that it is this faculty in the moral sense which, whilst it ensures for us the favour of man, keeps us also in the fear of God.

LESSONS IN DRAWING.—VII.

To draw Fig. 51, proceed as follows: draw the horizontal line *HL*, arrange the *rs*, and place the point *a* where the corner of the wall crosses the horizontal line; next, the points *d* and *e*, with the perpendiculars passing through them. As the arch is semi-circular, its centre will be at *h*, perpendicular to *i*, found by the intersection of the diagonal lines *fk* and *bm*; the point *h* is then the radiating point for the points of the stones forming the arch. If the arch were lower, as Fig. 52, draw the chord *ab*; from the centre *d* mark the required height *cd*, draw *ca* and *cb*, bisect *ac* and *cb* by the lines *fe* and *ge*, *e* will then be the centre of the circle of which *ac b* is a segment: the lines 1, 2, 3, 4, etc., will radiate at *e*. To bisect a line, as *cb* in Fig. 52, from *c* and *b*, with the same distance in the compasses make arcs to cut one another in *p* and *s*; through these points *p* and *s* draw a straight line, which will bisect the line *cb*, that is, it will divide it into two equal parts.

It will be seen that the heights of many kinds of arches are regulated by their diameters; the two pointed arches, Figs. 53 and 54, will exemplify this. Let the diameter of the pointed horse-shoe arch, Fig. 53, be *ab*, bisect it in *c*, and draw to any length *ef*; bisect *ac* in *e*, and *eb* in *d*; from *c*, with the radius *cb* (or distance of *cb* taken with the compasses), describe the arc *b f*; also from *d*, with the same radius, describe the arc *a f*. The higher-pointed arch, called the *early English*, Fig. 54, radiates from *a* and *b*, with the distance *a b* producing the arcs *a d* and *b d*.

The *semi-elliptical arch*, Fig. 55. Let *ab* be the diameter; bisect *ab* in *c* by the line *cd*; bisect *cb* and *ca* in the points *f* and *g*; from *f*, with the radius *fg*, draw the arc *gh*, and from *g*, with the same radius, draw the arc *af h*; draw from *h*, through

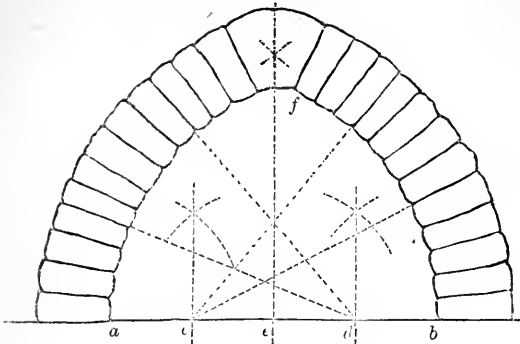


Fig. 53.

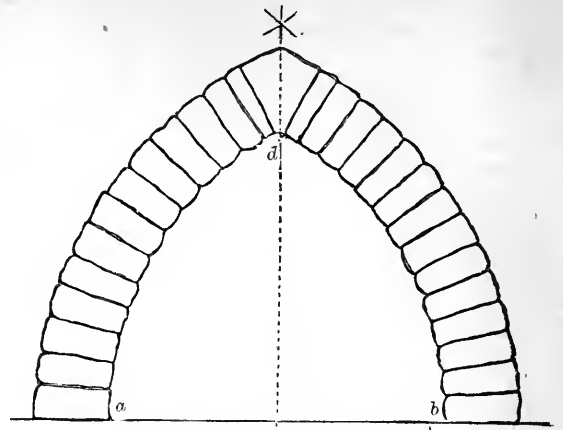


Fig. 54.

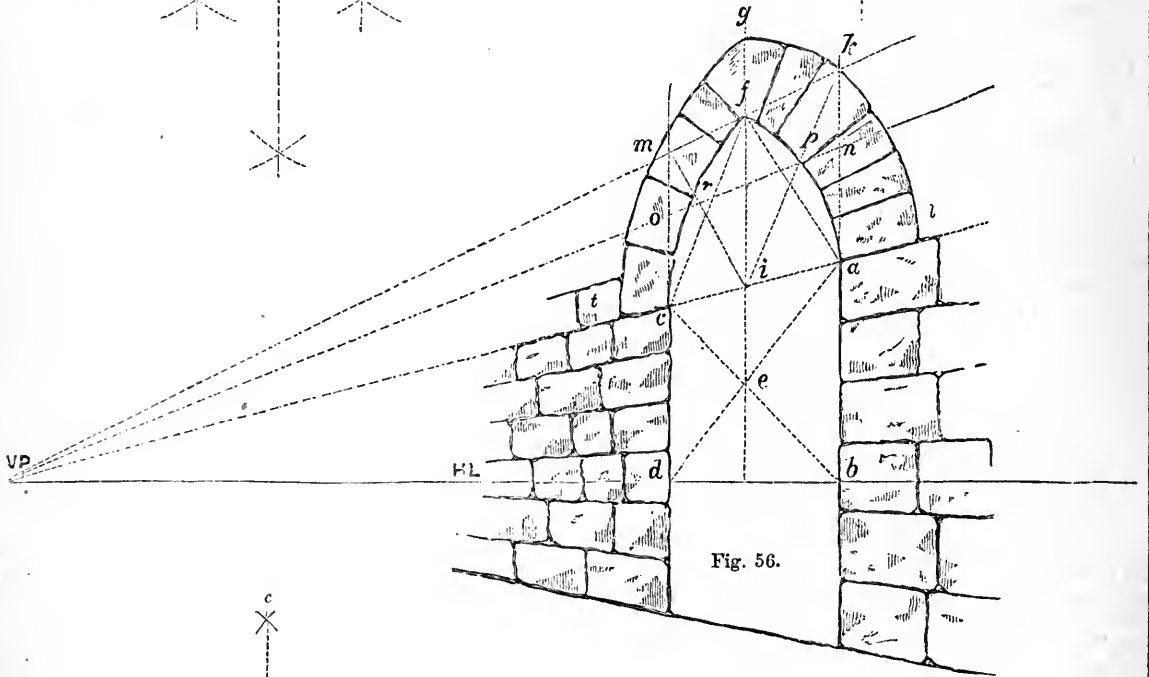


Fig. 56.

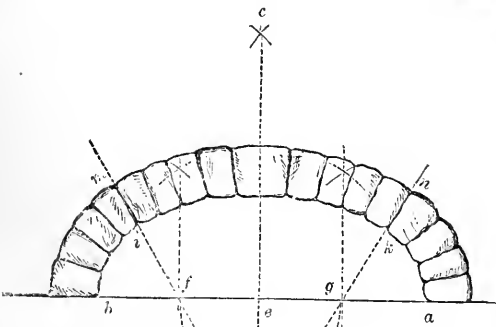


Fig. 55.

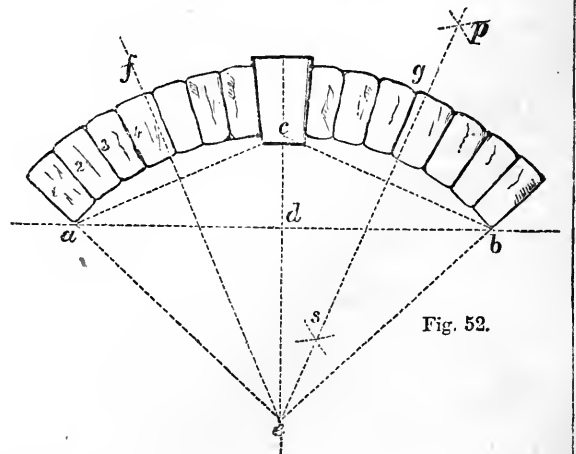


Fig. 52.

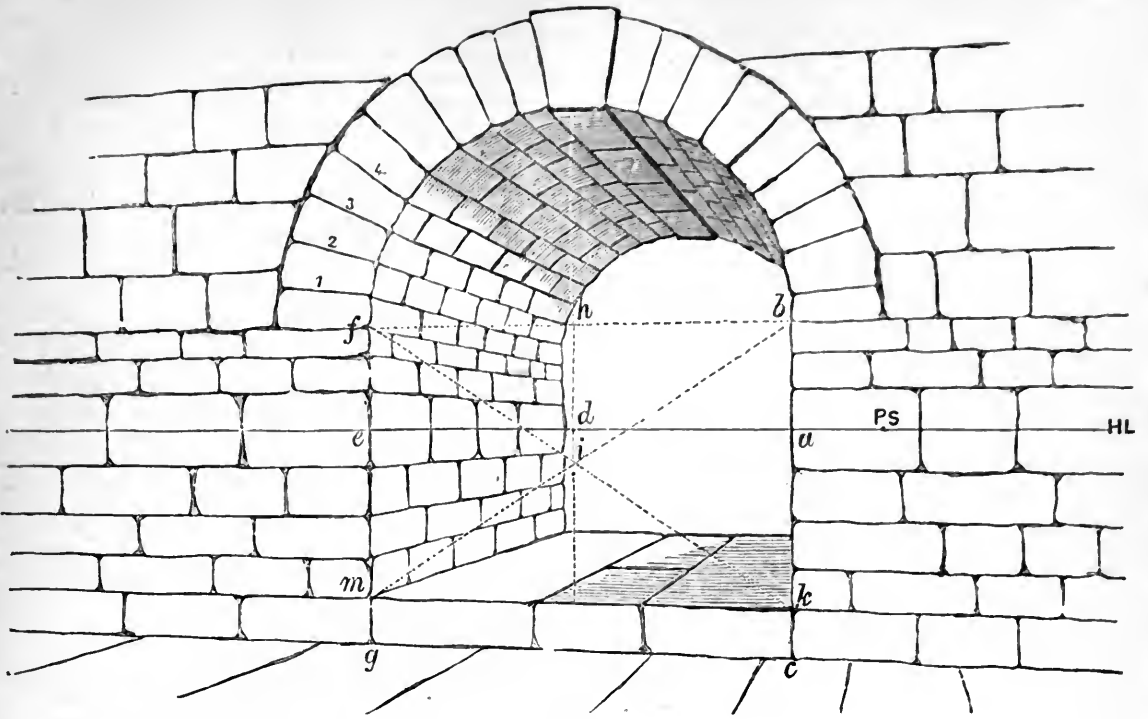


Fig. 51.

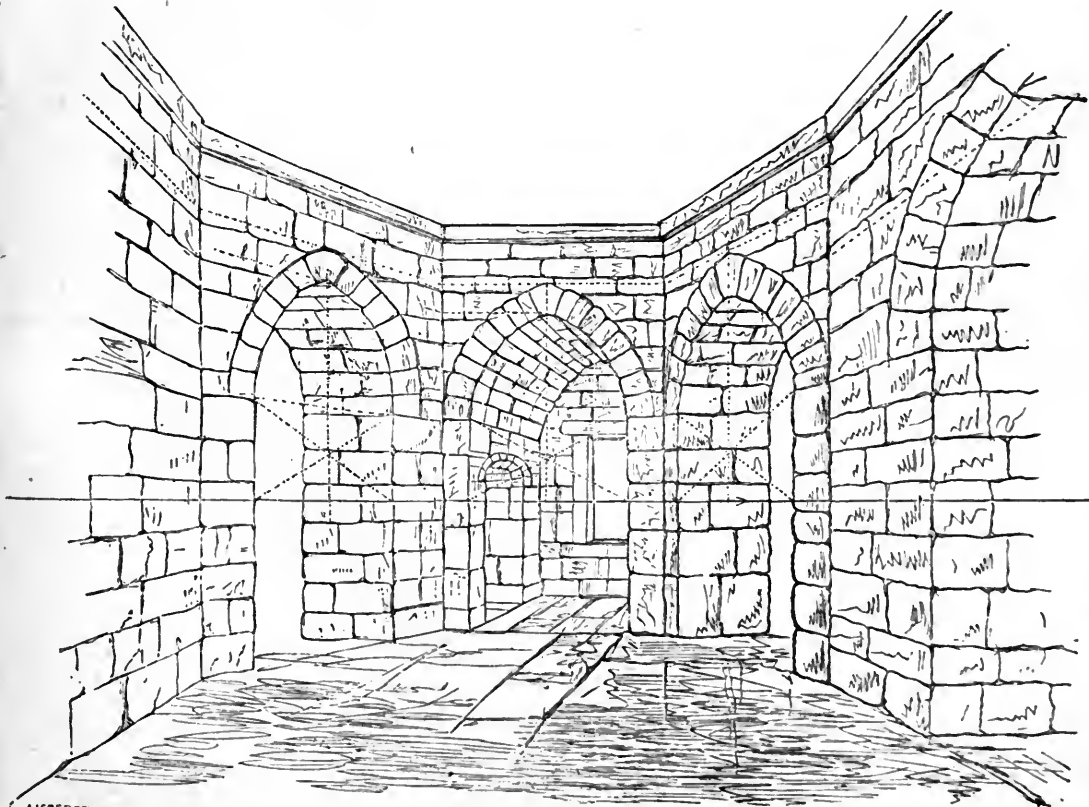


Fig. 57.

f, the line *h m*, and through *g* the line *h n*; from *f*, with the radius *f b*, draw the arc *b i*; from *g*, with the radius *g a*, draw the arc *a k*; and from *h*, with the radius *h i*, draw the arc *i k*; *a k i b* will be the arch required. It will be noticed that the radiation of the joints of the stones composing these various arches, is to the centres from which the arcs themselves are drawn. We give these few instances of the principles upon which arches are constructed, in order to assist the pupil when drawing a building from the object, or from a copy where these facts are not indicated by additional lines, to understand at once how he is to proceed in free-hand drawing, when placing his points of direction or arrangement. We shall have frequent occasion to seek for help in Geometrical Problems, as they so materially assist us in our explanations, and we hope the pupil also in comprehending them; we desire, therefore, that the pupil will practically go through the few problems given, in order to fix the principles of construction permanently in his mind. To draw an arch in perspective—that is, in a retiring position—the points of the arch and the points which help us in the construction must all be used, as they are when the arch (like Figs. 51 to 55) is in a parallel position. We will first give an example of a single retiring arch (Fig. 56), and then a group of them under different arrangements. Draw the horizontal line *H L*, and the line *a b*; from *a* draw a line to the *V P*; this will determine the length of the line *c d*; these are the perpendicular heights from which the arch springs. To find the centre, *e*, draw *c b* and *a d*, draw *e g*, and mark *f*, the height of the arch. The difficulty will be to find the point *p* in the curve *f a*, this curve not being so straight as *f c*; through *f* draw the line *m k* from the vanishing point; continue *d c* to *m*, and *b a* to *k*; draw the curve *f c*, observing its distance from the line (or chord) *c f*; draw *m i*, cutting the curve *f c* in *r*, draw *i k*; through *r* from the *V P* draw the line *o n*, cutting *k i* in *p*; *f p a* will be then the course of the curve to form the remainder of the arch; the outer edge of the arch, *t m g k l*, can be understood from the drawing; all the joints of the arch will radiate, as in Fig. 54, those from *a* to *g* in *c*, and those from *c* to *g* in *a*; the horizontal lines of the wall will vanish, as previously explained, at the point *V P*. If the arch had been a semi-circular one, the joints of the arch would then have radiated in the perspective centre *i*. So the pupil will see that to accomplish the difficulties of a retiring arch, he must first dot in that which may be termed the scaffolding or perspective, and build his arch upon it.

Fig. 57 represents the interior of a tower having recesses crowned by pointed arches. After the instructions given for the single arches, it will not be difficult to understand the principles of drawing these.

LESSONS IN LATIN.—VII.

NOUNS OF THE SECOND DECLENSION, ETC.

THE second declension is known by the ending of the genitive singular in *i*. The terminations of the nominative are *us*, *er*, *ir*, and *um*; of these terminations *us*, *er*, *ir*, are masculine, and *um* is neuter; that is, nouns ending in *us*, *er*, *ir*, are of the masculine gender, and nouns ending in *um* are of the neuter gender.

SECOND DECLENSION.

Sign *i* in the Genitive Singular.

CASE-ENDINGS.

LATIN.		ENGLISH.	LATIN.		ENGLISH.
Cases.	Singular.		Cases.	Plural.	
N.	us, er, ir, um,	(subject)	N.	i,	is, (subject)
G.	i,	of	G.	orum,	of
D.	o,	to or for.	D.	is,	to or for.
Ac.	um,	(object)	Ac.	os,	is, (object)
V.	es, er, ir, um,	O!	V.	i,	is, O!
Ab.	o,	by, etc.	Ab.	is	by, with or from.

A few remarks will make the meaning of the above table clear. First, let us speak of the singular. In the nominative there are four terminations. The arrangement is meant to show that of all these four *i* is the genitive-ending, and *o* the dative-ending. In the nominative plural, there are two terminations. The arrangement is meant to show that of both these *orum* is the genitive-ending, and *is* the dative-ending. The dative-ending and the ablative-ending is the same, being in the singular *o*, and in the plural *is*. In both the singular and

the plural, three cases are alike in nouns ending in *um*. These three cases are the nominative, the accusative, and the vocative, which in the singular end in *um*, and in the plural in *a*.

I subjoin an instance of each of the four terminations, thus:—hortus, a garden, has the first termination; puer, a boy, the second; vir, a man, the third; bellum, war, the fourth.

EXAMPLES IN THE SECOND DECLENSION.

Cases.		Singular.			
N.	hortus, a garden.	puer, a boy.	vir, a man.	bellum, war.	
G.	horti, of a garden.	pueri, of a boy.	vir, of a man.	belli, of war.	
D.	horto, to a garden.	puero, to a boy.	viro, to a man.	bello, to war.	
Ac.	hortum, a garden.	puerum, a boy.	virum, a man.	bellum, war.	
V.	horte, O garden!	puer, O boy!	vir, O man!	bellum, O war!	
Ab.	horto, by a garden.	puero, by a boy.	viro, by a man.	bello, by war.	

Cases.		Plural.			
N.	horti, gardens.	pueri, boys.	vir, men.	bella, wars.	
G.	hortorum, of gardens.	puerorum, of boys.	virorum, of men.	bellorum, of wars.	
D.	hortis, to gardens.	pueris, to boys.	viris, to men.	bellis, to wars.	
Ac.	hortos, gardens.	pueros, boys.	viros, men.	bella, wars.	
V.	hortis, O gardens!	pueri, O boys!	vir, O men!	bella, O wars!	
Ab.	hortis, by gardens.	pueris, by boys.	viris, by men.	bellis, by wars.	

In *ager*, a field, and some other nouns, the *e* is rejected in all the cases except the nominative and vocative singular. Thus, *ager* makes in the genitive singular *agri* :—

Cases.		Singular.	Cases.		Plural.
N.	ager, a field.		N.	agri, fields.	
G.	agri, of a field.		G.	agrorum, of fields.	
D.	agro, to a field.		D.	agris, to fields.	
Ac.	agrum, a field.		Ac.	agros, fields.	
V.	ager, O field!		V.	agri, O fields!	
Ab.	agro, by a field.		Ab.	agris, by fields.	

Adjectives have terminations similar to the nouns of the first and second declension. Thus, *bonus*, good, is declined like *hortus*, a garden, in the following manner:—

Cases.		Singular.	Cases.		Plural.
N.	bonus hortus, a good garden.		N.	boni horti, good gardens. [dens.	
G.	boni horti, of a good garden.		G.	bonorum hortorum, of good gardens.	
D.	bono horto, to a good garden.		D.	bonis hortis, to good gardens.	
Ac.	bonum hortum, a good garden.		Ac.	bonos hortos, good gardens.	
V.	bone horte, O good garden!		V.	boni horti, O good gardens!	
Ab.	bono horto, by a good garden.		Ab.	bonis hortis, by good gardens.	

Write out the following adjectives and nouns according to these models:—

Bonus ager.	Indoctus puer.	Malum bellum.
Doctus vir.	Magnus hortus.	

VOCABULARY.

Amica, -æ, f., a female friend.	Epistola, -æ, f., a letter.	Multi, many.
Amicæ, -arum, m., a friend.	Funestus, -a, -um, adj., deadly.	Peregrinus, -i, m., a stranger.
Aper, apri, m., a boar.	In (with the ablative case), in or on; (with the accusative), into.	Ripa, -æ, f., a river's bank.
Britannia, Britain.	Ludus, -i, m., play.	Regnum, -i, n., a kingdom.
Caper, capri, m., a goat.	Magister, magistri, m., a master.	Schola, -æ, f., school.
Discipulus, -i, m., a scholar.		

EXERCISE 21.—LATIN-ENGLISH.

1. Boni viri bonos pueros amant. 2. Boni pueri amantur a bonis viris. 3. Bonus puer scholam amat. 4. Boni magistri bonorum pueros amantur. 5. Estne tibi bonus magister? 6. Funestum est bellum. 7. Est mihi bona amica. 8. Pueri sunt in schola. 9. Nonne sunt pueri in schola? 10. Peregrini multi in Britanniam navigant. 11. Aper amici mei est magnus. 12. Est ludus in ripa. 13. Discipuli epistolam amant. 14. Rana sunt in ripis. 15. Caper est magnus. 16. Bella funesta sunt in insula.

EXERCISE 22.—ENGLISH-LATIN.

1. I love good scholars. 2. Good scholars are loved by good men. 3. Dost thou love a friend? 4. I have a boar. 5. Thou hast a goat. 6. The goats are on the river's bank. 7. A great and deadly war is in the island. 8. Many fields are in Britain. 9. Boars are often deadly. 10. O men, do you love the boys? 11. My friends do not love strangers. 12. Boys love play. 13. Do boys love play? 14. Have you a female friend? 15. I have not a large boar. 16. The letter of my female friend is in the garden.

We are now in a condition to decline and study adjectives of what are called three terminations; as, *amplus*, *ampla*, *amplum*, *large* or *spacious*. *Amplus*, you see, is like *hortus*; *ampla* is like *mensa*; and *amplum* is like *bellum*. In fact, *amplus* is of

the masculine gender, and is declined like a noun masculine of the second declension; *ampla* is of the feminine gender, and is declined like a noun feminine of the first declension; and *amplum* is of the neuter gender, and is declined like a noun neuter of the second declension. I subjoin the full declension of *amplus*, *a*, *um*. Like it are declined all adjectives ending in *us*, *a*, *um*; which are said to have three terminations from the fact that such three terminations, *us*, *a*, *um*, etc., they really have.

ADJECTIVES OF THREE TERMINATIONS OF THE FIRST AND SECOND DECLENSION.

EXAMPLE.—*Amplus*, *m.*; *ampla*, *f.*; *amplum*, *n.*; *large*.

Singular.		N.		Plural.	
M.	F.	M.	F.	M.	F.
N. <i>amplus</i>	<i>ampla</i>	<i>amplum</i>	<i>ampli</i>	<i>ampla</i>	<i>ampla</i>
G. <i>ampli</i>	<i>amplæ</i>	<i>ampli</i>	<i>amplorum</i>	<i>amplum</i>	<i>amplorum</i>
D. <i>amplæ</i>	<i>amplæ</i>	<i>amplæ</i>	<i>amplis</i>	<i>amplis</i>	<i>amplis</i>
Ac. <i>amplum</i>	<i>amplam</i>	<i>amplum</i>	<i>amplæ</i>	<i>amplæ</i>	<i>amplæ</i>
V. <i>ampli</i>	<i>ampla</i>	<i>amplum</i>	<i>ampli</i>	<i>amplæ</i>	<i>ampla</i>
Ab. <i>ampli</i>	<i>ampla</i>	<i>amplæ</i>	<i>amplis</i>	<i>amplis</i>	<i>amplis</i>

This form and other similar forms I advise you to learn by heart in three ways; first, vertically, that is, from top to bottom; you will thus see the identity in form of the adjective with the corresponding noun. Then learn it from the left hand to the right; thus, *amplus*, *ampla*, *amplum*; learning the singular first, and then the plural. Finally, learn the case-endings in the same two ways; thus:—

N.	G.	D.	Ac.	V.	Ab.	and	N.
<i>us</i> ,	<i>i</i> ,	<i>o</i> ,	<i>um</i> ,	<i>e</i> ,	<i>o</i> ,		<i>us</i> , <i>a</i> , <i>um</i> , etc.

You cannot bestow too much pains in making yourself perfectly familiar with each declension, each example, each form, as you go forward. There is a good Latin maxim which says, "*festina lente*," literally, *hasten slowly*, or as the English proverb says, "slow, but sure." In grammatical studies the observance of the proverb is very serviceable.

The adjective *liber*, *free*, is declined like the noun *puer*. The adjective *pulcher*, *fair* or *beautiful*, is declined like the noun *ager*. *Liber* in the feminine gender is *libera*, and *libera* is declined like *mensa*. In the neuter gender, it is *liberum*, and *liberum* is declined like *bellum*. I will give you the forms in full of both *liber*, *libera*, *liberum*, and *pulcher*, *pulchra*, *pulchrum*.

ADJECTIVES OF THREE TERMINATIONS.

EXAMPLE.—*Libër*, *free*.

Singular.		N.		Plural.	
N. <i>libër</i>	<i>libëra</i>	<i>libërum</i>	<i>libëri</i>	<i>libëræ</i>	<i>libëra</i>
G. <i>libëri</i>	<i>libëræ</i>	<i>libëri</i>	<i>libërorum</i>	<i>libërarum</i>	<i>libërorum</i>
D. <i>libëro</i>	<i>libëræ</i>	<i>libëro</i>	<i>libëris</i>	<i>libëris</i>	<i>libëris</i>
Ac. <i>libërum</i>	<i>libëram</i>	<i>libërum</i>	<i>libëros</i>	<i>libëras</i>	<i>libëra</i>
V. <i>libër</i>	<i>libëra</i>	<i>libërum</i>	<i>libëri</i>	<i>libëræ</i>	<i>libëra</i>
Ab. <i>libëro</i>	<i>libëra</i>	<i>libëro</i>	<i>libëris</i>	<i>libëris</i>	<i>libëris</i>

EXAMPLE.—*Pulcher*, *fair*.

Singular.		N.		Plural.	
N. <i>pulcher</i>	<i>pulchra</i>	<i>pulchrum</i>	<i>pulchri</i>	<i>pulchræ</i>	<i>pulchra</i>
G. <i>pulchri</i>	<i>pulchræ</i>	<i>pulchri</i>	<i>pulchrorum</i>	<i>pulchrarum</i>	<i>pulchrorum</i>
D. <i>pulchro</i>	<i>pulchræ</i>	<i>pulchro</i>	<i>pulchris</i>	<i>pulchris</i>	<i>pulchris</i>
Ac. <i>pulchrum</i>	<i>pulchram</i>	<i>pulchrum</i>	<i>pulchros</i>	<i>pulchras</i>	<i>pulchra</i>
V. <i>pulcher</i>	<i>pulchra</i>	<i>pulchrum</i>	<i>pulchri</i>	<i>pulchræ</i>	<i>pulchra</i>
Ab. <i>pulchro</i>	<i>pulchra</i>	<i>pulchro</i>	<i>pulchris</i>	<i>pulchris</i>	<i>pulchris</i>

Obs.—The *ch* is pronounced like *k*, thus, *pulker*, *pulkra*, *pulkrum*, etc.

Form, according to the models just given—

<i>Ager fecundus</i> , a fruitful field.	<i>Ovum magnum</i> , a large egg.
<i>Exemplum bonum</i> , a good example.	<i>Pulcher hortus</i> , a beautiful garden.
<i>Femina bona</i> , a good woman.	<i>Scriba bonus</i> , a good writer.
<i>Liber puer</i> , a free boy.	<i>Vir magnus</i> , a great man.

Filius, a son, makes in the vocative singular *filii*, and *meus* in the vocative singular makes *mi*, as, *O mi filii*! *O my son*! but *filia*, a daughter, makes in the vocative singular *filia*, and *meum* in the neuter makes *meum*, as, *O mea filia*! *O my daughter*! *O meum officium*! *O my duty*!

Proper names ending in *ius* have *i* in the vocative singular, as, *Tullius*, *O Tulli*; *Virgilius*, *O Virgili*; *Mercurius*, *O Mercuri*; *Antonius*, *O Antoni*.

Deus, God, has in the vocative singular *deus*; in the plural

it is thus declined: *N. dii*, *G. deorum*, *D. diis*, *Ac. deos*, *V. dii*, *Ab. diis*.

ERRATUM.—In the first Vocabulary, page 71, for *Vincio*, *I conquer*, read, *Vincio*, *I bind*.

VOCABULARY.

<i>Colo</i> , 3, <i>I cultivate</i> , <i>I honour</i> , or, <i>I worship</i> .	<i>Frumentum</i> , -i, n., corn.	<i>Rego</i> , 3, <i>I guide</i> , or, <i>I rule</i> .
<i>Committo</i> , 3, <i>I intrust</i> .	<i>Granum</i> , -i, n., a grain.	<i>Templum</i> , -i, n., a temple.
<i>Curro</i> , 3, <i>I run</i> .	<i>Hinnio</i> , 4, <i>I neigh</i> .	<i>Variis</i> , -a, -um, serious.
<i>Celeriter</i> , <i>swiftly</i> .	<i>Juba</i> , -æ, f., a mane.	<i>Vireo</i> , 2, <i>I become green</i> , or, <i>I become strong</i> .
<i>Equus</i> , -i, m., a horse.	<i>Longus</i> , -a, -um, long.	
<i>Fecundus</i> , -a, -um, fruitful.	<i>Musca</i> , -æ, f., a fly.	
	<i>Molestus</i> , -a, -um, troublesome.	

EXERCISE 23.—LATIN-ENGLISH.

1. *Equus hinnit*.
2. *Juba equi est pulchra*.
3. *Musca sunt molesta*.
4. *Suntne musca molesta?*
5. *Boni discipuli non sunt molesti*.
6. *Longa bella sunt molesta*.
7. *Equi celeriter currunt*.
8. *Vir regit equum*.
9. *Equus regitur a viro*.
10. *Equo pulchro delector*.
11. *Agri sunt fecundi*.
12. *Herbæ agrorum sunt variæ*.
13. *Agricola committit agris grava frumenti*.
14. *Agricola celit agros*.
15. *Quam pulchre virentur agri!*
16. *In agris florent variæ herbæ*.

EXERCISE 24.—ENGLISH-LATIN.

1. The field is fruitful.
2. Are the fields fruitful?
3. Wars are not fruitful.
4. Fields are cultivated.
5. You honour (worship) the gods.
6. The gods are honoured by Tully (Tullius).
7. The horse and the mare are guided by the man.
8. Boars run swiftly.
9. Do goats run swiftly?
10. Flies are (there are flies) in the beautiful garden.
11. Thou intrustest the horse to the field.
12. Good scholars are honoured.
13. O my son, temples are intrusted to the gods and goddesses.
14. O Antony, the gods and goddesses are worshipped in temples.
15. O good God! thou art worshipped in the fruitful fields.
16. Good men are honoured by their sons and their daughters.

KEY TO EXERCISES IN LESSONS IN LATIN.—VI.

EXERCISE 15.—LATIN-ENGLISH.

1. The frog croaks.
2. The frog is often (*sæpe*) the prey of the stork.
3. A stork injures a frog; or, the stork injures the frog.
4. The stork devours the frog.
5. O frog, thou croakest.
6. The water is disturbed by the frog.
7. Plants (or the plants) flourish.
8. The earth is clothed with an abundance of plants.
9. Storms injure (*nocent*) plants.
10. The earth produces plants.
11. O plants, how beautifully you adorn the earth!
12. The earth is clothed with plants.

EXERCISE 16.—ENGLISH-LATIN.

1. *Plantæ florent*.
2. *Procella nocet plantæ*.
3. *Plantæ nocentur procellâ*.
4. *Ranæ devorantur a ciconia*.
5. *Terra gignit plantas*.
6. *Plantæ gignuntur terrâ*.
7. *O plantæ, quam pulchrè gignimini terrâ!*
8. *Copian aqua laudo*.
9. *Procella movet aquas*.
10. *Aqua procellâ moventur*.

EXERCISE 17.—LATIN-ENGLISH.

1. I have a beautiful lark.
2. Hast thou (*estne tibi*) a beautiful lark?
3. My lark is beautiful.
4. Is my lark beautiful?
5. Is not thy lark beautiful?
6. Thy pigeon is very beautiful.
7. I have a good maid-servant.
8. My maid-servant is beautiful.
9. Julia is sacred (*augusta*).
10. Sacred Julia is beautiful.
11. Is not sacred Julia beautiful?
12. The lark of my maid-servant is beautiful.
13. Thy table is not square.
14. The island is great.

EXERCISE 18.—ENGLISH-LATIN.

1. *Est mihi columba*.
2. *Est tibi bona puella*.
3. *Estne tibi bona puella?*
4. *Non est mihi bona puella*.
5. *Alauda tua est pulchra*.
6. *Nonne magna est insula?*
7. *Magna non est insula*.
8. *Estne tibi bona ancilla?*
9. *Non est mihi bona ancilla*.
10. *Puellæ alauda est pulchra*.

EXERCISE 19.—LATIN-ENGLISH.

1. I have a deserter of Jugurtha.
2. Thou hast a bad deserter.
3. I praise a good poet.
4. A good poet is praised.
5. The mare is praised by the charioteer.
6. The sailors sail to the island.
7. Good sailors praise their country.
8. The eagle is often praised by poets.
9. Husbandmen greatly delight in plants.
10. Thou earnest, O sailor!
11. Do you not err, O charioteers?
12. I have the sadness of good poets.
13. I greatly love the shades of the groves.
14. The husbandmen ride through the wood.

EXERCISE 20.—ENGLISH-LATIN.

1. *Estne tibi perfuga?*
2. *Malus estne perfuga?*
3. *Boni poetas laudantur*.
4. *Poetas bonos laudo*.
5. *Boni agricolæ patriam laudant*.
6. *Bonorum poetarum patria laudatur*.
7. *Per sylvam equit pirata*.
8. *Ad insulam navigat nauta*.
9. *Bona est equa aurigæ boni*.

ANIMAL PHYSIOLOGY.—VI.

THE EAR (*concluded*).

WE have to search for the orifice of the ear of birds beneath the feathers. In a few cases, as in the owl and wild turkey, a circle of feathers surrounds the ear-hole; but generally there is no external indication of an ear. On examination, however, a zone of fine feathers with peculiarly fine barbs, through which the air passes readily, is found round the ear. Internally, the ear is not unlike that of brutes, except in the following particulars. The cochlea is rudimentary, that is, it is not developed into a coiled double canal, but is only a slight process from the vestibule, occupied by two cylinders of fine cartilage, representing the two staircases, but of very simple form. The semi-circular canals are similar and similarly disposed, except that two of them, the horizontal and one of the vertical ones, communicate where they cross one another. The most marked difference is that the chain of ossicles is reduced to one long one, forked at its tympanic end, and stretching right from the membrane of the oval hole to the cartilage of the drum-membrane. The whole organ is very compact and embedded in bone, and even the canal which runs from the tympanum to open at the top of the throat is of bone.

No one can doubt that the sense of hearing in birds is keen and appreciative. Indeed, if the correlation between the capability of producing a variety of sounds and the appreciation of the same be as close as we should naturally suppose it to be, the sense of hearing in our song birds is most exquisite. If the hen nightingale experiences a corresponding happiness in listening to the song of her mate to that which he evidently feels while his little throat is pouring forth its changeful notes; or if either of them can appreciate the impressions produced by the varied music, ranging as they do from a sweet melancholy to a thrilling joy, then these little summer visitants have an avenue to a constant pleasure, and by the possession of this they make a nearer approach to us than we have been disposed to admit as possible to any of the lower animals. That such should be the case may seem in the highest degree improbable to some minds; yet, before it is dismissed as a sentimental fancy, it should be remembered that our greatest naturalists hold it as a principle that a species is endowed with no habit or instinct, no product or power, which is solely for the benefit of other species—in fact, that the primary use of every such endowment is for the advantage of the species which possesses it; and if in the great harmony of Nature other species benefit from it, this is incidental, though not accidental. The bee makes honey for its own community, though man and the brown bear despoil its comb. Though leather and fur are so useful and almost indispensable to us, they were more useful and wholly indispensable to the beast that they once clothed. By analogy, therefore (to which there is no counter analogy), when we listen delighted to the strains of the nightingale in May, we may infer that the brooding bird experiences a yet more exquisite delight. So general is this principle, that it is considered certain that every species which produces sounds for its own sake, and disconnected with other necessary movements of the body, also possesses an organ of hearing.

The class of cold-blooded animals called reptiles, and which is ill represented except in the tropics, contains creatures of very different structure. The higher of these animals are more like to birds than to the lower members of their own class, and these again have a close resemblance in some respects to fish. Hence, as in the case of the eye, the ear of a typical reptile cannot be described as the ear of the class, because there are such great differences in this organ. Thus, the ear of the crocodile is almost precisely like that of a bird, and it is only in the means of letting the air into the tympanic cavity that there is much difference. The crocodile while it lives in the water breathes air, and it is provided with a means of drowning its prey under water while it is itself inhaling the air. This is effected by the channels of the nostrils being carried far back before they communicate with the throat, while a double valve in front of the communication closes and shuts off the throat from the mouth. By holding the prey crossways, and far back against the corners of its widely-gaping jaws, it keeps it under water while its own long snout and nostrils are thrust above the surface. Now we have seen that the tympanic cavity must be supplied with air, and water must be excluded from it; hence the Eustachian tube, or

rather complicated system of tubes, is carried backward instead of forward, and opened by a single orifice, behind the hind opening of the nostrils, into the throat, and therefore behind the valve, and the opening is on a projection and closed by a half-moon-shaped valve. Every precaution is thus supplied to exclude the water from, and include the air in, the tympanic cavity. Lizards, turtles, and also frogs, have a drum and drum-membrane; but this is on a level with the rest of the skin, so that there is no ear-hole, and in the case of the turtle the drum-membrane is covered by that hard scale which is next but one above the corner of the mouth. In the serpent there is no drum-membrane or air cavity; the long bone running from the oval hole through a cellular substance, and fastened by cartilage to the scaly skin; while in some of the lower fish-shaped reptiles the oval hole is brought right up to the surface, to the exclusion of drum, drum-membrane, and ossicles.

In tracing the organ, then, throughout this class, we have gradually lost all the outer courts of the ear, and also what remnant of a cochlea was left.

In the bony fishes all these parts are wanting, as might be supposed; but the ear, instead of being brought to the surface, is walled up by the bones of the large skull. If the roof of the skull of a fish be removed, a central compartment will be seen, much too large for the small brain, and on either side, at the back part, a large chamber, which communicates with the central one, and in which the large main portion of the ear is lodged; while the three semi-circular canals springing from this part by dilated bags run, two of them upward into tubular hollows of the skull-bones, and then unite to run into the same vestibular sack by a more central communication, while the third is horizontal and runs outward. The main vestibular sack has itself several compartments which sometimes communicate with it only by narrow constricted necks, and in these are found the otoliths, or ear-stones, which are suspended over the parts to which the strands of the ear-nerve are most largely distributed. These ear-stones are no longer fragmentary particles, as in the case of mammals, or soft chalk, as in the internal ears of frogs, but dense, hard, pearly bodies, one of which is of large size, and is represented in the engraving with its concave, streaked side towards the observer, this side being upward when in its natural position.

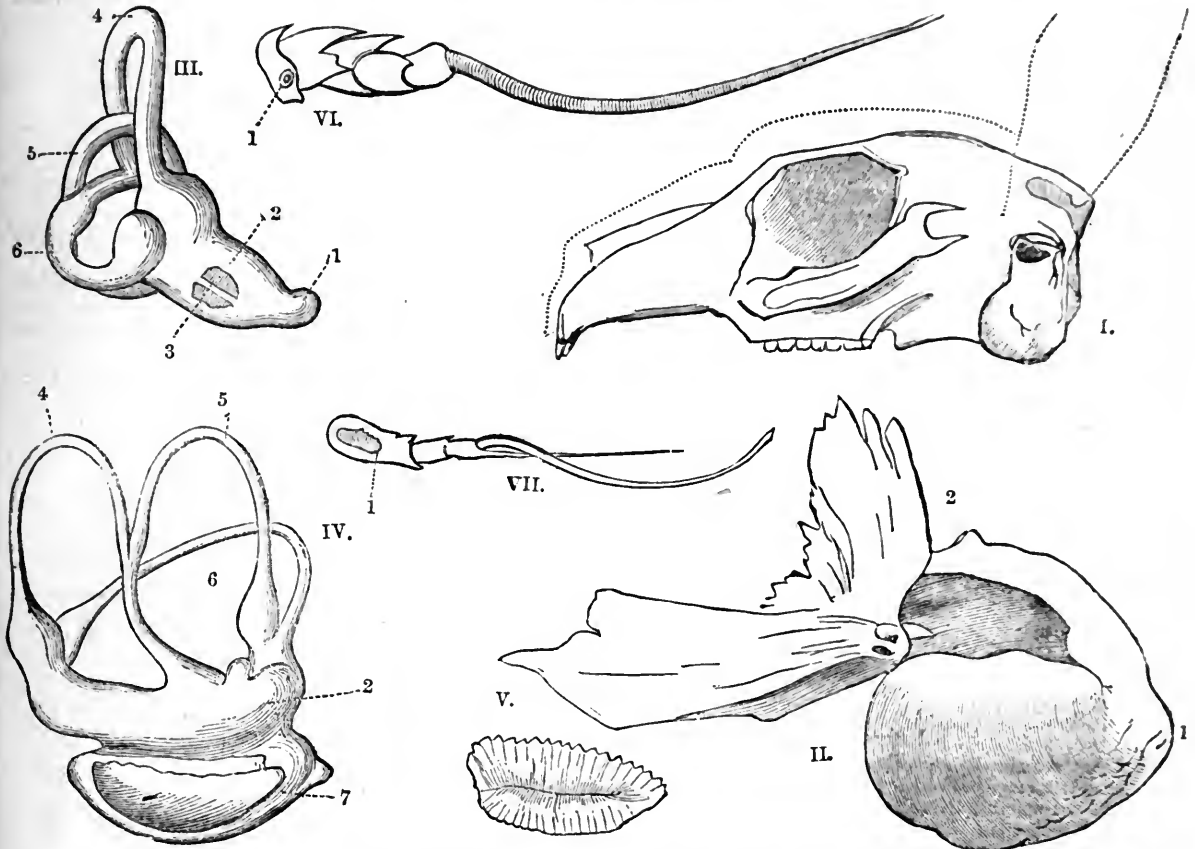
In illustration of what has been said concerning the advantage of causing the sound waves to be reverberated in air, a peculiar connection between the labyrinth and the internally situated air-bladder of some fish ought to be mentioned. In the carp, each ear-sack sends a passage to a central cavity in the base of the skull, and this has two bags at its hind end, all filled with fluid, as the cavity of the ear is, and from these a chain of three bones runs to the bladder. In the little fish called the loach, which is one of the first captives obtained by the searcher of the little pools left by the retreating tide, the air-bladder seems to be retained solely to minister to the ear; and in the herring the bladder itself sends processes to be applied to other processes sent to meet them from the vestibule.

In the other great order of fish—distinguished from the foregoing ones by the general character of the skeleton, this being not bony, but grisly—from the fact that elastic cartilage is not so resonant a body, and not so good a conductor of sound, as bone, other appliances are given to bring the ear in closer relation to the external water, whence the sounds come. The whole labyrinth is closely surrounded by gristle, and in sharks from the gristle cavity a canal runs to the top of the head, and is there closed by the skin. In the ray, a canal runs from the union of the two semi-circular canals to a similar orifice. Both of these canals are of course filled, not with air, but with fluid, that of the shark being filled with what is called perilymph, or external fluid, and that of the ray with endolymph, or internal fluid.

So much has been conjectured, and so little is really known, about the organ of hearing in the invertebrate classes, that it is scarcely advisable to enter upon the subject in a popular publication. The great diversity of sounds produced by insects, some of which, like the cicada (which makes the Italian coppers ring perpetually with its loud, grating cry), have very elaborate contrivances for the production of noises, makes it almost certain that this large order of the jointed animals have the sense of hearing. On the other hand, the almost universal muteness of the mollusca might have led us to suppose that the organ of

hearing would be wanting to them. Yet, strange to say, while the ears of the cuttle-fish and the slug have been satisfactorily detected, the seat of hearing in insects is still undetermined. The antennæ, or jointed appendages of the head, have been usually looked upon as the seat of the sense of hearing, but whether it be in the basal joint or the terminal one is a matter of dispute; and in one instance it was supposed to have been found in the hip joint of the front pair of legs—a singular position, it must be confessed. To show the difficulty of determining these matters, we have given a sketch of the external orifices of two supposed organs of sense in the common lobster. The little conical protuberance, with a hole through the shell at the summit, which is closed by a membrane, beneath which is a little bag of fluid with a nerve running to it, which is found on

problems may be thus propounded:—What structures, in the fish, are the representatives of the ossicles of the tympanum called the hammer (*malleus*) and anvil (*incus*) in the mammal? To this question an answer is given by some of our best anatomists which is almost startling from its strangeness, but which, on further examination, has much to support it. These anatomists affirm that the two bones, which form the joint of the lower jaw in the fish, are the representatives of the hammer and anvil, taken out, so to speak, of the ear-drum, much enlarged and applied to quite a different purpose. Such questions as these require much research to determine them, and are only mentioned here to give a slight insight into the difficulties found in unravelling the plan of Nature, though there is undoubtedly a plan in all her works.



I. BONE CONTAINING THE EAR OF A RABBIT. II. EAR-BONE OF THE WHALEBONE WHALE, ONE-FOURTH NATURAL SIZE. III. INTERNAL EAR OF A BIRD. IV. EAR OF A COD. V. EAR-STONE OF COD. VI. UNDER SIDE OF LONG ANTENNA OF A LOBSTER. VII. UPPER SIDE OF SHORT ANTENNA OF A LOBSTER.

Ref. to Nos. in Figs.—II. 1, tympanic bone; 2, its point of attachment to the skull. III. IV. 1, cochlea; 2, vestibule; 3, oval hole; 4, 5, 6, semi-circular canals; 7, sack of ear-stone. VI., VII. 1, organs of sense.

the under side of the first joint of the first, or long, pair of antennæ, has been long considered the organ of hearing. Now, however, the opinion seems to prevail that this is an organ of smell, while that found opening on the upper side of the first joint of the second, or short, pair of antennæ, is now thought to be the true ear. In searching for the ear, the presence of hard bodies suspended by threads in a sack containing liquid, and capable of striking upon a nerve filament, is considered as characteristic and indicative of an ear, just as the expansion of a nerve in front of black pigment and behind a transparent membrane is thought to denote an eye. The first-named structure is found in the organ of the lobster last described, but not in the other.

It will be seen that much remains to be made out about the ear, and the subject is extremely difficult to study. Indeed, some of the most perplexing problems of the comparative anatomist seem to be associated with the ear. One of the

The temporal bones—which, in man, lodge the internal and support the external ears, and besides these functions, close in the brain-case at the sides, send out strong buttresses forward to strengthen the bones of the face, and others to sling the throat bones upon, and also give attachment to the lower jaw—are the most difficult bones in the body to describe and remember. Many vessels and nerves enter them by numerous holes, and these subdivide and find their way out in such strange ways, that many a poor medical student has trembled when, in an examination, a temporal bone has been placed in his hand. These bones are no doubt composed of many elements which are distinct in reptiles, birds, and fish: but, to make confusion worse confounded, the student of comparative anatomy finds on the one hand that Professor Owen divides the bone into at least nine elements, and gives them names according to his theory; on the other Professor Huxley transposes all the relations, and christens them by new names.

LESSONS IN FRENCH.—XIII.

SECTION I.—FRENCH PRONUNCIATION (*continued*).V.—COMPOUND VOWELS (*continued*).

EU.—Name, *uh*; sound, like the *e* mute or unaccented, which has been already explained, except when it is a verb, or commences a verb, in which latter case it has the sound of French *u*, which also has been explained.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Demeure	D'muhr	Residence.	Leur	Luhr	Their.
Eux	Uh	Them.	Milieu	Me-le-nh	Middle.
Fleur	Fluhr	Flower.	Peuple	Puhpl'	People.
Heureux	Uh-ruh	Happy.	Pleu-voir	Pluh-v'wah	To rain.
Heure	Uhr	Hour.	Plusieurs	Plu-ze-uh	Many.
Jeune	Zhuhn	Young.	Veuve	Vuhv	Widow.

Sometimes the *u* of this combination is under a circumflex accent, thus, *éu*, in which case the sound of the compound vowel is prolonged.

The correct sound of this compound vowel is no more difficult to be acquired than is the correct sound of *e* mute or unaccented. But it often happens that the letter, or combination of letters, which immediately follows it, adds vastly to the difficulty of pronouncing it. Bring the lips nearly together, ovally, in speaking this compound vowel. Practise patiently and thoroughly upon the above and other examples, until you are satisfied you have mastered the difficulty.

OI.—Name, *oah*, or *wah*; sound, like the letters *oah* of the proper name *Noah*. Do not give this compound vowel the sound of *uor*, or *oo-ave*, as is too commonly done.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Ardoise	Ar-doahz	Slate.	Histoire	Is-t'wah	History.
Auditoire	O-dit-oahr	Assembly.		(trill the r)	
Avoir	Av'wah	To have.	Manoir	Man'wah	Manor.
Bois	B'wah	Wood.	Noir	N'wah	Black.
Désespoir	Day-zes-p'-wah	Desperation.	Pouvoir	Poo-v'wah	To be able.
Devoir	Dev'-wah	To owe.	Roi	R'wah (trill the r)	King.

OU.—Name, *oo*; sound, like the letters *oo* in the English word *moon*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Bouleversé	Bool-ver-say	Distracted.	Pour	Poor (trill For.	
Coup	Koo	A blow.		the r)	
Douche	Doosh	Douche or bath.	Pourri	Poo-ree	Rottenness.
Fouet	Foo-ay	A whip.	Route	Roote (trill the r)	A route.
Où	Oo	Where.	Tout and Toute	Toote	All.
Oubli	Oo-blee	Forgetfulness.	Toucher	Too-shay	To touch.
Poudre	Poodr	Powder.	Tour	Toore	Journey.

VI.—DIPHTHONGS.

68. There are six *diphthongs*, namely:—*ia*, *ie*, *io*, *ua*, *ue*, *ui*, whose sounds we now proceed to illustrate.

But do not suppose that these combinations of vowels are always diphthongs, in whatever place they are situated. If followed by two consonants, the *first* of which is *m* or *n*, the *last* vowel forms with the *m* or *n* a nasal, unless the *m* or *n* be doubled.

Sometimes, again, these vowels which now appear as diphthongs are but parts of syllables of a word, and must be pronounced only as distinct vowels.

IA.—Name, *ia*; sound, like the letters *i* in the English word *fig*, and *a* in the word *fat*, pronounced as one syllable. The sounds of both, however, must be distinctly heard without any hiatus between them.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Criard	Kree-ar	Clamorous.	Phable	Plee-abl	Flexible.
Coriacé	Kor-eassay	Tough.	Pliage	Plee-azh	Folding.
Fiacre	Fee-akr	Cab.	Tiare	Tee-ar (trill the r)	Tiara.
Iatrique	Iatreek	Iatrical.	Viande	Vee-anhd	Meat.
Piaffe	Pee-aff	Ostentation.			

IE.—Name, *ee*; sound, like the letters *ee* in the English word *bee*.

FRENCH.	PRONUNCIATION.	ENGLISH.
Académie	Ak-ad-aymee	Academy.
Analogie	An-al-ozhee	Analogy.
Anomalie	An-om-alee	Anomaly.
Asie	Az-ee	Asia.
Bonhomie	Bo-no-mee	Good nature.

FRENCH.	PRONUNCIATION.	ENGLISH.
Bonnerie	Bo-nait'-ree	Hostery business.
Comédie	Ko-may-dee	Comedy. [Factionary.
Confiserie	Konh-fiz-ree	Art of making con-
Démocratie	Day-mo-kra-see	Democracy.
Figuerie	Foeg'-ree	A fig-garden.
Pie	Pee	A magpie.
Vie	Vee	Life.

This combination is a very common ending of words in the French language. The *e*, however, often bears the acute accent, thus, *ié*. These vowels also appear very often in the body of a word, with the *e* accented. In such cases they do not constitute a diphthong, and cannot be illustrated by the sound of *ee* in the English word *bee*, but each preserves its own distinct vowel sound.

IO.—Name, *eo*; sound, like the letters *io* in the last syllable of the Latin word *cur-cu-io*.

FRENCH.	PRONUNCIATION.	ENGLISH.
Approvisionnement	A-pro-vee-zoo-nay	To victual.
Cautonné	Ko-seo-nay	A warrantee.
Dénationaliser	Day-na-seo-na-le-zay	To denationalise.
Micche	Meo-sh (long o)	A brat.
Pioche	Poo-sh (long o)	Pickaxe.
Violon	Veo-lonh	Violin.

This diphthong retains the sound first illustrated in most, if not all, endings in *sion* and *tion*.

SECTION XXIII.—IRREGULAR VERBS: THEIR PRESENT INDICATIVE.

1. There are in French, as in other languages, verbs which are called irregular, because they are not conjugated according to the rule, or model verb of the conjugation to which they belong [§ 62].

2. Many irregular verbs have tenses which are conjugated regularly.

3. The singular of the present of the indicative of the irregular verbs is almost always irregular.

4. In verbs ending in *yer*, the *y* is changed into *i* before an *e* mute [§ 49].

5. PRESENT OF THE INDICATIVE OF THE IRREGULAR VERBS.

ALLER, 1, to go.	ENVOYER, 1, to send.	VENIR, 2, to come.
S. Je vais, I go, do go, or am going.	J'envoie (R. 4) I send, do send, or am sending.	Je viens, I come, do come, or am coming.
Tu vas.	Tu envoies. [ing.]	Tu viens.
Il va.	Il envoie.	Il vient.
P. Nous allons.	Nous envoyons.	Nous venons.
Vous allez.	Vous envoyez.	Vous venez.
Ils vont.	Ils envoient (R. 4).	Ils viennent.

6. All verbs ending in *enir* are conjugated like *venir*.

7. The student will find in § 62 the irregular verbs alphabetically arranged. He should always consult that table when he meets with an irregular verb.

8. The expression *à la maison* is used for the English *at home*, *at his* or *her house*, etc.

Le chirurgien est-il à la maison? Is the surgeon at home?
Mon frère est à la maison, My brother is at home.

9. The preposition *chez*, placed before a noun or pronoun, answers to the English *at the house of*, *with* (meaning *at the residence of*), *among*, etc. [§ 142 (3)].

Chez moi, chez lui, chez elle, At my house, at his house, at her house.

Chez nous, chez vous, chez eux, m., At our house, at your house, at their house, f.,

That is, literally, *at the house of me*, *at the house of him*, etc.

Chez mon père, chez ma sœur, At my father's, at my sister's.

10. The word *avec* answers to the English *with*, meaning merely *in the company of*.

Venez avec nous, ou avec lui, Come with us, or with him.

11. The word *y* means *to it*, *at it*, *at that place*, *there*. It is generally placed before the verb, and refers always to something mentioned [§ 39, § 103, § 104].

Votre sœur est-elle chez vous? Is your sister at your house?
Oui, Monsieur, elle y est, Yes, Sir, she is there.

12. In French, an answer cannot, as in English, consist merely of an auxiliary or a verb preceded by a nominative pronoun; as, *Do you come to my house to-day? I do. Have you books? I have.* The sentence in French must be complete; as, *I go*

there; I have some. The words oui or non, without a verb, would, however, suffice.

Venez-vous chez moi aujourd'hui? Do you come to my house to-day?
 Oui, Monsieur, j'irai. Yes, Sir, I will.
 Avez-vous des livres chez vous? Have you books at home?
 Oui, Monsieur, nous en avons. Yes, Sir, we have.

RÉSUMÉ OF EXAMPLES.

Où est le colonel? Where is the colonel?
 Il est chez son frère aîné. He is at his eldest brother's.
 N'est-il pas chez nous? Is he not at our house?
 Non, Monsieur, il n'y est pas. No, Sir, he is not.
 Madame votre mère est-elle à la maison? Is your mother at home?
 Non, Madame, elle n'y est pas. No, Madam, she is not.
 Allez-vous chez nous, ou chez lui? Do you go to our house, or to his house?
 Nous allons chez le capitaine. We go to the captain's.
 N'est-il pas chez votre frère? Is he not at your brother's?
 Non, Monsieur, il est chez nous. No, Sir, he is at our house.
 N'envoyez-vous pas vos habits chez vos sœurs? Do you not send your clothes to your sister's?
 Je les envoie chez elles. I send them to their house.
 N'allez-vous pas chez ce monsieur? Do you not go to that gentleman's?
 Je n'y vais pas, je n'ai pas le temps d'y aller aujourd'hui. I do not (R. 12), I have not time to go there to-day.

VOCABULARY.

Aller, I, ir., to go.	Horloger, m., watch-maker.	Relieur, m., bookbinder.
Ami, m., friend.	Hollandais, -e, Dutch.	Resteur, I, to remain, live.
Associé, m., partner.	Magasin, m., warehouse.	Russe, Russian.
Capitaine, m., captain.	Maison, f., house.	Venir, I, to come.
Demeurer, I, to live, dwell.	Matin, m., morning.	Voisin, -e, neighbour.
Gilet, m., waistcoat.	Peintre, m., painter.	

The French, in speaking to a person whom they respect, prefix the word Monsieur, Madame, or Mademoiselle, to the word representing their interlocutor's relations or friends.

EXERCISE 41.

1. Où allez-vous, mon ami? 2. Jo vais chez Monsieur votre père; est-il à la maison? 3. Il y est ce matin. 4. D'où venez-vous? 5. Nous venons de chez vous et de chez votre sœur. 6. Qui est chez nous? 7. Mon voisin y est aujourd'hui. 8. Où avez-vous l'intention de porter ces livres? 9. J'ai l'intention de les porter chez le fils du médecin. 10. Avez-vous tort de rester chez vous? 11. Je n'ai pas tort de rester à la maison. 12. L'horloger a-t-il de bonnes montres chez lui? 13. Il n'a pas de montres chez lui, il en a dans son magasin. 14. Chez qui portez-vous vos livres? 15. Je les porte chez le relieur. 16. Allez-vous chez le capitaine hollandais? 17. Nous n'allons pas chez le capitaine hollandais, nous allons chez le major russe. 18. Est-il chez vous ou chez votre frère? 19. Il demeure chez nous. 20. Ne demeurons-nous pas chez votre tailleur? 21. Vous y demeurez. 22. Votre peintre d'où vient-il? 23. Il vient de chez son associé. 24. Où portez-vous mes souliers et votre gilet? 25. Je porte vos souliers chez le cordonnier et votre gilet chez le tailleur.

EXERCISE 42.

1. Where does your friend go? 2. He is going [Sect. XXII., 6] to your house or to your brother's. 3. Does he not intend to go to your partner's? 4. He intends to go there, but he has no time to-day. 5. What do you want to-day? 6. I want my waistcoat, which (qui) is at the tailor's. 7. Are your clothes at the painter's? 8. They are not there, they are at the tailor's. 9. Where do you live, my friend? 10. I live at your sister-in-law's? 11. Is your father at home? 12. No, Sir, he is not. 13. Where does your servant carry the wood? 14. He carries it to the Russian captain's. 15. Does the gentleman who (qui) is with your father live at his house? 16. No, Sir, he lives with me. 17. Is he wrong to live with you? 18. No, Sir, he is right to live with me. 19. Whence (d'où) comes the carpenter? 20. He comes from his partner's house. 21. Has he two partners? 22. No, Sir, he has only one, who lives here (ici). 23. Have you time to go to our house this morning? 24. We have time to go there. 25. We intend to go there, and to speak to your sister. 26. Is she at your house? 27. She is at her (own) house. 28. Have you bread, butter, and cheese at home? 29. We have bread and butter there. 30. We have no cheese there, we do not like cheese. 31. Is your watch at the watch-

maker's? 32. It (elle) is there. 33. Have you two gold watches? 34. I have only one gold watch. 35. Who intends to go to my father's this morning? 36. Nobody intends to go there.

OUR HOLIDAY.

HOCKEY.

WHEN the frosts of winter have hardened the ground, and the air is keen and bracing, out-door amusements, to be at once enjoyable and beneficial, must be active and exhilarating in their nature. Hence the popularity in the winter season of such games as Football and Hockey; their new competitor, La Crosse, of which we gave a description in No. 1 of the POPULAR EDUCATOR, which seemed destined to attract general favour on the same grounds, only survived a few seasons. A new game is a new source of harmless pleasure to hundreds, and perhaps to thousands or tens of thousands, and therefore it was all the more to be regretted that this game was so soon entirely abandoned. The great and almost sudden popularity of Croquet shows how welcome is a suitable addition to the list of popular amusements, and we therefore spare a passing word to comment upon the reception given to the Indian game which was the subject of our first paper.

Of Football we have also treated; and we have now to describe the game of Hockey, which, under the names of Shinty in Scotland and Hurling in Ireland, is popular throughout the United Kingdom.

Hockey consists in driving a ball from one point to another by means of a hooked stick, and is believed to derive its name from the shape of the latter implement, sometimes called a *hookey*. No precise rule is laid down as to the form this stick should take. It is simply a weapon with a bent knob or hook at the end, large or small, thick or thin, according to the option of the player, and used for the purpose of striking the ball, or perhaps of catching it up on the point for a throw towards the goal. Hockey-sticks, therefore, are of all shapes, sometimes simply in the form of a stout walking-stick with a crook at the end.

The Hockey ball must be one fitted to receive hard and frequent blows. Anything in the nature of a cricket-ball is found to be ill-adapted for this peculiar game, as the leather soon bursts, through the effects of the knocks received from all kinds of rugged-pointed sticks. A large bung, strongly tied and quilted over with string, is a favourite and an inexpensive ball for the purpose; and the best of all is perhaps a solid india-rubber one, or the larger part of a thick india-rubber bottle, firmly closed at the end from which the neck has been cut.

Now for the game itself, which in its principle bears a great resemblance to Football, and contains at least the germ of the Canadian La Crosse. The players are divided into two parties, each of which has its goal, the goals being fixed towards either end of a tolerably spacious ground. They consist, as at Football, of two upright posts, about six feet apart, but the cross-pole is almost invariably employed at Hockey, and is usually placed at a height of about four feet from the ground. Through these goals the ball has to be driven; and the space through which it has to pass at either end, before the game is won, is therefore a space of about six feet by four.

In commencing, the two parties meet midway between the goals, and are arranged in line, their left hands towards the opponents' goal, and their right directed to their own. The ball is thrown up into the air by one of the party winning the toss, by which toss also the choice of position for the goal is determined. As the ball falls, it is the object of both sides to strike it towards the goal of the enemy, or at least to prevent it from being struck in the direction of their own. Two goal-keepers are stationed at each end to beat back the ball if it approaches dangerously near; and, if the party playing be large enough, it is usual to place two of the opposite side near the respective goal-keepers, in order that their defensive efforts may be rendered unavailing.

It may well be imagined that on the fall of the ball an exciting scene ensues. In the attempt to strike it, the hockey-sticks are crossed in mimic warfare, and as it reaches the ground both sides surround it in a general "scrimmage," while it is pushed, thrust, or struck by the hockey-sticks, according to the chance which the various players may get of aiming at it. The hockey-stick properly should never be raised much higher than



HOCKEY.

the ground, for a dexterous shove at the ball may sometimes be quite as effective in serving the purpose of your side at a critical moment as a swinging blow, the opportunity for which may, indeed, very rarely occur. If the ball receives a good hit, and flies forward to the goal, a general rush is made in pursuit, one side aiming to follow up the advantage, and the other to overtake the ball first and restore the balance of the game.

It will be apparent that in a rush and struggle of this description a fall or a hard knock is exceedingly likely to occur, and that Hockey is therefore not a game suited to weakly or timid players. But there are rules by which it is sought to avoid, even in the heat of the conflict, any chance of more than a comparatively slight injury to the players, and to confine that result purely to the effects of accident. It is forbidden, in the first place, to raise the head of the stick higher than the shoulder, under the penalty of a blow on the shins from the hockey-stick of one of the opposite side; and thus a check is given to the reckless and promiscuous flourishing about of the player's stick, to the imminent hazard both of his friends and opponents. Moreover, any player proved wilfully to have struck another is at once excluded from the play. Besides these rules, the following are generally accepted:—

1. A player must not cross to the side of his opponents before a rush or scrimmage has commenced.
2. The ball must be fairly struck through the goal, and not thrown or kicked.
3. It is forbidden to kick or throw the ball during the general game, but the ball may be stopped by any part of the person of a player who may intervene between it and the goal.
4. If the ball be struck beyond, but not through the goal, and if it be passed through the goal otherwise than by a fair hit, the youngest player of the side owning that goal shall return it by a gentle throw towards the centre of the ground.

These, with the two rules given before, comprise all that it is necessary to observe in playing the game of Hockey, except the general rules of good temper and forbearance, which are required in all games alike.

The Scottish form of the game, known as Shinty, calls for no special remark, more than that the goals are called "hails," and that the game itself may owe its name either to the frequent danger to the player's *shins*, or to the *shindy* which characterises the culminating struggle. "Hurley," the Irish variation of the game, also differs but little from that here described; but in Ireland the game has been, perhaps, a more general favourite, and played occasionally on a larger scale, than in either of the sister kingdoms. We borrow from Mr. and Mrs. S. C. Hall's "Ireland" an amusing anecdote in illustration of this fact. "About half a century ago," we are told, "there was a great match played in the Phoenix Park, Dublin, between the Munster men and the men of Leinster. It was got up by the then lord-lieutenant and other sporting noblemen, and was attended by all the nobility and gentry belonging to the vice-regal court, and the beauty and fashion of the Irish capital and its vicinity. The victory was contended for a long time with varied success; and at last it was decided in favour of the Munster men, by one of that party running with the ball on the point of his hurley and striking it through the open window of the vice-regal carriage, and by that manœuvre baffling the vigilance of the Leinster goalmen, and driving it in triumph through the goal."

There is no record of matches on quite so extensive a scale having been played in the sister kingdoms; but we learn on the authority just quoted that, in the last generation, several good matches at hurley were played on Kennington Common between the Irish residents of St. Giles's and those of the eastern portions of the metropolis, the affair being got up by some of the sporting noblemen of the day. Besides Kennington Common, several of the other open spaces around London were once noted as favourite spots for the exhibition in perfection of the game of hockey, and especially, in the last century, the extensive fields which then lay at the back of the British Museum. The amusement is not so frequently seen now, having yielded somewhat before the rival attractions of football and cricket, but it is a favourite still in many parts of the country.

LESSONS IN GEOMETRY.—VII.

PROBLEM XIV.—To find a third proportional to two given straight lines.

Let *A* and *B* be the two given straight lines to which it is required to find a third proportional. Draw two straight lines *c*, *p*,

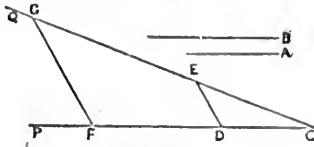


Fig. 21.

c *Q*, forming with each other a small angle *PCQ*. On *CP* set off *CD* equal to *A*, and *DF* equal to *B*, and on *CQ* set off *CE* equal to *B*. Join *DE*, and through the point *F* draw *FG* parallel to *DE*, and cutting *cQ* in *G*; the straight line *EG* is a third proportional to *A* and *B*; that is, *A* is to *B* as *B* is to *EG*.

If we know the length of *A* and *B*, we can find the third proportional to them by dividing the square of the length *B* by the length of *A*. Thus, if *A* be three feet, and *B* be six feet, the third proportional to *A* and *B* measures twelve feet, for the square of 6 divided by 3, or $36 \div 3 = 12$.

PROBLEM XV.—To find a fourth proportional to three given straight lines.

Let *A*, *B*, and *c* be the three given straight lines to which it is required to find a fourth proportional. Draw two straight lines *d*, *p*, *Q*, *D*, *Q*, forming with each other a small angle, *PDQ*. On *D* *p*

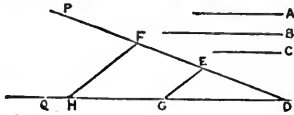


Fig. 22.

set off *DE* equal to *A*, and *EF* equal to *c*, and on *DQ* set off *DG* equal to *B*. Join *EG*, and through *F* draw *FH* parallel to *EG*, and cutting *DQ* in *H*. The straight line *HG* is a fourth proportional to *A*, *B*, and *c*; that is, *A* is to *B* as *c* is to *HG*.

If we know the length of *A*, *B*, and *c*, we can find the fourth proportional to them by multiplying the length of *B* and *c* together, and dividing the product by the length of *A*. Thus, if *A* be four feet, *B* six feet, and *c* two feet, the fourth proportional to *A*, *B*, and *c* measures three feet; for $6 \times 2 = 12$, and $12 \div 4 = 3$.

PROBLEM XVI.—To divide a given straight line into any number of parts which shall be to one another in a given proportion.

Let *AB* be the given straight line, which it is required to divide into five parts, which are to one another in the following proportions—namely, 5, 2, 3, 1, 4. First draw the straight

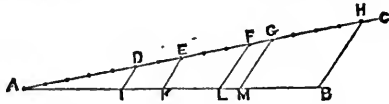


Fig. 23.

line *AC* of indefinite length, making a small angle *BAC* with the given straight line *AB*. Along *AC*, from a scale of equal parts, set off in regular succession *AD* equal to 5 of these equal parts, *DE* equal to 2, *EF* equal to 3, *FG* equal to 1, and *GH* equal to 4. Join *HB*, and through the points *D*, *E*, *F*, *G* draw the straight lines *DI*, *EK*, *FL*, *GM*, cutting the straight line *AB* in the points *I*, *K*, *L*, *M*. The given straight line *AB* is now divided into five parts, *AI*, *IK*, *KL*, *LM*, *MB*, which are to one another in the required proportions—namely, 5, 2, 3, 1, and 4.

This method of dividing a straight line into any number of parts, which shall be to one another in a given proportion, is based on Problem XII. (page 192). Supposing it had been required to divide *AB* into 15 equal parts, it is manifestly only requisite to set off along *AC* 15 equal parts, denoted by the dots on the line *AC*, from *A* to *H*, and then draw straight lines in succession through each dot on *HA*, from *H* to *A*, parallel to *HB*.

The process that has been described in this Problem ensures

an accurate division in cases where the different parts would be represented by fractions or mixed numbers (see Lessons on Arithmetic, page 160), if we endeavoured to arrive at them by an arithmetical process. For example, had the line *AB* in Fig. 23 measured 30 inches, we can see at once that, as the sum of the numbers which show the proportion of the lines into which it is required to divide it is equal to 15, the half of 30, we have only to multiply each number by 2, and mark off *AI* equal to 10 (or 5×2) inches, *IK* equal to 4 (or 2×2) inches, and so on. But supposing *AB* had measured 29 inches, instead of 30, then *AI* would be represented numerically by $9\frac{2}{3}$, *IK* by $3\frac{1}{3}$ inches, etc., and lines involving fractions of inches such as $\frac{1}{3}$, which are not to be found on an ordinary scale, would be very difficult to mark out without making a special scale for the purpose, or resorting to the plan given above.

PROBLEM XVII.—To draw an equilateral triangle on any given straight line.

Let *AB* be the given straight line on which it is required to draw an equilateral triangle. From the point *A* as a centre, with *AB* as a radius, describe the arc *BC*; and from the point *B* as a centre, with *BA* as a radius, describe the arc *AC*, cutting the arc *BC* in the point *C*. Join *AC*, *BC*; the triangle *ABC* is equilateral or equal-sided (see Definition 19, page 53), and it is drawn on the given straight line *AB*.

If the arcs *CA*, *CB* be extended to cut each other in the point *D* below the straight line *AB*, by joining *DA*, *DB*, we get another equilateral triangle *ABD*, which is equal to the equilateral triangle *ABC*, and which is also drawn on the given straight line *AB*. By taking any straight line as a radius, and from each of its extremities as centres striking arcs intersecting or cutting each other on opposite sides of it, we get, by drawing straight lines from the points in which the arcs cut each other to the extremities of the straight line used as a radius, a regularly-formed diamond-shaped figure, whose four sides and shortest diagonal or diameter are all of equal length, such as *ACBD* in the above figure. This figure with four equal sides is called a rhombus. (See Definition 30, page 53.)

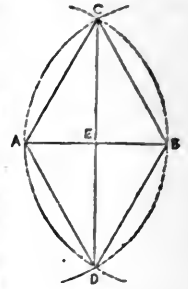


Fig. 24.

The learner should construct Fig. 24 on a large scale by the aid of his compasses and ruler. On applying a parallel ruler to the opposite sides of the figure *ACBD*, he will find that they are parallel to each other, namely, *AC* to *BD*, and *BC* to *AD*; *ACBD* is therefore a parallelogram, and *AB*, *CD* are its diagonals. (See Definition 26, page 53.) From Theorem 5 (page 156) the student learns that the greatest side of every triangle is opposite the greatest angle, and that the greater the opening of the angle the greater must be the line that subtends or is opposite to it. Now in the triangle *ABC*, or in any other equilateral triangle, the three straight lines or sides by which it is contained are all equal to one another, and as equal sides must necessarily subtend equal angles, the three angles of the triangle *ABC*—namely, *ABC*, *BCA*, *CAB*—are also all equal to one another. Again, from Theorem 7 (page 156) we have learnt that the three interior angles of any triangle are equal to two right angles. A right angle contains 90 degrees, and as two right angles contain just twice as many, or 180 degrees, each of the equal angles *ABC*, *BCA*, *CAB*, in the interior of the equilateral triangle *ABC*, contains $180 \div 3$ or 60 degrees.

Continuing our investigations a little further, we find that each of the angles *ACE*, *BCE* is half of the angle *ACB*, and is therefore an angle of 30 degrees. The angles *ADE*, *BDE* are also angles of 30 degrees, because each of them is half of the angle *ADB*, which, like the angle *ACB*, is an angle of 60 degrees. The angle *CAD* is equal to the angles *CAB*, *DAE*, and as each of these equal angles contains 60 degrees, the angle *CAD* contains 120 degrees. In the same way the angle *CBD* also contains 120 degrees. The diagonals of the rhombus *ACBD* intersect each other at right angles, therefore it will be seen that each of the angles *CEA*, *CEB*, *DEA*, *DEB* is a right angle.

Fig. 24 teaches us how to draw an angle of 45 degrees without the aid of the protractor, as we will proceed to show. *ACE* is an angle of 30 degrees, and so is its adjacent angle

B C E Bisect the angle **B C E** by the method shown in Problem VI. (page 191). Each of its halves is an angle of 15 degrees, and the angle formed by the angle **A C E** and the half of **B C E** must necessarily be an angle of 45 degrees.

To describe or draw an equilateral triangle, whose sides shall be of a given length, it is manifestly only necessary to set off **A B** of the length required, and then to proceed to form the triangle by the mode of construction given above.

LESSONS IN GERMAN.—XIII.

SECTION XXIV.—CONJUGATION OF VERBS.

Dürfen expresses a possibility dependent upon the will of another, or upon a law, as:—**Ich darf diese Blumen nicht pflücken**, I cannot (I am not allowed, permitted to) pluck these flowers. **Der Bauer darf nicht fischen**, the peasant is not allowed (by law) to fish. **Ich darf diese Früchte essen**, aber **ich kann sie nicht erreichen**, I can (have the right to) eat these fruits, but I cannot obtain (get at) them. (§ 83. 1. 2.)

CONJUGATION OF THE PRESENT AND IMPERFECT OF **dürfen**.

PRESENT.	
<i>Singular.</i>	<i>Plural.</i>
Ich darf , I am permitted;	wir dürfen , we are permitted.
Du darfst , thou art permitted	ihr dürft , you are permitted.
Er darf , he is permitted;	sie dürfen , they are permitted.

IMPERFECT.	
Ich durfte , I was permitted;	wir durften , we were permitted.
Du durdest , thou wast permitted;	ihr durftet , you were permitted.
Er durfte , he was permitted;	sie durften , they were permitted.

1. **Können** corresponds in the present and imperfect to the English "can," as:—**Der Fisch kann schwimmen**, the fish can swim. **Er konnte nicht lesen**, he could not read.

Können also answers sometimes to "may," as:—**Das kann sein**, that may be. **Er kann schon da sein**, he may be already there. **Es kann regnen**, it may rain. (§ 83. 1. 3.)

CONJUGATION OF THE PRESENT AND IMPERFECT OF **können**.

PRESENT.	
<i>Singular.</i>	<i>Plural.</i>
Ich kann , I can;	wir können , we can.
Du kannst , thou canst;	ihr könnt , you can.
Er kann , he can;	sie können , they can.

IMPERFECT.	
Ich konnte , I could;	wir konnten , we could.
Du konntest , thou couldst;	ihr konntet , you could.
Er konnte , he could;	sie konnten , they could.

2. **Mögen** expresses a possibility dependent on the will of the subject or the speaker, as:—**Er mag gehen**, he can (may, is at liberty to) go. **Sie mögen gehen**, you may (have permission to) go. **Ich mag ihn nicht sehen**, I do not wish to see him. **Das mag ich nicht glauben**, I do not like to believe that. (§ 83. 4.)

3. **Mögen**, like "may," denotes a concession on the part of the speaker, as:—**Er mag ein treuer Freund sein**, he may be a true friend. **Sie mögen es getan haben**, they may have done it. (§ 83. 4.)

CONJUGATION OF THE PRESENT AND IMPERFECT OF **mögen**.

PRESENT.	
<i>Singular.</i>	<i>Plural.</i>
Ich mag , I may or am allowed;	wir mögen , we may or are allowed.
Du magst , thou mayst or art allowed;	ihr möget , you may or are allowed;
Er mag , he may or is allowed;	sie mögen , they may or are allowed.

IMPERFECT.	
Ich mochte , I was allowed;	wir mochten , we were allowed.
Du mochtest , thou wast allowed;	ihr mochtet , you were allowed.
Er mochte , he was allowed;	sie mochten , they were allowed.

4. **Müssen** in those tenses in which its English equivalent "must" is defective, is to be rendered by "to be obliged, forced, compelled," etc., as:—**Er musste es thun**, he was obliged to do it. See complete conjugation, § 83. 5.

CONJUGATION OF THE PRESENT AND IMPERFECT OF **müssen**.

PRESENT.	
<i>Singular.</i>	<i>Plural.</i>
Ich muß , I must;	wir müssen , we must.
Du mußt , thou must;	ihr müßt , you must;
Er muß , he must;	sie müssen , they must.

IMPERFECT.	
Ich mußte , I was obliged;	wir mußten , we were obliged.
Du mußtetest , thou wast obliged;	ihr müßtetet , you were obliged.
Er mußte , he was obliged;	sie mußten , they were obliged.

5. **Sollen** indicates necessity, dependent upon the will of another person; thus corresponding in signification with the second and third persons of our word "shall," as:—**Du sollst sterben**, thou shalt die. **Er soll es thun**, he shall do it. **Sie sollten hier bleiben**, you should (ought to) remain here. **Wenn er kommen sollte**, if he should come. (§ 83. 6.)

CONJUGATION OF THE PRESENT AND IMPERFECT OF **sollen**.

PRESENT.	
<i>Singular.</i>	<i>Plural.</i>
Ich soll , I shall;	wir sollen , we shall.
Du sollst , thou shalt;	ihr solltet , you shall.
Er soll , he shall;	sie sollen , they shall.

IMPERFECT.	
Ich sollte , I should;	wir sollten , we should.
Du solltest , thou shouldst;	ihr solltet , you should.
Er sollte , he should;	sie sollten , they should.

6. **Wollen** expresses a desire, but not a positive intention, and is rendered by "to wish," as:—**Was will er?** What does he wish? **Was will er thun?** What does he wish to do?

The imperfect often answers to our "was going," when expressive of purpose, as:—**Ich wollte sagen**, I was going to say. (§ 83. 8.)

CONJUGATION OF THE PRESENT AND IMPERFECT OF **wollen** WITH AN ACTIVE VERB.

PRESENT.	
<i>Singular.</i>	<i>Plural.</i>
Ich will gehen , I wish to go;	wir wollen gehen , we wish to go.
Du willst gehen , thou wishest to go;	ihr wolltet gehen , you wish to go.
Er will gehen , he wishes to go;	sie wollen gehen , they wish to go.

IMPERFECT.	
Ich wollte gehen , I wished to go;	wir wollten gehen , we wished to go.
Du wolltest gehen , thou wishedst to go;	ihr wolltet gehen , you wished to go.
Er wollte gehen , he wished to go;	sie wollten gehen , they wished to go.

7. The perfect and pluperfect tenses of these verbs, as also of **lassen**, to permit, to cause, is formed by means of the infinitive, instead of the participle (§ 74. 3), as:—

Er hat nicht gehen können.	He has not been able to go.
Wir haben nie schießen dürfen.	We have never been allowed to shoot.

Ich habe es nicht thun mögen.	I have not wished to do it.
Sie haben schreiben müssen.	They have been obliged to write.
Sie hätte lesen sollen.	She ought to have read.
Sie haben nicht arbeiten wollen.	You have not been willing to work.
Ihr habt ihn nicht gehen lassen.	You have not caused him to go (have not sent him).

8. In the future, therefore, these verbs (except in the tense auxiliaries) are, in form, like the perfect. Compare the following examples:—

Ich werde reden dürfen.	I shall be allowed to speak.
Ich habe reden können.	I have been allowed to speak.
Du wirst ihn sehen können.	You will be able to see him.
Du hast ihn sehen können.	Thou hast been able to see him.
Er wird bleiben mögen.	He will wish to remain.
Er hat bleiben mögen.	He has wished to remain.

9. The phrase, **Wie viel Uhr ist es?** like the corresponding one in English, is abbreviated; the full form being **Wie viel auf der**

Uhr ist es? What o'clock (literally, how much upon the clock) is it?

When a part or the whole of the last quarter of an hour is named, it is designated, as in English, by its distance from the hour following, as:—

Es fehlen fünf, acht, oder zehn Mi- It lacks five, eight, or ten
nuten bis (or an) zwölf. minutes to twelve.

Es fehlt ein Viertel bis zwölf. It lacks a quarter to twelve.

When a half-hour is named, it is not measured, as in English, from the preceding hour, but from the one that follows. This is, likewise, commonly the case with any part or the whole of the first quarter, although it may, as in English, be referred to the hour preceding, as:—

Es ist halb* zwölf. It's half (towards twelve) past eleven.

Es ist zehn Minuten auf zwölf. It is ten minutes (towards twelve) past eleven.

Es ist ein Viertel auf zwölf. It is a quarter (towards twelve) past eleven.

Es ist zehn Minuten nach eins. It is ten minutes past one.

Es ist ein Viertel nach eins. It is a quarter past one.

10. The prepositions bei, nach, mit, von, zu, etc. (§ 111) govern no case but the dative, while an, auf, in, unter, etc. (§ 115) govern the dative only when used with a verb of rest, or of motion, within specified limits, as:—

Der Mann arbeitet an dem (am, The man is working at the
§ 4. 2) Tische. table.

Das Kind tanzt auf dem Brette. The child is dancing on the
board.

Der Knabe spielt in dem Garten. The boy is playing in the
garden.

Der Hund ist unter dem Baume. The dog is under the tree.

But when motion towards a given point is signified, the accusative is used, as:—

Der Mann geht an den Tisch. The man is going to the table.

Das Kind springt auf das (auf, The child springs upon the
§ 4. 2) Brett. board.

Der Knabe eilt in den Garten. The boy hurries into the garden.

Der Hund läuft unter dem Baum. The dog runs under the tree.

Dative and Accusative.

Der Fisch schwimmt in dem Wasser. The fish swims in the water.

Der Stein fällt in das Wasser. The stone falls into the water.

Er steht an der Thüre. He is standing at the door.

Er geht an die Thüre. He is going to the door.

VOCABULARY.

Aufmerksam, attentive	Hausfrau, f. house- wife.	Nächst, next.
Daß, that.		Neidisch, envious.
Deutsch, German.	Ritche, f. cherry.	Regnen, to rain.
Druckschriß f. print.	Können, can, to be able.	Sagen, to say.
Finden, to find.	Kunst, f. art, skill.	Schwer, heavy, hard, difficult.
Gedult, f. patience.	lernen, to learn.	Thun, to do.
Genug, enough.	Lesen, to read.	Verkaufen, to sell.
Güte, f. goodness,	Mannheim, n. Mann- heim.	Warten, to wait.
kindness.	Morgen, to-morrow.	Wache, f. week.
Handschrift, f. hand- writing, manu- script.	Müssen, must.	Wollen, to will.
		Zeit, f. time.

RÉSUMÉ OF EXAMPLES.

Mit der Ruhe eines Stoikers ertrug er den heftigsten Schmerz. With the (quiet) calmness of a stoic he endured the most violent pain.

Bei dem Gedanken an die Schmach seines Vaterlandes konnte er die Thränen nicht länger zurückhalten. At the thought of the disgrace of his native country he could not (longer) repress (the) his tears.

Wir müssen uns bestreben, wenn wir anders gute Bürger sein wollen, mir unsern Kräften und nach unserm Vermögen dem Staate zu nützen. We must exert ourselves, if we (otherwise) wish to be good citizens, with all our strength and according to our ability to serve the State.

Wir dürfen Andern nicht thun, was wir nicht wünschen von ihnen ge-
than zu haben. We must not do to others what we do not wish to have done by them.

Er hat Briefe schreiben wollen. He has wished to write letters.

Wirst sie gehen müssen? Will she be obliged to go?

Sie wird nicht gehen können. She will not be able to go.

Wir haben es nicht thun mögen. We have not wished to do it.

Sie werden gehen dürfen. You will be allowed to go.

Ich mußte den ganzen Abend lesen. I was obliged to read the whole evening.

Sie hatten es nicht thun sollen. They ought not to have done it.

EXERCISE 37.

1. Wollen Sie mit mir nach Mannheim gehen? 2. Ich kann nicht, ich habe keine Zeit. 3. Wann können Sie gehen? 4. Ich werde die nächste Woche gehen, wenn Sie so lange warten können. 5. Will Ihr Lehrer mit Ihnen auf das Feld oder nach der Stadt gehen? 6. Er will nicht aufs Feld, und kann nicht nach der Stadt gehen. 7. Was wollen diese Kinder? 8. Sie wollen Aepfel und Kirchen, aber sie können keine kaufen, denn sie haben kein Geld. 9. Was wollen Sie, mein Herr? mein Fräulein? meine Dame? 10. Wollen Sie die Güte haben, mir ein Glas (Sect. LXL) Wasser (Sect. XXV.) zu geben? 11. Können Sie mir sagen, wie viel Uhr es ist? 12. Ich kann es (Sect. XXXV. 6) Ihnen nicht sagen, ich habe keine Uhr bei mir. 13. Was wollte der Kaufmann Ihnen verkaufen? 14. Ich konnte nichts bei ihm finden, was ich kaufen wollte. 15. Wir werden morgen schlechtes Wetter haben. 16. Es kann sein, daß es noch heute regnen wird. 17. Können Sie die deutsche Handschrift lesen? 18. Nein, ich habe genug mit der Druckschrift zu thun. 19. Der Reitsiße (Sect. XVI.) will seinen Freund nicht leben. 20. Eine Gelehrte ist nicht immer eine gute Hausfrau. 21. Gelehrte ist eine schwere Kunst; Manche (§ 53. 1) können sie lehren, aber nicht lernen. 22. Ein guter Lehrer muß Gelehrte haben. 23. Jeder gute Schüler wird aufmerksam sein.

EXERCISE 38.

1. You can go into the garden, but you cannot remain long there. 2. These attentive scholars were allowed to go with their teacher to Mannheim. 3. We can employ [amusement] our time better. 4. Can you speak German? 5. We could not learn our lessons this week. 6. You must learn this week's lessons [die Aufgaben dieser Woche] attentively. 7. You may go to-morrow to your parents. 8. He may be a good man. 9. The housewife must (is obliged to) go to market to-morrow. 10. Have you written to your parents? 11. Yes, I was obliged to write. 12. It is two o'clock. 13. I shall arrive at your house at a quarter past three o'clock. 14. Will you come twenty minutes before eight o'clock? 15. I may come to your house this evening, but do not wait for me. 16. As long as [so lange als] it rains, I cannot go out. 17. Fish can only [nur] live in water, and birds in the air. 18. You should not have done that, it will not be any recommendation [eine Empfehlung] to you. 19. I wish to go to the theatre this evening. 20. We may not have the opportunity [Gelegenheit] another time.

LESSONS IN MUSIC.—IV.

THE Binary (or two-pulse) measure is the boldest of the measures, and the one most easily felt or performed. It is by far the best for large masses of voice, and is well adapted to aid in giving majesty to a tune. Try "St. Stephen's" or "Bedford," first in the three-pulse measure (lengthening the accented notes), and then in the two-pulse measure, and you will understand the character of the Binary measure. The Trinary (or three-pulse) measure is well adapted to aid in producing a soft and soothing musical effect. When the tune is simple it is not unfit for congregational use, especially if the people have been trained to keep the accent. The adaptation of this measure to soft and soothing music is illustrated by its analogy (according to Dr. Bryce) to the breathing of health and rest. The Quaternary (or four-pulse) measure, when delicately performed, gives much elegance to a tune. It is adapted to congregational tunes when the movement is not too slow. Try the well-known tune "Vesper Hymn," taking care to give the medium accent. The Senary (or six-pulse) measure is commonly used in connection with quick movements, and is naturally soft, light, and elegant; for this reason it is better adapted to secular compositions than to sacred music.

* In case of halb, the preposition auf is commonly omitted.

EXERCISE 9.—DOH, ME, SOH. *Three-pulse Measure.* KEY D (OR C).

d : m : s s : m : d d : - : d d : - : -
 d : d : d d : d : d d : d : d d : - : -
 m : s : d¹ d¹ : s : m d¹ : - : d¹ d¹ : - : -
 a : d : d d : d : d d : d : d d : - : -

Take a low sound of your voice for the key-note in this exercise. If any one gives you the pattern from an instrument, tell him to play in the key of D with two sharps. You understand that the letters under the "staff" are the initials of the notes on the modulator, and direct you in tracing out the tune there. The notes are placed within the accent marks to which they belong. DOH occupies the whole of the loud "pulse" of the measure. ME fills the first soft pulse, and SOH the second. This is the Tertiary measure. The second measure is easily understood. In the third measure you have the first DOH occupying two pulses (loud and soft), and the second DOH only one pulse. The horizontal stroke, as in the second pulse, always indicates that the preceding note is to be continued. Thus the last note of the exercise is continued through the whole measure. In the fourth measure the third accent-mark is followed by no note. In the time of that pulse, therefore, the voice rests. If the previous exercises have been perfectly learnt from the

modulator, you will probably be able to make this out without pattern. Be careful to give the proper accent. You are strongly recommended not to study the "staff," at present, in any of these exercises. It is printed here that you may be able to return to it when you have gained some command of voice and some knowledge of music itself, and are not likely to be perplexed by its numerous signs; but if we may suppose that you have done this, then the following remarks will be of use. [The open note is twice as long as the closed notes. The empty "pulse," during which the voice rests, is represented by a distinct character, called a "rest." It tells you to rest as long as one of the closed notes, in the same time, would be sung. A dot after a note, in the old notation, bids you sing that note half as long again. Thus you perceive that the relative length of notes is expressed by symbols, and not, as in the solfa notation, measured out pictorially by the regularly recurring accents placed along the page.]

EXERCISE 10.—THE SCALE. *Three-pulse Measure.*

d : r : m f : s : l t : d¹ : r¹ d¹ : - : t d¹ : t : l s : f : m r : d : t₁ d : - : -
 d : t₁ : d r : m : f s : l : t d¹ : - : s l : s : f m : r : d t₁ : l₁ : t₁ d : - : -

Take a low note for the key-note of this exercise also. Point it from memory on the modulator, like the last, and all you learn. Mark the accent well, and learn to sing both the upper and the lower line of notes. [The key-note is placed on the lowest line to prevent your accustoming your eye to look for it

always in the same place on the staff. It would be well for you if it could be so. But as it is to be found, in different tunes, on every position on the staff, it is important that we should not mislead you. We prefer, however, that this exercise should be sung in the key of D or C, not of E.]

EXERCISE 11.—DOH, ME, SOH. *Four-pulse Measure.* KEY G. *Quickly.*

d : d d : d d : m s : - s : s s : s s : m d : -
 d : s₁ d : s₁ d : m m : - m : d m : d s : s₁ d : -

Take a middle sound of your voice for the key-note. If your friend patterns, let it be "in the key of G with one sharp." Trace the exercise on the modulator. Sing it with spirit, mark-

ing the accents carefully. What measure is it in? [You will notice that the old notation has no mark for the secondary accents.]

EXERCISE 12.—DOH, ME, SOH. *Four-pulse Measure.* KEY F (OR E).

d : m m : d m : s s : m s : d¹ d¹ : s d¹ : d¹ d¹ : -
 d : - m : - m : - m : - s : - m : - m : - d¹ : -
 d¹ : s m : s s : m d : m m : d d : d d : d d : -
 m : - m : - d : - m : - s₁ : - m : - d : - m : -

Take a low, but not very low, note for your DOH. Tell your friend to pattern it (if you are still dependent on him) "in F with one flat." Learn both "parts." Be careful to hold the long notes of the lower line with evenness of sound, swelling

them a little in the middle, so as to express the medium accent. [The open note without a stem is to be sung twice as long as that with a stem. There was not room to write the last long open note of the "second" part on the staff.]

EXERCISE 13.—THE SCALE. *Six-pulse Measure. KEY D. Quickly.*

Take a low sound for the key-note. Sing, when you have traced the tune on the modulator, rapidly and lightly, marking delicately the accents. In singing from the book, your eye will scarcely rest on the soft accents. You will only have time to think of the "loud" and "medium" marks. [A curve is placed over

the dotted open note and the close note, to show that these two notes should be sung as one. The note is written in this way, instead of being written as a dotted open note without a stem (which would give the same length), that the accent may be marked.]

EXERCISE 14.—TROUBADOUR.

(The words from "Ballads for the Times," by M. F. Tupper, Esq.) KEY F. M. 96.

All's for the best; then FLING AWAY TERRORS,
Meet all your fears and your foes in the van,
And, in the midst of your dangers or errors,
TRUST LIKE A CHILD, WHILE YOU STRIVE LIKE A MAN.

All's for the best; for unbiassed, unbanded,
Providence reigns from the east to the west,
And by his wisdom and mercy surrounded,
HOPE AND BE HAPPY THAT ALL'S FOR THE BEST.

You should take a rather low note for your DOH here. Tell your patterning friend—"the key of F with one flat." The first thing you will notice, in looking at this tune, is, that some of the "aliquots" or pulses have two notes in them. The dot which follows SOH, the second note, always means that the note before it takes half a pulse. It, of course, leaves the other half

to the other note—in this case ME. When you have carefully traced the first phrase of the tune (five notes) on the modulator, then sing it with special attention to this point—letting the notes SOH ME (which are placed in one pulse of the voice) run from your tongue just twice as fast as the others. And so on with the rest. You will notice that both the first and second

parts of the tune are repeated, so that it is not so long as it looks. If you find the "second" part of the tune low for your voice, pitch the key-note a little higher. Be careful to point on the modulator *from memory*. Remember that every tune, thus thoroughly learnt, becomes a power by which others will be more easily mastered. You need not attempt the words yet. When you do, let those printed in CAPITALS be sung with increased force and loudness of voice, and those in *italics* with increased softness. [The square note is used to indicate the place of DOH at the beginning of the staff, but it is not to be sung. The place of DOH, being thus once marked, is not afterwards indicated by a square note as in previous exercises. The pupil must learn to keep the place of DOH in his mind. The notes with a tail to the stem are to be sung *half* as long as those without the tail.]

LESSONS IN FRENCH.—XIV.

SECTION I.—FRENCH PRONUNCIATION (*continued*).

VI. DIPHTHONGS (*continued*).

U.A.—Name, *wah*. Sound: this diphthong has the combined sound of the French *u*, together with that of *a* in the English word *fat*, unless the latter be under a circumflex accent; in which last case the *a* has the sound of *a* in the English word *mark*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Écuage	Ay-kuazh	<i>Scutage</i> (<i>in feudal law</i>).	Guano	Gua-no	<i>Guano</i> .
Empuan-ter	Anh-puanh-tay	<i>To infect</i> .	Huard	Uar	<i>Sea-eagle</i> .
			Nuage	Nuazh	<i>Cloud</i> .
			Puant	Puanh	<i>Offensive</i> .

Sometimes this diphthong has the sound of *a* in the English word *fat*, viz. :—

Aiguade	Ay-gad	<i>A watering-place</i> .
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To an Englishman, at least, the sound of *a w* is naturally suggested in the pronunciation of this diphthong.

We might illustrate its sound by the use of *a w* in the above words, viz. :—

Écuage	Ay-k'wazh	Huard	War.
Empuanter	Anh-p'wanh-tay.	Nuage	N'wazh.
Guano	Gwa-no	Puant	P'wanh.

This last illustration, however, is not strictly correct, because it does not preserve the distinct sound of the French *u*, which sound, especially in combination, many Frenchmen themselves are not careful to preserve. In common conversation, this diphthong sounds like an English *w*.

In French words commencing with *qua*, the diphthong *ua* has two different sounds. In some the sound of *ua* would be illustrated by the letters *koua* or *k'wa*, but in others by *ka*, viz. :—

Quadrangle is pronounced *kouah-drang-gl'*, or *k'wah-drang-gl'*. *Quadrature*, a geometrical phrase, is pronounced *kouah-dra-ture*, or *k'wah-dra-ture*. But the same word, used as a term of horology, is pronounced *kah-dra-ture*.

Quai, a wharf, is pronounced *kay*.

Quaiche, a naval term, meaning a ketch, is pronounced *kaish*.

Until the learner has become really familiar with the French language, the surest way to be correct in the use and pronunciation of words commencing with *qua*, will be to consult a dictionary.

UE.—Name, *we*. Sound: this diphthong occurs most frequently as the *final* letters of French words, after the consonants *g* and *q*, in which cases both are silent.

When *final*, and before other consonants, they have the usual sound of the French *u*.

UI.—Name, *we*. Sound: this diphthong has the combined sound of the French *u*, together with that of French *i*, which latter is like the letters *ee* in the English word *bee*.

FRENCH.	PRONUN.	ENGLISH.	FRENCH.	PRONUN.	ENGLISH.
Appui	Ap-pui or A-pwee	<i>Support</i> .	Oui	Ooee or Wee	<i>Yes</i> .
Conduite	Konh-d'weet	<i>Tube</i> .	Puissance	P'wee-sanhs	<i>Power</i> .
Huit	Ucet or Weet	<i>Eight</i> .	Ruine	R'ween or Ruin.	
Lui	Luee or L'wee	<i>Him</i> .		R'ween	
Nuit	Nuee or N'wee	<i>Night</i> .		(trill ther)	

69. The ten diphthongal combinations of *three successive*

vowels, in the same word, are thus divided, to show their pronunciation :—

iai	i-ai	ea.	oui	ou-i	ooe or wee.
iau	i-au	eo.	uai	u-ai	ua or wa.
ieu	i-eu	eh.*	uei	u-ei	ua.
oua	ou-a	ooah or wah.	uie	u-ie	uee or wee.
oue	ou-e	ooay.	ueu	u-eu	nuh*.

70. Diphthongs of *four successive vowels* in the same word are thus divided for pronunciation :—

ouai	ou-ai	oo-a.
oueu	ou-eu	ooeh.*
ouée	ou-é	ooay.

VII. NASAL VOWEL SOUNDS.

71. The sound of *am* and *an*, *em* and *en*, *im* and *in*, is represented by the letters *anh*, and is like the sound of the letters *an* in the English words *an-chor* and *can-ker*, with an effort to speak through the nose, as it is termed. But be particular to avoid the sound of English *g* in all nasals.

There is, strictly speaking, a real difference between the nasal sounds of *an*, *em*, and *in*, but it is so slight, and so peculiarly delicate, that scarcely any one not a native Frenchman can detect and describe it intelligibly. In common reading and conversation, these nasals above-mentioned have but one sound, viz., that which has been assigned them in our previous Lessons. It is considered correct enough for all practical purposes.

When extraordinary nicety of pronunciation is demanded, as is always the case in using the language of prayer, and in holy and devotional language, the *a* of the nasals *am* and *an* should be pronounced broader than the *e* or *i* in the nasals *em*, *en*, *im*, and *in*. In the former case, let the *a* have the sound of *ah*; in the latter, the sound of *a* in the word *fat*.

The sound of *om* and *on* is represented by the letters *onh*, and is like the sound of the letters *on* in the English word *con-quer*, uttered with an effort to speak through the nose, as it is termed.

The sound of *um* and *un* is represented by the letters *unh*, and is like the sound of the letters *un* in the English word *un-cle*, uttered with an effort to speak through the nose.

Concerning these nasals, remember these two general rules, viz. :—

Rule 1.—Single *m*'s and *n*'s followed by *vowels* are not nasals.

Rule 2.—When the *m* and *n* are doubled, the nasality is destroyed.

Exceptions to this last Rule will appear in their proper places.

We now proceed to illustrate these nasal sounds, commencing with examples in which the sounds *am* and *an* are found.

FRENCH.	PRONUNCIATION.	ENGLISH.
Ambassade	Anh-bass-ad	<i>Embassy</i> .
Ambre	Anhbr'	<i>Ambur</i> .
Chambre	Shanhbr'	<i>Chamber</i> .

FRENCH.	PRONUNCIATION.	ENGLISH.
Ancêtres	Anh-saytr'	<i>Ancestors</i> .
Cantique	Kanh-teek	<i>Song</i> .
Sans	Sanh	<i>Without</i> .
Quand	Kanh	<i>When</i> .

Aim, *ain*, and *ein* have each the nasal sound of *an*, represented by *anh*. The reason will be obvious, if we but dissect these combinations, which we now proceed to do, viz. :—

In the first, *aim*, *ai* is equivalent in sound to *a* only; hence, substituting *a* for *ai* in the combination *aim*, we have simply *am*, whose sound has been explained.

In the second, *ain*, its sound is represented by *anh*, for the same reason.

In the third, *ein*, *ei* is equivalent only to *a* in sound; hence, substituting *a* in the place of *ei* in the combination *ein*, we have *an*, whose sound is represented by *anh*.

Again, *eam* and *oan* have each the nasal sound represented by the letters *anh*.

Aen in the proper name *Caen* have also the sound of *an*, represented by the letters *anh*; hence the word *Caen* is pronounced *Kanh*.

The following will afford good examples in illustration of the nasal vowel sounds *em* and *en* :—

* Like the sound of *e* mute.

	EM.	
FRENCH.	PRONUNCIATION.	ENGLISH.
Emblème	Anh-blaim	Emblem.
Enjot	Anh-ploah or pl'wah	Employment.
Exemple	Eg-zanh-pl'	Example.
Membrane	Mauh-bran	Membrana.
Temps or Tema	Tanh	Time.

	EN.	
FRENCH.	PRONUNCIATION.	ENGLISH.
Bien	Beeahn (one syll.)	Well.
Cependant	S'pauh-dauh	Meanwhile.
Enchanter	Anh-shanh-tay	To charm.
Encore	Anh-kor	Again.
Moment	Mo-manh	Moment.
Rendezvous	Ranh-day-voe	Appointed place.
Sentiment	Sanh-tec-muuh	Sensation.
Surprendre	Sur-pranhdr'	To surprise.

SECTION XXIV.—INTERROGATIVE FORM OF PRESENT INDICATIVE.

1. In the first person singular of the present of the indicative of almost all those French verbs which in that person have only one syllable, the common interrogative form [Sect. XXII. 9] is not allowed. To render the verb interrogative, the expression *est-ce que* is prefixed to the affirmative form [§ 98 (5) (6)].

Est-ce que je vends du drap? Do I sell cloth?
Est-ce que je joue souvent? Do I play often?

2. The first person singular of the indicative of *avoir*, *to have*; *être*, *to be*; *aller*, *to go*; *pouvoir*, *to be able*; *devoir*, *to owe*; *savoir*, *to know*, etc., may, however, be conjugated interrogatively according to the general rules.

Ai-je vos mouchoirs? Have I your handkerchiefs?
Combien vous dois-je? How much do I owe you?

3. The form *est-ce que* is always allowable, and sometimes preferable, when the first person singular of the present of the indicative of a verb has several syllables [§ 98 (6)].

Est-ce que je vous envoie des livres? Do I send you books?
Est-ce que je commence à parler? Do I begin to speak?

4. *Est-ce que* may, in familiar conversation, be used with all the persons of those tenses susceptible of being conjugated interrogatively:—*Qu'est-ce que vous lisez?* may be said, instead of, *Que lisez-vous?* *What do you read?*

5. INTERROGATIVE FORM OF THE INDICATIVE PRESENT OF

ALLER, to go.	ENVOYER, to send.	VENIR, to come.
<i>Est-ce que je vais?</i> do I go, or am I going?	<i>Est-ce que j'envoie?</i> do I send, or am I sending?	<i>Est-ce que je viens?</i> do I come, or am I coming?
<i>Vas-tu?</i>	<i>Envoies-tu?</i>	<i>Viens-tu?</i> [coming?]
<i>Va-t-il?</i>	<i>Envoie-t-il?</i>	<i>Vient-il?</i>
<i>Allons-nous?</i>	<i>Envoyons-nous?</i>	<i>Venons-nous?</i>
<i>Allez-vous?</i>	<i>Envoyez-vous?</i>	<i>Venez-vous?</i>
<i>Vont-ils?</i>	<i>Envoient-ils?</i>	<i>Viennent-ils?</i>

6. The article *le*, preceded by the preposition *à*, is contracted into *au* before a noun masculine commencing with a consonant, or an *h* aspirate; and into *aux* before a plural noun [§ 13 (8)].

Allez-vous au bal ou au marché? Do you go to the ball or to the market?

7. *À l'église* means *at or to church*; *à l'école*, *at or to school*.

Nous allons à l'église et à l'école. We go to church and to school.

8. *Quelque part* means *somewhere, anywhere*; *nulle part*, *nowhere*.

Votre neveu où est-il? Where is your nephew?
Il est quelque part. He is somewhere.
Il n'est nulle part. He is nowhere.

RÉSUMÉ OF EXAMPLES.

Est-ce que je vais à l'école? Do I go to school?
Vous allez à l'église aujourd'hui. You go to church to-day.
Est-ce que je commence mon travail? Do I begin my work?
Est-ce que je parle Anglais? Do I speak English?
Est-ce que j'envoie ce livre à mon frère? Do I send this book to my brother?
Allez-vous au marché demain? Do you go to market to-morrow?
J'y vais après-demain. I go there the day after to-morrow?
Envoyez-vous vos enfants à l'école? Do you send your children to school?
Je les envoie chez le professeur. I send them to the professor's.
Je les y envoie cette après-midi. I send them there this afternoon.
Vos habits où sont-ils? Where are your clothes?

Ils sont quelque part. They are somewhere.
Ils ne sont nulle part. They are nowhere.
Est-ce que je demeure chez vous? Do I live at your house?
Est-ce que je mange trop? Do I eat too much?

VOCABULARY.

Absent, -e, absent.	Concert, m., concert.	Noir, -e, black.
Adresse, f., address.	Couper, 1, to cut.	Perruquier, m., hair-dresser.
Banque, f., bank.	Cuir, m., leather.	Point, not.
Banquier, m., banker.	Depuis, since.	Poste, f., post-office.
Billet, m., note.	École, f., school.	Rouge, red.
Bois, m., wood.	Écolier, m., scholar.	Village, m., village.
Chapeau, m., hat.	Eglise, f., church.	Vert, -e, green.
Chapelier, m., hatter.	Marché, m., market.	

EXERCISE 43.

1. Où est-ce que je vais? 2. Vous allez chez le chapelier. 3. Est-ce que je vais à la banque? 4. Vous allez à la banque et au concert. 5. Est-ce que je coupe votre bois? 6. Vous ne coupez ni mon bois ni mon habit. 7. Est-ce que je porte un chapeau vert? 8. Vous ne portez pas un chapeau vert, vous en portez un noir. 9. Votre écolier va-t-il quelque part? 10. Il va à l'église, à l'école et au marché. 11. Ne va-t-il pas chez le perruquier? 12. Il ne va nulle part. 13. Ne portez-vous point des bottes de cuir rouge? 14. J'en porte de cuir noir. 15. N'allez-vous pas chez le banquier? 16. Je ne vais pas chez lui; il est absent depuis hier. 17. Vient-il à la banque ce matin? 18. Il a l'intention d'y venir, s'il a le temps.* 19. A-t-il envie d'aller au concert? 20. Il a grande envie d'y aller, mais il n'a pas de billet. 21. Demeurez-vous dans ce village? 22. Oui, Monsieur, j'y demeure. 23. Envoyez-vous ce billet à la poste? 24. Je l'envoie à son adresse.

EXERCISE 44.

1. Do I wear my large black hat? 2. You wear a handsome green hat. 3. Does the banker go to the hairdresser's this morning? 4. He goes there this morning. 5. Does he intend to go to the bank this morning? 6. He does not intend to go there, he has no time. 7. Do you send your letters to the post-office? 8. I do not send them, they are not yet written (*écrites*). 9. Do I send you a note? 10. You send me a ticket, but I have no wish to go to the concert. 11. Does your brother go to school to-morrow? 12. He goes (there) to-day, and remains at home to-morrow. 13. Do I go there? 14. You do not go anywhere. 15. Where do you go? 16. I am going to your brother's, is he at home? 17. He is not at home, he is absent since yesterday. 18. Does your brother live in this village? 19. He does not [Sect. XXIII. 12], he lives at my nephew's. 20. Are you wrong to go to school? 21. No, Sir, I am right to go to church and to school. 22. Do you wish to come to my house? 23. I like to go to your house, and to your brother's. 24. When are you coming to our house? 25. To-morrow, if I have time. 26. Does the banker like to come here? 27. He likes to come to your house. 28. Is the hairdresser coming? 29. He is not yet coming. 30. What are you sending to the scholar? 31. I am sending books, paper, and clothes. 32. Where is he? 33. He is at school. 34. Is the school in the village? 35. It is there.

LESSONS IN BOTANY.—VII.

SECTION XI.—REPRESENTATIVES FOR LEAVES IN CRYPTOGAMIC PLANTS.

LEAVES, properly so called, only exist on plants which bear flowers. The reader may test this by his own experience. Did he ever see a leaf on a mushroom, or a moss, or any other cryptogamic plant? Probably he may say, "Yes, I have seen them on ferns, and these are cryptogamic plants." Well, we have already stated that the leaf-like expansions on ferns are not leaves, but fronds, and we have explained the distinction between a leaf and a frond. It only remains to be said, in connection with this subject, that the little stem to which these fronds are attached, and which corresponds to a petiole in a real leaf, is denominated a *stipes*, from the Latin *stipes*, the trunk of a tree. In the next page is a representation of one of the tree-ferns of tropical climates, the trunk of which is denominated a *caudex*, from the Latin *caudex*, a stem.

* The *i* of *si* is elided before *il*, *ils*, but in no other case. This is the only instance of the elision of *i*.

In past ages these tree-ferns must have been amongst the most numerous of vegetable productions. Coal, we need hardly say, is well known to be nothing more than the remains of vegetable substances, so long buried under great pressure in the earth that they have changed to the condition in which we at present find them. Notwithstanding the change of quality, yet in many cases the original shape of the vegetable has not undergone alteration. So that a person sufficiently acquainted with Botany can readily tell the kind of plant from which any specimen of coal under consideration has been formed.

Although fronds are the substitutes for leaves in ferns and several other cryptogamic plants, nevertheless these organs are not the universal substitutes; but the general complexity of cryptogamic plants, the microscopic nature of these organs, and the comparatively limited acquaintance with this division of the vegetable world, render it undesirable to state much concerning them in a series of papers like these, in which so many tribes of flowering plants claim our notice.

SECTION XII.—ON THE REPRODUCTIVE ORGANS OF PLANTS: THE FLOWER AND ITS APPENDAGES.

Having written what is necessary concerning the nutritive parts of plants, we shall now describe their reproductive members, the flower and its appendages. It would be folly, indeed, to describe formally what is meant by a flower, but the purposes to which a flower is designed in the economy of vegetable nature will require our attentive consideration. Without flowers there could be no fruit; without fruit there can be no seed; and without the latter the greater number of vegetables could not be multiplied. The reason, then, for denominating flowers the reproductive organs of plants will be manifest. To state this fact, that flowers are the reproductive portions of a plant, is very easy. To demonstrate, however, the elaborate means by which the functions of reproduction are discharged is very difficult. Indeed, the laws affecting the multiplication of animals and vegetables are so similar in many respects, that many of the terms employed in this department of Botany are borrowed from the sister studies of animal anatomy and physiology; and without some preliminary knowledge of these sciences it would be next to impossible to make the reader comprehend the intricacies of vegetable reproductions.

We therefore shall not attempt to deal with these intricacies, but shall content ourselves by saying that all plants most probably, certainly all evidently-flowering or phanogamous plants, possess sexes, and these sexes are usually in the same plant, in the same flower of the plant. Occasionally, however, the two sexes are on different flowers, and sometimes on different plants. We may, therefore, popularly say, that the greater number of flowers contain both gentlemen and ladies; but occasionally, on some plants, the gentlemen and ladies have flowers, each sex to itself; and occasionally, again, the gentlemen monopolise all the flowers on one plant, and the ladies all the flowers on the other. When the two sexes reside in two sets of flowers on one plant, then such a plant is said to be *monœcious*, from two Greek words, *μονος* (pronounced *mon'-os*) and *οικος* (pronounced *oi'-kos*), signifying "one house;" the plant, we suppose, being regarded as a house, and the flowers as chambers in the same. When, however, the males all reside in the flowers of one plant, and the females in all the flowers of another, then such plants are said to be *diœcious*, or "two-housed," the reason of which will be obvious.

SECT. XIII.—ANATOMICAL EXAMINATION OF A FLOWER.

Pleasing objects of contemplation as flowers are, beautiful to

look at and agreeable to smell, the botanist is obliged frequently to destroy them before he can make himself acquainted with the peculiarities of their structure; that is to say, he is obliged to cut or pull their various organs from their attachments; this operation is termed dissection. Presently, then, we shall have to dissect a flower and learn its various parts. As a preliminary to this examination, however, it will be necessary that the learner should make himself acquainted with some general terms employed in this department of Botany.

First of all, then, the manner in which flowers are arranged upon any plant is termed the inflorescence of that plant. By this term botanists understand not merely the flower itself, but various appendages to the flower; in short, the term inflorescence has a very wide signification.

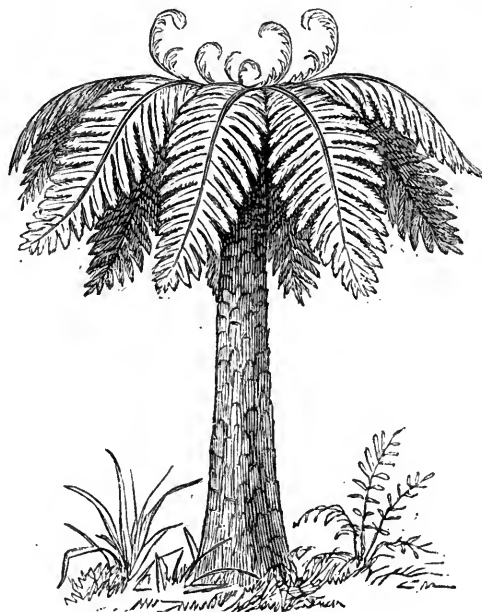
SECTION XIV.—MANNER IN WHICH FLOWERS ARE ATTACHED.

The attachment of flowers to the parent stem usually takes place through the intervention of a little branch-like appendage, to which the term *peduncle*, or occasionally *pedicel*, is applied. The reader will therefore remember that a peduncle or pedicel stands to a flower in the same relation as a petiole to a leaf. It is also called the *primary axis* of inflorescence, and the flower-stalks which spring from it are called the *secondary*, *tertiary*, etc., *axes*. These pedicels or flower-stalks are arranged on various plants in different ways, and thus give rise to various terms indicative of the nature of inflorescence. The word *peduncle* is derived from the low Latin *pedunculus*, a little foot, while *pedicel* is derived from the Latin *pediculus*, which has the same meaning. Both words are diminutives of the Latin *pes*, a foot.

The inflorescence, or mode of flowering, is said to be *definite* or *terminal* when the primary axis is terminated by a flower. When the original stem goes on growing in a straight line, giving off as it proceeds little flower-shoots or secondary axes of various degrees on either side, but does not terminate in a flower, then the term *indefinite inflorescence* is applied; the propriety of which term will be obvious. The term *axillary* is sometimes given to this condition of inflorescence. If the reader glance for an instant at Fig. 60 in the opposite page, he will be at no loss to comprehend what is meant by *indefinite* or *axillary* inflorescence. The reader will here please to observe the little leaf-like things from the *axilla* (or junctions with the primary axis) of which the flower-peduncles spring in this example. Such leaf-like appendages are frequently to be seen attached to the peduncles of many flowers. They are called *bracts*, from the Latin *bractea*, a thin plate of metal, and although their usual appearance is green like a leaf, yet they sometimes undergo very strange modifications. Thus, the pineapple, which we discovered long ago to be no fruit, is, in reality, nothing more than an assemblage of fleshy bracts, and the scale of the fir-cone is nothing more than hard leathery bracts. In proportion as bracts are developed nearer to a flower, so does their natural green colour give place to the colour of the flower itself. Occasionally the flower actually springs from the upper surface of a bract, as in the case of the linden (Fig. 61).

Sometimes bracts unite at the base of each group of flowers, and on the same plane, as, for example, we find it in the carrot. This association of bracts gives rise to what botanists term the *involucrum*, a Latin word, which is derived from *volvo*, to wrap or roll, and which means anything that serves to wrap or cover.

Under the classification *indefinite inflorescence* are compre-



59. TREE FERN.



60. AXILLARY INFLORESCENCE. 61. FLOWER OF THE LINDEN TREE—BRACT CONSOLIDATED WITH THE PEDUNCLE. 62. RACEME OF THE CURRANT. 63. COMPOUND RACEME OF THE HORSE CHESTNUT. 64. CORYMB OF THE MAHALEB CHERRY. 65. SIMPLE UMBEL OF THE COMMON CHERRY. 66. COMPOUND UMBEL OF THE COMMON FENNEL. 67. DICHO TOMOUS CYME. 68. CORYMBOSE CAPITULUM OF GROUNDSEL. 69. COMPOUND SPIKE OF WHEAT. 70. SIMPLE SPIKE OF THE VERVAIN. 71. CAPITULUM OF THE SCABIOUS. 72. CORYMBOSE CYME OF THE HAWTHORN. 73. FASCICULE OF THE MALLOW. 74. UMBELLAR CYME OF THE CELANDINE.

hended the *raceme*, the *panicle*, the *corymb*, the *umbel*, the *spike*, the *capitulum*, and the *cyme*, all of which we shall now proceed to describe.

The *raceme*, from the Latin *racemus*, a cluster, is that kind of inflorescence in which the pedicels or secondary axes are almost equal in length, and arise immediately from the primary axis or stem. Of this kind of inflorescence the black, white, and red currant-trees offer familiar examples (Fig. 62).

The *panicle* (from the Latin *panicula*, anything of a little round swollen figure, the diminutive of *panus*, a woof about the quill in a shuttle), sometimes called a *compound raceme*, is a form of inflorescence in which the secondary axes or pedicels, springing from the primary axis or stem, do not at once bear each a terminal flower, but ramify a third, and sometimes even a fourth time. Of this description is the inflorescence of the horse-chestnut (Fig. 63).

The *corymb*, from the Greek *κορυμβος* (pronounced *kor-um'-bos*), a branch, is that kind of inflorescence in which the lower pedicels, much longer than the upper ones, terminate, in consequence of this difference of length, at the same level, or nearly so, as the latter. An example of this is afforded by the Mahaleb cherry, of whose inflorescence a diagram is appended (Fig. 64).

The *umbel*, from the Latin *umbella*, a little shade, the diminutive of *umbra*, a shade, is an inflorescence in which the pedicels or secondary axes, being equal in length amongst themselves, spring from the same level, rise to the same height, and diverge like the ribs of an umbrella or parasol. An umbel is *simple* when each pedicel terminates at once in a flower, as, for example, in the common cherry (Fig. 65); and *compound* when the pedicels, instead of terminating at once each in its own flower, severally give off other pedicels on which the flowers are arranged. An example of this is seen in the common fennel (Fig. 66).

The *spike*, from the Latin *spica*, a point, may be either simple or compound. The compound spike is that form of inflorescence in which the pedicels are completely, or almost completely wanting, and the flowers accordingly are *sessile*, as may be seen in the vervain (Fig. 70). The compound spike is that form in which the secondary axes, instead of terminating in a flower, emit each a little flower-bearing pedicel. Of this description is the inflorescence of wheat (Fig. 69).

The *capitulum*, from the Latin *caput*, a head, is the form of inflorescence in which sessile flowers are collected upon the thickened head, called *torus*, of a peduncle. This torus may be flat, as we see it in the marigold and the scabious (Fig. 71), or concave, as in the fig. It appears, then, that the *capitulum* is that form of inflorescence to which the fig belongs.

The *cyme*, from the Greek *κυμα* (pronounced *ku'-ma*), a wave, is a definite inflorescence which imitates by turns several of the indefinite kinds of inflorescence, from all of which it essentially differs in the circumstance that the primary axis is itself terminated by a flower which appears before the others; each of the subsidiary axes also terminates in a flower, but the secondary axes flourish before the tertiary ones, tertiary axes before quaternary ones, and so on in like manner for the rest. The chief varieties of the *cyme* are the *racemous cyme*, as in the campanula or blue-bell; the *dichotomous*, or divided, *cyme* (Fig. 67), from the Greek *διχα*, apart, and *τεμνω* (pronounced *tem-no*), to cut; the *corymbous cyme* (Fig. 72); the *umbellar cyme* (Fig. 74); the *scorpioidal*, or scorpion-like, *cyme*, as in the myosotis or forget-me-not; and the *contracted cyme*, in which the flowers are crowded together through the extreme shortness of the axes. The *fascicule*, from the Latin *fasciculus*, a little bundle, is an inflorescence in which the axes preserve a certain length and an irregular distribution, as in the sweet-william.

Mixed inflorescence is that which partakes of the characters of both definite and indefinite inflorescence. In the dead-nettle the general inflorescence is indefinite, whilst the partial inflorescence consists of true cymes or fascicules. In the mallow there is a similar arrangement (Fig. 73). In the groundsel (Fig. 68) and the chrysanthemum the general inflorescence is a definite corymb, but the partial inflorescences are capitulous. In the family of plants called umbelliferous, and to which the *carrot*, the *fennel*, *angelica*, etc., belong, each umbel in itself is indefinite, but the aggregate of umbels is definite; frequently, indeed, the axis of an umbel bears a little central umbel of its own.

READING AND ELOCUTION.—VII.

PUNCTUATION (continued).

XI. THE APOSTROPHE.

71. The *Apostrophe* is a mark which differs from a comma in its being placed above the line, and in being used for a different purpose.

72. The apostrophe shows that some letter or letters are left out; as, 'tis for *it is*, tho' for *though*, lov'd for *loved*.

73. The apostrophe is likewise used in grammar to designate the possessive case; as, John's book.

XII. THE QUOTATION MARK.

“ ”

74. A *Quotation mark* consists of four commas placed above the line; two at the beginning and two at the end of a word, sentence, or part of a sentence. The two which are placed at the beginning are inverted, or turned upside down.

75. A quotation mark shows that the word or sentence was spoken by some one, or was taken from some other author.

XIII. THE DIÆRESIS.

“ ”

76. A *Diæresis* consists of two periods placed over a vowel: thus, ä.

77. The diæresis shows that the letter over which it is placed is to be pronounced separately; as, Crëator, Zoönomia, äerial.

In the following examples the student will recognise each of the above-mentioned marks, and read them accordingly.

Examples.*

The kindling fires o'er heaven so bright, look sweetly out from you azure sea.

Banished from Rome! what's banished, but set free from daily contact of the things I loathe? "Tried and convicted traitor"—Who says this? Who'll prove it, at his peril, on my head? "Banished?"—I thank you for 't. It breaks my chain! I held some slack allegiance till this hour—but now my sword's my own.

Your consul's merciful. For this all thanks. He dares not touch a hair of Catiline. "Traitor!" I go—'—but I return. This—trial! Here I devote your senate! I've had wrongs to stir a fever in the blood of age. * * * * * This day is the birth of sorrows.

The eye could at once command a long-stretching vista, seemingly closed and shut up at both extremities by the coalescing cliffs.

It seemed like Laocöon struggling ineffectually in the hideous coils of the monster Python.

In those mournful months, when vegetables and animals are alike coerced by cold, man is tributary to the howling storm and the sullen sky; and is, in the pathetic phrase of Johnson, a "slave to gloom."

I would call upon all the true sons of humanity to cooperate with the laws of man and the justice of Heaven in abolishing this "cursed traffic."

Come, faith, and people these deserts! Come and reanimate these regions of forgetfulness.

I am a professed lubricator; and who so well qualified to delineate the sally hours, as

"A meagre, muse-rid mope, adjust and thin?"

He forsook, therefore, the bustling tents of his father, the pleasant "south country" and the "well Lahai-roi;" he went out and pensively meditated at the eventide (see Genesis xxiv. 62).

The Grecian and Roman philosophers firmly believed that "the dead of midnight is the noon of thought."

Young observes, with much energy, that "an undevout astronomer is mad."

Young Blount his armour did unlace, and, gazing on his ghastly face, said—"By Saint George, he's gone! that spear-wound has our master sped; and see the deep cut on his head! Good night to Marmion!"—"Unmurtured Blount! thy brawling cease; he opes his eyes," said Eustace, "peace!"

A celebrated modern writer says, "Take care of the minutes, and

* In this lesson, as well as in some of the preceding lessons, there are several sentences of poetry, which are not divided into poetical lines. The object of printing these lines without regard to this division, was to prevent the student from falling into that "sing song" utterance, into which he is too apt to fall in reading verse. It remains to be observed here, that abbreviations and contractions, such as occur in poetical sentences in this lesson and others, which appear in the form of prose, are not allowable in prose itself.

the hours will take care of themselves." This is an admirable remark, and might be very reasonably recollected when we begin to be "weary in well-doing," from the thought of having much to do.

I've seen the moon gild the mountain's brow; I've watched the mist o'er the river stealing; but ne'er did I feel in my breast, till now, so deep, so calm, and so holy a feeling; 'tis soft as the thrill which memory throws athwart the soul in the hour of repose.

Blot be the day I 'scaped the wrangling crew from Pyrrho's maze and Epicourp's sty; and held high converse with the godlike few, who to th' enraptured heart, and ear, and eye, teach beauty, virtue, truth, and love, and melody.

But thou, who Heaven's just vengeance dar'st defy, this deed, with fruitless tears, shalt soon deplore.

O Winter! ruler of the inverted year! thy scatter'd hair with sleet-like ashes fill'd, thy breath congeal'd upon thy lips, thy cheeks fring'd with a beard made white with other snows than those of age, thy forehead wrapt in clouds, a leafless branch thy sceptre, and thy throne a sliding car, indebted to no wheels, but urg'd by storms along its slippery way, I love thee, all unlovely as thou seem'st, and dreaded as thou art!

For as I passed by, and beheld your devotions, I found an altar with this inscription, "TO THE UNKNOWN GOD." Whom therefore ye ignorantly worship, him declare I unto you.

XIV. THE ASTERISK, OBELISK, DOUBLE OBELISK, SECTION, PARALLEL, PARAGRAPH, INDEX, CARET, BREVÉ, AND BRACE.

The student should take particular notice of the following marks, so that he may call them by name, and discover their use in the following examples:—

- * An Asterisk, or Star.
- † An Obelisk, or Dagger.
- ‡ A Double Obelisk.
- ¶ A Paragraph.
- § A Section.
- || A Parallel.

78. The Asterisk, Obelisk, Double Obelisk, Paragraph, Section, Parallels, and sometimes figures or letters, are used to show that there is a note at the bottom of the page. When many notes occur on a page, these marks are sometimes doubled.

79. The Paragraph was formerly used to show the beginning of a new subject in a chapter.

80. The Section is generally used to sub-divide chapters into lesser parts.

81. The Index or Hand points to something which requires particular attention.

82. The Breve is placed over a letter to show that it has a short sound; as, Hĕlĕna.

83. The Brace is used to unite several lines of poetry; or, in prose, to connect a number of words with one common term.

84. The Caret is never used in printed books; but in writing it shows that something has accidentally been left out; as,

recited
George has his lesson.

OBS.—When several asterisks or stars are placed together, they represent an ellipsis.

Examples.

Many persons pronounce the word Hĕlĕna* incorrectly. They call it Hĕlĕna; and the words accept'able, recognise, Epicure'an, and Europe'an, are sometimes incorrectly called acceptable, recognise, Epicure'an, and Euro'pean.

The I'p'rosy, therefore, of Na'aman shall cleave unto thee.
* * * * And he went out from his presence a l'p'er as white as snow.

The Cougar † is the largest animal of the cat kind, found in North America; and has occasionally received the name of the American lion, from the similarity of its proportions and colour to those of the lion of the old world.

The keeper of the elephant gave him a gallon of arrack, ‡ which rendered the animal very furious.

I fell upon my knees on the bank, with my two servants, and the dragoman § of the monastery.

The history of Joseph is exceedingly interesting and full of instruction. ||

* This with the St. before it, is the name of a small island situated on the west of Africa, noted for the exile of Napoleon I.

† Pronounced *Coo'-gar*. The name given to this animal by the Americans generally is *painter*, evidently a corruption of *panther*.

‡ *Arrack* is a very strong spirituous liquor.

§ *Dragoman* means an interpreter.

|| The whole history of Joseph will be found in the Bible; from the 37th chapter to the end of the book of Genesis.

It was a cave, a huge recess, that keeps till June December's snow; a lofty precipice in front, a silent tarn † below.

C-e-o-u-s, }
C-i-o-u-s, } are pronounced like shds.
S-c-i-o-u-s, }
T-i-o-u-s, }

See where the rector's ** splendid mansion stands, embosomed deep in new enclosed lands,—lands wrested from the indigent and poor, because, forsooth, he holds the village cure. ††

When the young blood danced jocund through his veins, 'tis said his sacred stole ‡‡ received some stains.

Their wants are promised Bridewell, §§ or the stocks.

MECHANICS.—VI.

FINDING CENTRES OF GRAVITY.

IN the last lesson it was shown that every mass of matter has a centre of gravity, but we did not inquire how such centres are found in bodies of known shapes. To that part of our subject we now proceed.

As a general rule, the problem requires high mathematics for its solution; but there are some cases in which the centre can be discovered without much difficulty. I take, first, the practical method by suspension, which gives it exactly whenever the body is of a uniform thickness, such as a deal board, or card, or piece of paper. The two opposite faces should be equal and alike, the edges being either perpendicular or square to them, or running off at the same slope. In all such cases it is evident that the centre of gravity is within the substance of the board half-way across between the faces. If, therefore, we can find the point on either face under which it lies, by boring straight in half-way at that point, the required centre is reached.

But how find the outside point? Let the board be of any irregular shape, as at a (Fig. 27), and bore two holes through it perpendicularly at any two points, near its edge, o and q. Put a straight iron rod now through o, and on the rod, by a small ring, hang a plumb-line, o A, close to the board. Put rod, line, and board now across two supports, so arranged that the rod may be horizontal. The board having settled to rest, the centre of gravity will, as I showed in last lesson, be somewhere behind the plumb-line. Chalk now, or mark with a pencil, the course, o A, of this line on the board. Perform the same operation with the hole q, pencilling in like manner the line q B. What now have we? Two lines, behind both which the centre of gravity lies; whence we infer that their intersection, g, is the point required.

But the method in part applies to bodies which have not parallel faces like boards, or are not cut perpendicularly, or at the same slope across at their edges; but in such cases the sought centre is not midway across. All that is necessary is that there should be one flat face on it, as in that represented at b (Fig. 27). You can still determine the point o, behind which the centre of gravity lies, by boring two passages at o and q, perpendicularly to the face, into its substance, suspending and marking the lines o A, q B, as before. The centre of gravity will still be behind the point g; but where, or how far in, is another question, the answer to which depends on the shape of the body.

If the board which above first occupied our attention be supposed to become very thin—to be cardboard, or even paper—the body becomes almost all surface, and the point g and the centre of gravity nearly coincide. Practically, they become identical; and the operation is sometimes spoken of as "the finding of the centre of gravity of an area or surface." In strictness, a surface cannot have a centre of gravity, for (see Lesson I. on Geometry) it has no thickness, and therefore can have no weight, no force, no centre of force. But, for all that, the inquiry is useful. We may agree, for mechanical purposes, that a surface should have such a centre; and the best course for that purpose is to give it a thickness the smallest we can conceive, namely, that of one particle or atom. Imagine, then, a triangle, or polygon, or circle, one atom thick; and let us agree that, when we find its

† Tarn is a small lake, high up in the mountains.

** A clergyman.

†† Cure.—The office of a clergyman.

‡‡ Stole.—A long robe worn by the clergy of England.

§§ Bridewell.—A house of correction.

centre of gravity, we have the centre of gravity of an "area" or "surface." Also let it be understood that the centre of gravity of a *line*, straight or curved, means that point for such a *line of atoms*.

TO FIND CENTRES OF GRAVITY BY CONSTRUCTION.

This is done by the rule for finding the centre of parallel forces, given in Lesson IV. (page 123). We shall commence with the most general case, namely:—

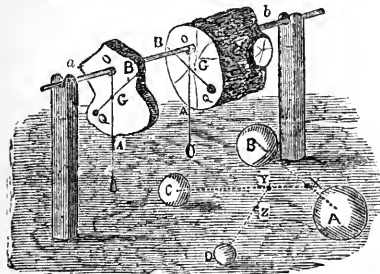


Fig. 27.

in Fig. 27 above, or are some in that plane, some above, and some below. Let them be four in number and on the same plane, their centres being A, B, C, D; then four parallel forces, the weights, act at these centres: what has to be done? Join first A with B, and cut the joining line at x inversely as the weights at these points. Next connect x and c, and cut c x at y inversely as the two first weights to that at c. Lastly, y being joined to d, divide d y at z inversely, as the weights of the three balls already used are to that of the fourth, d. This last point, z, is the required *common* centre of gravity.

You observe that the joining and cutting of the lines is in no way influenced by, or dependent on, the bodies being on the same or in different planes, or of their number. How many soever they be, the operation is the same. Note, also, that a *common* centre of gravity can be *outside* the bodies of which it is the centre.

2. To find the Centre of Gravity of a Right Line.—A mechanical right line being, as we have agreed, a line of atoms of equal size and weight, the case is that which we have considered in Lesson IV., of a number of equal parallel forces acting at equal distances from each other, along a right line. The resultant passes through the middle point of that line; hence the centre of gravity of a right line is its *middle* point.

This enables us to find the centre of gravity of a *uniform* rod. By "uniform," I mean such that the *cross sections* are of the same size and form throughout its length. Such a body may be considered a collection of equal *mechanical right lines* placed side by side, their ends being made flat or level.

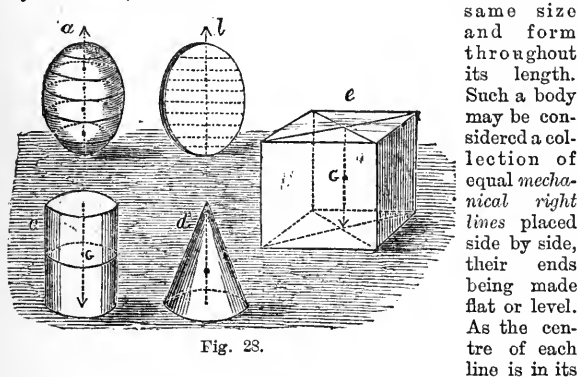


Fig. 23.

middle, the centre of the whole bundle is in the cross section at the *rod's* middle. And observe that this holds good of all other bodies, besides mere rods, which can be considered made up of *equal parallel lines*, such as of a cylinder or uniform pillar, or of a beam of timber, a cubical block of stone; the centres of gravity will be in the cross sections at their middle points. And it makes no difference whether the flat ends of the cylinder, pillar, beam, or block are *perpendicular* to the lines of which it is supposed to be composed, as in c and e (Fig. 28), or *oblique* to them, as at d and f (Fig. 29); the centre of gravity is still in the middle cross section parallel to

the flat ends. Moreover, as all bodies so shaped may be considered a collection of areas, one atom thick, piled on top of each other, either perpendicularly or with a slope, like cards, or a pile of sovereigns, the centre of gravity of each must lie also on the line joining the centres of gravity of the two *areas* which form their *ends*. The centre itself, therefore, is the point in which this line pierces the middle cross section, as at c and e, Fig. 28, in the cylinder and cube. But this requires us to be able to find the centre of gravity of such *areas*, of which take first the triangle.

3. To find the Centre of Gravity of a Triangle.—This we do by considering the triangle made up, as in the triangle a, in Fig. 30, of lines an atom thick, all parallel to the side AB. The centre of gravity of each line is at its middle point. If, therefore, I can satisfy you that the middles of all the lines are on the line c m, which joins the vertex c with the middle m of AB, the centre for the whole triangle is somewhere on that line.

I have, then, to prove that c m bisects, or divides into two equal parts, every line parallel to AB. Suppose, now, that I cut c m into three equal parts, c x, x y, y m, as in the triangle b, in Fig. 30, and draw parallels to AB at the two points of section inside, meeting AC and BC each in two points from which parallels to c m are drawn, meeting AB in four points, two on each side of m. Now, since c m is equally divided, and the white figures inside are parallelograms, it is evident that the line parallel to c m marked a, b, on each side, are equal to each other, and to c x, the third part of c m. Hence the three small shaded triangles next to AC are equal to each other, and have equal angles. Their three sides parallel to AB are therefore equal, which shows that AM is cut by the parallels to c m into three equal parts. For the same reason BM is cut into three equal parts; and since AM is equal to BM, the six parts into which AB is divided are equal to each other. You thus see that the first parallel above AB is made of parts, two on either side of c m, equal to the parts below, and is therefore bisected by c m. The next above is also evidently bisected, being composed of two parts, one on either side. Now, if I divide c m into five parts instead of three, I have four other parallels also bisected by c m; if into 7 or any other number, it is the same—I can fill the whole triangle with parallels to AB bisected each by the line c m. The centre of gravity of the triangle is therefore on c m.

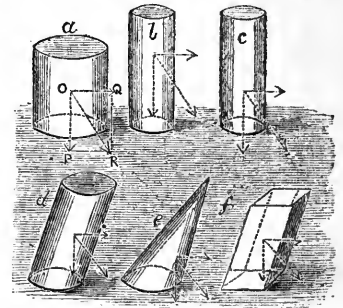


Fig. 29.

But by a similar reasoning it can be shown that this centre of gravity must be in AL (in triangle a, Fig. 30) bisecting AC. Hence we have for rule that, in order to find the centre of gravity of a triangle, we must join any two of its vertices with the middle points of the sides opposite to them, and that the intersection G of the joining lines is the required point. This centre G is distant from M one-third of c m, and from L one-third of AL.

The centre of gravity of a *parallelogram* can now be shown to be the intersecting of its diagonals AC, BD (see c, Fig. 30); for, since the diagonals bisect each other, the line BD is the bisector of the common side AC of both the triangles, ABC and ACD. The centre of each, therefore, is on that line, and therefore the common centre of both—that is, the centre of the parallelogram. But, by the same reason, considering the parallelogram made of the two triangles on BD, the centre is on AC. Being thus on both diagonals, it is at their intersection.

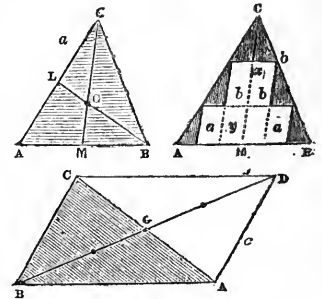


Fig. 30.

4. To find the Centre of Gravity of a Polygon.—Let $A B C D E$ (Fig. 31) be the polygon, and from the angle A draw the dotted lines $A C$, $A D$ to the remote angles C and D . The polygon is thus cut up into three triangles. Let G , H , and K be the centres of gravity of these latter figures; there are thus three bodies whose centres, G , H , and K , are known, and whose masses are the three areas of the three triangles.

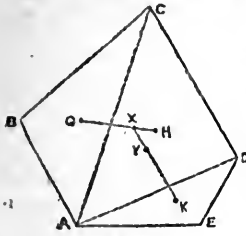


Fig. 31.

Suppose now that you had calculated these areas, and had them written down in numbers. Then join G with H and cut $G H$ at X inversely as the numbers expressing the areas of the triangles $A B C$, $A D C$. Connect X now with K , and cut $K X$ at Y inversely, as the quadrilateral $A B C D$ to the triangle $A E D$; the point Y is the required centre. If the polygon had more sides than are in Fig. 31, the process is the same, and must be

continued until all the triangles into which it is necessary to divide the polygon have been gone over.

5. To find the Centre of Gravity of the Circumference of a Circle.—Let the circumference be taken to be a curved line of atoms, as in a , in Fig. 32, to the right; and through the centre G of the circle let any line, $A G B$, be drawn passing through two of them, one on either side. Since these two are of equal

weight, and equally distant from G , their common centre of gravity is the middle of $A B$, that is, the point G . So, likewise, going round the figure, the centre of gravity of every opposite pair of atoms is G , and therefore G is the common centre of all, or of the circumference.

The centre of gravity of a ring is thus seen to be the centre of the circle in which it is formed, for the ring may be considered a bundle of circles an atom thick, bound together, one above and around the other, so as to have for common centre of gravity the centre of the central circle.

The centre of gravity of the area of a circle is also the centre of figure of the circle, for the area may be considered as made up of a number of circles of atoms, lying one inside the other, and having the same centre, G , which, by the above, is therefore their common centre of gravity.

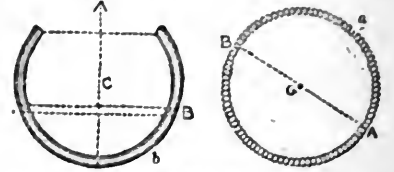
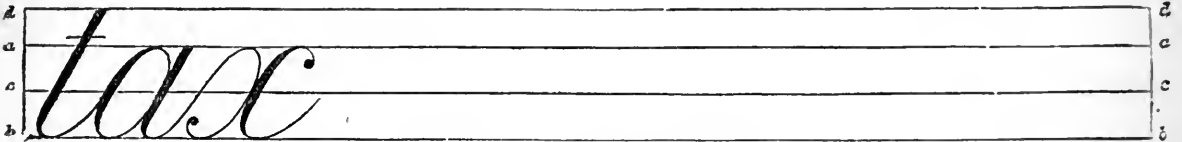
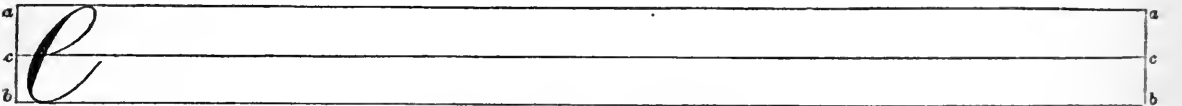


Fig. 32.

The centre of gravity of a hollow sphere may, in like manner, be proved, by drawing lines through G to the atoms on its surface, to be the centre of figure of the sphere; and a solid sphere may be considered as consisting of a number of these hollow ones inside one another.



COPY-SLIP NO. 47.—THE WORD **tax**.



COPY-SLIP NO. 48.—THE LETTER **e**.



COPY-SLIP NO. 49.—THE WORD **axe**.

LESSONS IN PENMANSHIP.—XIV.

IN Copy-slip No. 46 (page 196), an example was given of the letter x . This letter is formed of the letter c twice repeated; the first, or the one to the left, being turned upside down, while the second, or the one to the right, is formed in the ordinary way. The left half of the letter is commenced on the line $c c$ with a hair-line which is turned at the top to the right, and brought downwards without being thickened by pressure on the pen. The hair-line is turned to the left as it approaches the line $b b$, carried round, and terminated in a dot about midway between the lines $b b$, $c c$. The right half is then added. It is made in precisely the same way as the letter c , the thick down-stroke touching the thin down-stroke of the turned c , and forming the thickened centre of the letter.

In Copy-slip No. 48 the learner will find an example of the letter e , which is commenced on the central line, $c c$, by a hair-stroke carried up in a slanting direction to the right. This hair-line is then turned at the top line, $a a$, and carried to the left, and the letter is finished in the same manner as the letter c , or the right half of the letter x ; but in making the thick down-stroke care must be taken to let it pass over the point in

the line $c c$, at which the up-stroke forming the loop or bow of the letter e was commenced.

Copy-slips Nos. 47 and 49, comprising the words **tax** and **axe**, are given to show the learner how the letters x and e are connected with letters that precede or follow them.

In the last lesson it was said that the letters c , x , and e are modifications of the letter o . The learner may prove this in a practical manner for his own satisfaction, if he will take the trouble to make the letter o in pencil, on a piece of ruled paper, and then trace the letter c or e over it in ink; or otherwise, by making the letters c and e , and then adding to them the fine hair-stroke on the right side that is required to form the complete oval of the letter o . To show that x is a modification of o it will be necessary to make the letter o twice over, so that the right side of the first touches the right side of the second, and then trace the letter x over the double o thus formed; or, as in the case of c and e , the hair-stroke that is necessary to complete the oval of o may be added on the right and left of the letter x . In the letters c , x , and e , the bottom-turn is carried to the right, beyond the limit of the bottom-turn of the letter o , in order to join them the more readily to any letter that may follow them.

LESSONS IN ARITHMETIC.—XIV.

DECIMALS (continued).

9. Multiplication of Decimals.

To multiply 6'34 by 2'149.

$$6'34 \times 2'149 = \frac{634}{100} \times \frac{2149}{1000} = \frac{634 \times 2149}{100000}$$

Now the numerator shows us that we must multiply the figures together as in whole numbers, and the denominator shows us that the result will have as many decimal places as there are decimal places in the multiplier and multiplicand together.

$$634 \times 2149 = 1362466,$$

and the required result must have 5 decimal places. Hence the answer is, 13'62466.

Hence we see the truth of the

Rule for the Multiplication of Decimals.

Multiply the two numbers together, as in whole numbers, and cut off from the resulting product as many decimal places as the sum of the number of decimal places in the multiplier and multiplicand.

Obs.—When the number of significant figures in the product is not as great as the sum of the number of decimal places in the multiplier and multiplicand, we must prefix ciphers.

EXAMPLE.—Multiply '013 by '02.

Multiplying as in whole numbers, we get 26; but since there are 5 decimal places in the multiplier and multiplicand together, we prefix 5 ciphers to 26, and the required result is by the rule '00026.

The reason of this may also be seen analytically thus:—

$$'013 \times '02 = \frac{13}{1000} \times \frac{2}{100} = \frac{26}{100000} = '00026 \text{ (Arts. 5, 6).}$$

EXERCISE 32.

1. Find the products of the following numbers, and point them according to rule:—

- | | |
|----------------------------|------------------------------|
| 1. '96 × '5 | 15. 213'02 × 4'318. |
| 2. '358 × '096. | 16. 10'2016 × 38'26. |
| 3. 1'0013 × '25. | 17. 164'023 × 1'678. |
| 4. 3'6951 × 4'1. | 18. 9'40061 × 15'812. |
| 5. '1003 × 6'12. | 19. 7'31042 × 10'021. |
| 6. 8'0004 × '004. | 20. 40'4368 × 1'2904. |
| 7. '0006 × '00012. | 21. 75'35060 × 62'3906. |
| 8. '3005 × '0035. | 22. 31'50391 × 17'0352. |
| 9. 100'0003 × '000306. | 23. 0'000713 × 2'30561. |
| 10. 25007823 × '0000001. | 24. 42'10062 × 3'821013. |
| 11. 394'20023 × '00000003. | 25. 1'0142034 × '0629034. |
| 12. 2564'21035 × 4'300506. | 26. 64'301257 × 1'000492. |
| 13. 44'046 × '43. | 27. 840003'1709 × 112'10371. |
| 14. 35'601 × 1'032. | 28. 0'834567834 × '00000008. |

2. In 1 rod there are 16'5 feet: how many feet are there in 41'3 rods?

3. In 1 degree of the earth's circumference there are 69'05 British miles: how many miles are there in 360 degrees?

4. In 1 barrel there are 31'5 gallons: how many gallons in 65'25 barrels?

5. In 1 inch there are 2'25 nails: how many nails are there in 60'5 inches?

6. In 1 square rod there are 30'25 square yards: how many square yards are there in 26'05 rods?

7. In 1 square rod there are 272'25 square feet: how many square feet are there in 160 rods?

HISTORIC SKETCHES.—VII.

KING CHARLES'S VETO ON EMIGRATION.

FATE was almost cruel to King Charles the First. One act of his, or rather let us call it one act of his government, recoiled more upon his head than ever foul cannon recoiled upon its gunner. Eight vessels were lying in the Thames in the early part of the year 1637, bound for "the plantations" in America. When they were about to sail, an order came from the king in council forbidding the masters of them to go. Obedience was exacted by the royal officers from the all-unwilling masters, and the intending passengers were compelled to land again, to disembark their baggage, and to renounce the object of their voyage. The ships were emigrant ships, laden with colony-founders' stores, and intended for colonists' use; the people who had taken passage in them were of the stuff from which

colonies—nay, empires—are made; and the object of the people in going was to establish a settlement where politics and religion, which were discouraged at home, might have freedom to live, and liberty to grow. An embargo was laid upon the ships, and for the time their departure was delayed. Some of the would-be voyagers never pursued their journey; they refused to give the guarantees which were required of them before they could get licence to go; they returned to their homes and their duty, and made themselves names in English history for ever. Among them were John Hampden, who first tried conclusions with the king by refusing to pay a tax levied by the royal authority only; Sir Arthur Hazelrig, one of the most determined enemies the kingly power ever had; John Pym, the future leader of the House of Commons, and promoter of all the constitutional resistance which Parliament subsequently offered to the king's illegal pretensions; and last, not least, Oliver Cromwell! These and many kindred spirits were flying from tyranny and oppression at home, going with their worldly wealth to follow in the footsteps of the Pilgrim Fathers, who, a few years before, had sailed and founded in the wild regions of the West a colony where freedom was to flourish till it grew up and overshadowed the land.

Certainly fate was cruel. Had these eight ships sailed! Had Cromwell, and Pym, and Hampden, and the rest, been suffered to depart, how might not English history have been written differently? None, of course, can tell whether, among the noble army of patriots who at that time thronged Parliament, there might not have been found another Hampden, another Pym to impeach Lord Strafford, another "Cromwell, guiltless of his country's blood;" but taking the men as they were at the time, and considering what they afterwards became, it is excusable to speculate upon what different scenes would have presented themselves, had not the unlucky order of embargo been issued from the privy council.

But why were these men going? England had been the home, not of themselves only, but of their forefathers for generations. Cromwell's family counted among its recent members, as poor Charles afterwards found, and tried to use the knowledge in bribing his enemy—that same Henry Cromwell who was secretary to Cardinal Wolsey, and who, after that statesman's fall in 1530, had risen in King Henry's service, till he became Earl of Essex, and was finally promoted to the honour of being executed, by order of the master he had served too well—the master "whose commands," as Mr. Hallam tersely observes, "were crimes." The other emigrants were no less illustrious, no less bound by the strongest ties to the land of their birth. What motive could they have for voluntarily forsaking all that was dear to them in nationality, and turning their backs upon the country they loved? Disgust at things as they were in the country, and despair of ever seeing them become better. Shortly stated, these were the causes which drove such men away.

"We strove for honours—'twas in vain: for freedom—'tis no more,"

they might have said with the indignant Roman citizens.

Henry the Eighth had begun that system of ruling by virtue of his own strong will, which the nation afterwards, for national purposes and under circumstances of national danger, allowed his daughter Elizabeth also to exercise. But even under her, beneficent and nationally glorious as her reign was, the people, by their representatives in Parliament, were perpetually striving to put a bridle on that sovereign power which the queen was so fond of wielding. They loved her much, but they loved their children more, and they would not suffer her to forge chains for freeborn limbs, nor permit that they and theirs should breathe by royal permission. When the dangers which caused the people for a while to submit themselves wholly to her, had passed away, no time was lost in winning back rights and privileges which Elizabeth and her high-handed father had taken into their own hands. In the re-conquest it was inevitable that collisions should take place between the queen and the Parliament, and collisions did actually take place; but owing to the perseverance of the House of Commons, and to the great good sense of Elizabeth, who always knew when to loosen the reins which were being held too short, the result of these disputes was always favourable to right and liberty, and never cost the queen a whit of her people's affection. But when she died, in 1603, and was succeeded by James of Scotland, there were still some ugly instruments at the disposal of the crown against

the liberty of the subject. The wisdom of Elizabeth's advisers had used these instruments sparingly, and had kept them as much as possible out of sight. They were now to fall into hands which knew not how to use them wisely—hands which clutched the blade instead of the hilt of the weapon, and got themselves badly ent accordingly.

The ugly instruments in question were the Star Chamber and High Commission, tribunals unknown to the common law of the land, exercising a jurisdiction quite incompatible with the existence of liberty, and apt to become the means of all sorts of oppression. It would take too much space to examine here the whole history of these courts. With regard to the former of them, the Star Chamber, much ignorance prevails, and advantage has been taken to throw a sentimental and false colour upon its actions, with a view to making it an element in the composition of historical romances. It will be sufficient to say that it was a court composed of the king himself, and such members of his privy council as he chose to summon; that it took cognizance of certain offences not then noticed as such by the ordinary law courts, such as libel and slander, and also assumed a right to take any case it chose from the consideration of the regular courts of law, and especially the criminal courts, and deprived a man in this way of the right of trial by his peers, which had been secured for him by Magna Charta. The lords of the council were at once judges and jury, even in cases where the crown was concerned; there was not any appeal from their sentence, and the sentences of the court were often most ruinous (notwithstanding the clause of the Great Charter which forbade any man to be fined to such an extent as would prevent his getting a livelihood), even where they did not condemn a man to imprisonment, and sometimes to torture. Any punishment short of death—and many of the punishments came only just short of it—the court of Star Chamber asserted its power to inflict; and the claim having been put forward in action at a time when men were not able to question it, came at length to be looked on almost as a matter of course, except by those who suffered by it, and by those faithful guardians of the liberties of England who only bided their time to announce that the court itself was an illegal thing, and ought to be abolished.

The High Commission was a tribunal invented under Queen Elizabeth, a sort of ecclesiastical Star Chamber, composed of ecclesiastics, who made it their business to "sniff out moral taints," and to be down on any one who worshipped God in any other way than that prescribed by the Church of England. It was armed with power to fine and imprison, and this power it used till resistance became so strong, even under Elizabeth, that it was deemed prudent to admonish it from above. It was a sort of Protestant Inquisition; but Englishmen were not Spaniards, and the seeds of priestly tyranny were crushed ere they could grow into a plant. Still it existed, in company with the Star Chamber, which ever waxed more and more intolerable in its administration under the successors of Elizabeth.

Men had endured much from the Tudor princes, as they always will endure at the hands of rulers whose strong personal character makes them respected, even though feared; but from princes of the House of Stuart, they were by no means ready to put up with insult and oppression, so that when members of Parliament were cited to appear in the Star Chamber to answer, as to a crime, for language spoken by them in their place in Parliament, they resisted, and remonstrated with the king, and declared what he had done to be a breach of privilege of Parliament. Against other acts of the Star Chamber, and of the government, the Houses also protested, and Puritans in politics, as well as in religion, who had been trained up in Elizabeth's parliaments, and who sat in the parliaments of James, uttered their words of remonstrance and warning, not fearing even the dismal dungeons in the Tower, which the chances were would be their reward for their boldness.

The king was despicable, his government was weak: the Parliament men were for the most part noble, and unquestionably they were strong; so all through the reign of James I., 1603-1625, there were perpetual conflicts between the sovereign and the people, and though when the king died the Crown had not given up any of its so-called prerogatives, there had been conjured up a deep spirit of resistance to them, a spirit which found expression in the reign of James's successor, his ill-fated son, Charles I.

But much had yet to be borne before order-loving, law-fearing

Englishmen could be induced to rise up and say, "This thing shall not be." With a government as weak, or weaker than James's, Charles pretended even greater claims than his father, and exercised his prerogative even more annoyingly and more tyrannically. He levied certain taxes on the people, not only without the consent of Parliament, but in direct contravention of several statutes; he issued proclamations, and required them to be obeyed as laws; he resented the offer of advice as unwarrantable interference; and he refused finally to summon the counsellors, whose advice was always so unpalatable. Brought up in the notion that kings are appointed directly by God, and that the Church of England was also of Divine institution, he put forward offensively his own claims on the one hand, and backed with all his might the claims of the Church on the other. In order to do this he was necessitated to employ very extensively, in the face of increasing opposition, the two courts of which mention has been made.

Two members of Parliament, Sir John Eliot and Sir Dudley Digges, were imprisoned by order of the Star Chamber, for "seditious" words used by them, as members, when the Duke of Buckingham was impeached; and when the House refused to vote supplies till its members were released, the king threatened them, but gave way about his prisoners. Then came a series of attacks on the constitution by the king and his ministers, which were repelled with more or less damage to the good-will between him and his people; the king tried to govern without Parliament, and Parliament was resolved there should be no peace for him if he did. With the Earl of Strafford as chief adviser in state affairs, and Archbishop Laud as head of the Church, Charles strove to make himself an absolute king, caring little apparently how rough-shod he rode over the feelings and affections of his people. The honour of the nation was forgotten by a disgraceful foreign policy, pirates from Morocco were allowed to prey upon ships in the English Channel, the influence of England abroad had sunk to zero, and at home all power and statesmanship were directed to the one object of laying the nation, bound hand and foot, at the feet of the king.

The Star Chamber was set in motion against the opponents of the kingly power, and indeed against all who ventured to criticise the actions of government. Sir David Foulis was fined £5,000 for dissuading a friend from paying an unlawful tax; Prynne, a barrister of Lincoln's Inn, for an abusive book he had written against some of the practices in the king's household, and against the ultra-High Church practices of the primate, was sentenced to be disbarred, to be put in the pillory at Cheapside and at Westminster, to have both ears cut off, to be fined £5,000, and to be imprisoned for life! People were ruinously fined for turning their arable land into pasture, in contravention of some obscure law of Henry VII.; for refusing to lend money to the king; and for encroaching on the royal forests. One man, Morley, was fined £1,000 for reviling and striking one of the king's servants at Whitehall; another, named Allison, was fined £1,000, imprisoned, and pilloried at Westminster, for having said falsely that the Archbishop of York had incurred the king's displeasure. For calling the Earl of Suffolk "a base lord," Sir Richard Granville was ordered to pay £4,000 to the earl and £4,000 to the king; Sir G. Markham having thrashed Lord Darcy's huntsman for abusing him, and having promised to do the like by Lord Darcy, should he approve his servant's conduct, was fined £10,000.* Landed proprietors being ordered by the king's proclamation not to live idly in London, but to go to their estates, were fined in the Star Chamber for non-compliance. In 1637 Burton, a divine, and Bastwick, a physician, were condemned for sedition and schism to the same punishment as had been inflicted on Prynne, and that unfortunate man having again offended, was further mutilated and fined another £5,000. Williams, Bishop of Lincoln, was fined £10,000, and sent to the Tower, for some trumpery offence against Laud; Osbaldistone, the master of Westminster School, for having nicknamed Laud in a letter to Williams, was ordered to be pilloried before all his school, and to pay £5,000, but he saved himself by flight. Lilburne, charged with distributing seditious pamphlets, was whipped by the hangman, pilloried, and imprisoned with irons on him.

It was under circumstances like these, when despair seemed

* This case occurred in the previous reign, but it shows the tension to which the power of the court could be strung.

to have seized the minds of men; when the king was hurrying forward headlong in a career of violent misgovernment, and no one was found to stand in his way and stop his mad course; when oppression seemed to be triumphant, and right and justice were openly trodden under foot; when honour had gone from England, and the homes of her people were no longer pleasant places, that Hampden, and Pym, and Hazelrig, and Cromwell proposed to quit her shores and begin life anew in America. The royal order, arbitrarily issued, prevented them as we have seen. They returned to their homes and their duties, and when, compelled as a last resource to summon Parliament, whose advice he had not sought for eleven years, the king again addressed the House of Commons, these men were in their places, resolved to do their duty to the uttermost, even to exceed it

Earl of Strafford, the supporter of the impeachment of Laud, the life and soul of all the constitutional opposition which the parliament made to the king. His name is not to the warrant for the execution of Charles I. (January 30, 1648-49), though with Hampden, Hazelrig, and two more, he was one of those five members whose arrest the king in 1641 endeavoured to effect in person (see "Historic Sketches," IV., page 120); but his name stands out brilliantly among those advanced patriots and purely disinterested men who in 1641, immediately after the execution of Lord Strafford, wrung from the king a consent to the abolition by statute of the courts of Star Chamber and High Commission.

Of Oliver Cromwell, the fourth man among the detained, it is unnecessary now to write. Much has been said for him,



JOHN PYM. BORN 1584. DIED 1643.

some will say. Be that as it may, of the men whom Charles's order stopped from emigrating, Hampden in the same year brought forward the question of the king's right to levy taxes, when he resisted even to trial the demand which was made on him for ship-money; and he fell subsequently, mortally wounded, at Chalgrove, early in the war between the king and the parliament. Sir Arthur Hazelrig was foremost among the more intemperate enemies of the king in all the subsequent troubles, but he did not identify himself remarkably with any of the great questions upon which the sword had finally to pronounce judgment. Of Pym much, but scarcely enough, has been written. Unselfish, truly persuaded as to the course he was pursuing, unswerving in his fidelity to that course, incorruptible, calm amidst tumults, a fountain of wisdom in a sea of folly, he was eminently fitted for the post which he a long while filled, that of leader of the popular party in the House of Commons. He was the framer of the articles of impeachment against the

much more, but less weighty, has been said against him; but his name and his character have brightened since the light of honest, critical inquiry was turned upon him. Some there are who cannot admire him enough for his policy, which raised the foreign influence of England to a height it had not attained since Henry the Fifth was crowned in France, and which at home brought order, albeit by a stern method, out of the chaos into which the Great Rebellion had thrown all things. Others there are who seem to think that nothing can atone for a usurpation which nevertheless declined to perpetuate itself by establishing a dynasty, and who can never forgive or forget the fact that Cromwell's name appears among the first signatures on Charles's death-warrant, and that but for him that death-warrant would never have been written.*

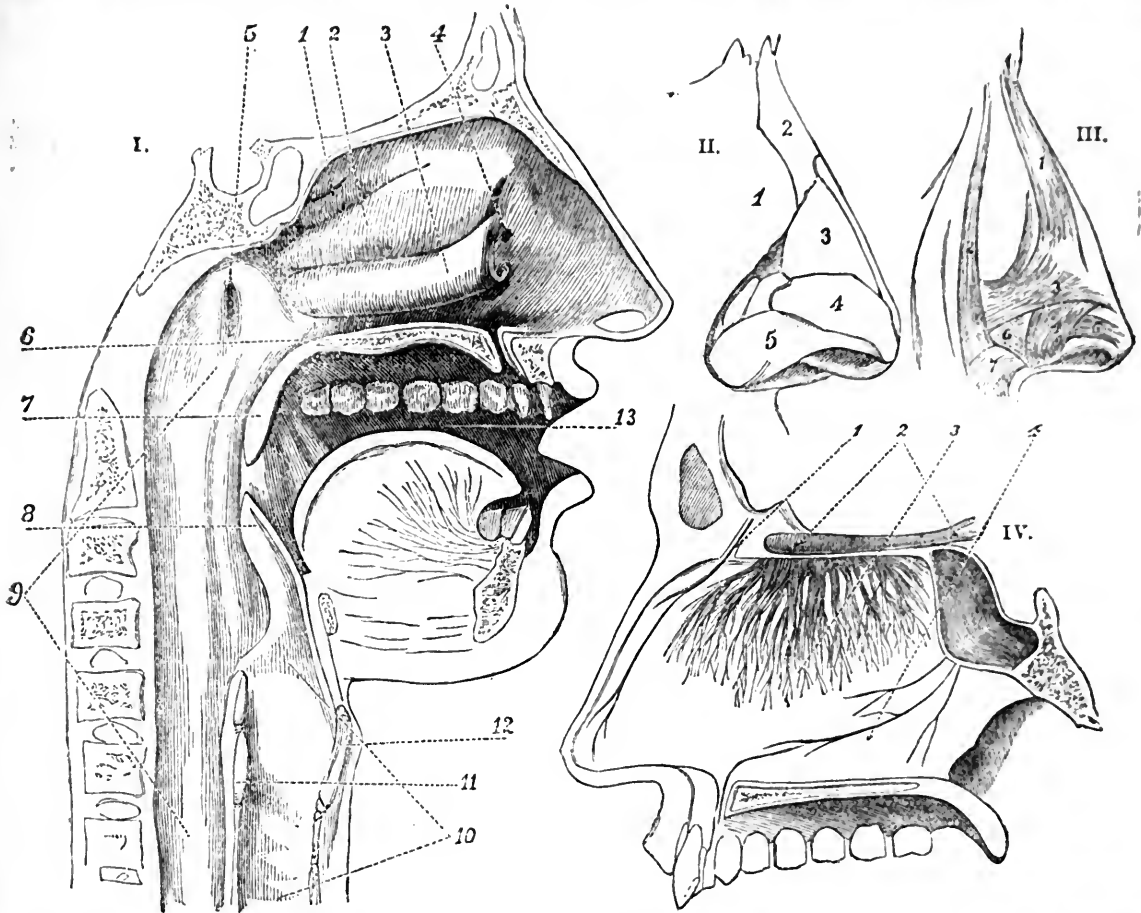
* For Synopsis of Events in the Life and Reign of Charles I., and List of Contemporary Sovereigns, see page 122.

ANIMAL PHYSIOLOGY.—VII.

THE ORGAN OF SMELL.

In the preceding articles on the organs of sight and hearing it was remarked that while the sensations excited through their agency were so different, the external causes which operated on the eye and ear respectively were not dissimilar. Rapid vibrations, propagated by bodies themselves in violent but otherwise unnoticed vibration, are conveyed through intervening media for great, and, in the case of light, unlimited distances, by waves which are capable of indicating the direction from which

nected with mental operations. Their uses have more relation to our animal than to our intellectual life, and the appetites which arise from a desire to gratify these senses have always been considered to be less refined and more sensual than those which pertain to the senses of sight and hearing. It is true that a spurious delicacy and refinement of the sense of smell have caused the wealthier classes in times of high civilisation to delight in costly and rare essences and scents; but the extensive use of those has been the characteristic of effeminate races, and of times when civilisation, in its highest sense, had begun to succumb to luxury. When Rome boasted of her



I. VERTICAL SECTION OF HUMAN HEAD, SHOWING THE RELATION OF THE PASSAGES FOR AIR AND FOOD. II. FRAMEWORK OF THE NOSE. III. MUSCLES OF THE NOSE. IV. SEPTUM OF THE NOSE AND ITS NERVES.

Ref. to Nos. in Figs.—I. 1, upper turbinate bone; 2, middle do.; 3, lower do.; 4, hole leading to the canal which drains the eye; 5, Eustachian hole; 6, palate; 7, uvula; 8, epiglottis; 9, pharynx; 10, larynx; 11, cricoid cartilage; 12, thyroid cartilage; 13, cavity of the mouth. II. 1, part of upper jaw bone; 2, nose bone; 3, upper side cartilage; 4, lower do.; 5, cellular tissue. III. 1, pyramidal muscle of the nose; 2, muscle to lift the side cartilages; 3, compressor of the nose; 4, front dilator of the nostril; 5, small compressor of the nostril; 6, hind dilator of the nostril; 7, muscle to pull down the side cartilages. IV. 1, nerve of the lobe of nose; 2, olfactory lobe; 3, nerves of the septum; 4, nerve of palate.

they proceed. These vibrations, therefore, can inform the mind concerning objects far removed from its instrument, the body, with an accuracy which makes us scorn the idea that we can be deceived in that which our eyes have seen and our ears heard. Through these avenues the human mind extends itself, till it touches, and by the aid of reason may be said to grasp, the universe; and the highest powers of the mind are employed in interpreting the messages brought to us by light and sound.

In marked contrast to these are the remaining senses of which we have to write—namely, those of smell, taste, and touch. These senses are excited by material particles applied directly to those parts of the body which can take note of their peculiar qualities, and hence they are far less necessarily con-

costly perfumes, she had almost ceased from the prouder boast of being mistress of the world; and the more manly tone of modern and western society has decided between Hotspur and the fop, to the prejudice of the latter.

Matter or material substances exist in three forms—the solid, liquid, and gaseous; and almost all substances can be made to assume each of these forms. Thus ice may be transformed into water and into steam. When the particles of matter hang together so closely and rigidly that they will not move over one another without the application of force, they form a solid. When the particles hang together so loosely that they will move over and round each other with the slightest force, so that they can scarcely be said to hang together at all, the substance is called a liquid. When the particles not only do

not hang together, but exert a force to fly off from one another, the substance they form is called a gas. The sense of touch, strictly and properly defined—that is, excluding the sensation of heat and of resistance—has to do with solids. The sense of taste has to do with liquids only, as nothing is sapid which is not liquid or capable of being dissolved. The sense of smell occupies itself with gases; for these alone can gain access to the organ, or cause the sensation of smell. Lest the reader should suppose this statement opposed to the testimony of his experience, from the well-known fact that solids, such as cedar-wood, camphor, and musk, excite the sensation of smell, while ordinary scents are preserved and carried about in a liquid form, it must be explained that these substances contain volatile essential principles, which, on free exposure to the air, are slowly given off in a state of vapour. Some solids give off particles of their substance in a state of vapour without first becoming liquid, as is ordinarily the case. Thus snow, which coats the earth in winter, will diminish daily, even though the air is frosty, and there is no melting process going on. In other cases, as in cedar-wood, oils naturally volatile seem to be long entangled in the solid matter, and but slowly rendered to the air; but their odoriferous power is so great that very small portions of them produce strong perfumes. This is sometimes truly wonderful. Dr. Carpenter states that a grain of musk may be freely exposed to the air for ten years, during which time it perfumes the whole surrounding air; yet when weighed, there is no perceptible loss observed. Matters which exhale odoriferous emanations are detected at a great distance, from the tendency of gases to pass through and diffuse themselves equably throughout all other gases. Thus, though there be but a very small escape of coal-gas in one part of the room, it soon announces itself to the nose in every corner of the apartment. This is a faculty peculiar to gases, and produces many interesting results, which, however, cannot now be dwelt upon.

The final cause for which the sense of smell is given to the higher animals—i.e., to beasts, birds, and reptiles—is primarily to warn them against receiving into the lungs and stomach noxious matters, and secondarily to guide them in the search for wholesome air and food. As a rule, to which, however, there are many exceptions, noxious smells are associated with noxious gases, and that food which gives off a pleasant aroma is of a nature, and in a condition, to supply good nutriment. The bulk of the atmosphere consists of inodorous gases, admirably mixed so as to suit the purposes of respiration, and the main products of vegetable life are nutritive and bland; but small quantities of destructive effluvia and of deadly poisons are no uncommon things in nature, and unless some kind of quarantine were exercised on air and food, the system could not be maintained in health. True, therefore, to its office of sanitary inspector, the organ of smell holds a position at the entrance of the passages for air and food. In order to appreciate its office it is necessary to understand the relation of these passages to one another. This is best done by a reference to the illustration. The largest figure represents the nose chamber of the left side; the hollow of the mouth below it; the pharynx, or channel for food, running down towards the stomach on the left side (of the figure); and the larynx, or channel of the air, when pursuing its course to the lungs, parallel to it, on the right-hand side, as they would appear if the head were cut in two with the downward stroke of a sharp, resistless knife, made as near to the middle plane as possible, yet so as to be on the left of the upright partition between the two nose-chambers. The ordinary course of the air, when no food is being swallowed, is upward through the nostril, then horizontally through the lower part of the nose-chambers, then downward and forward behind the soft palate, entering the hole immediately below the part marked as the "epiglottis," and so on to the lungs. The simpler course of the food is horizontally through the mouth, and then vertically downward. If the reader has understood the engraving, he will see that the air and food passages cross one another; or, perhaps, it makes it more clear to say that the air passage enters the food canal from above, and passes out again below and in front of it. This is a singular arrangement, and open, one would have said, to the obvious objection that the food might get into the lungs, where it is not only not wanted, but could not be for a moment endured. This catastrophe is, however, provided against by the act of swallowing, in which the soft palate closes the air

entrance above, and the epiglottis is bent down, while the sides of the hole below are so contracted beneath its overhanging and protecting hood, that the food passes over it, and the drink on each side of it, without danger of their making an entrance into the larynx. It will be seen that the effluvia from food not only rises into the nasal organ when it is presented to the mouth, but passes to it, also, after it has been introduced into the mouth, so that the nose is an effective guard to this entrance, as well as to that which it more immediately occupies.

The external protecting framework, or nose, covers in the nasal chambers in front, and, on account of its oblique direction, overhangs the orifices, which are further defended from intrusive solids by a number of stiff hairs. At the upper part, or roof of the nose, this framework is of bone, because there no flexibility is required, but towards the point it is composed of cartilages, which are more elastic, and which can also move in relation to one another, while the outer and lower sides of the orifices are composed of yet more bendable cellular tissue. These wings of the nose can play up and down, and to and from, the central partition by the action of muscles, so as to enlarge, contract, or slightly alter the direction of the openings; but the framework is, nevertheless, stiff enough to keep the nostrils moderately distended while in a state of rest. Stretching horizontally backward from the nose are the nasal chambers, divided from one another by a plain partition, which is bony behind and gristly in front, and they pass under the chamber of the brain and over the cavity of the mouth, to open backward over the throat. Solid floors of bone divide this second storey of the head from the upper and lower rooms, and bones also wall in the right and left sides. These walls, however, are not smooth and plain like the central partition, but have three bony projections one above the other, which are called turbinated bones, because they are curled upon themselves like scrolls, the first convex surface of the scroll being directed inwards. These turbinated bones stretch inwards, nearly reaching the plain partition, and thus divide each lateral chamber into three horizontal passages, called the upper, middle, and lower meatuses. All the interior of the chambers is covered with a membrane, which is very thick and pulpy on the scroll bones, the roof of the chamber, and central partition. This membrane is peculiar in that it secretes a slimy mucus, it is very vascular, and so contains much blood, and the ultimate fibres of the nerve of smell lose themselves in its substance. The nervous apparatus of smell on each side arises from under the brain by three roots; it is in the shape of a little round horizontal bar of brain matter, ending in a bulb, and it lies in a groove of the soft brain above, and of the hard bone beneath, being separated from its fellow by a crest of bone. These bulbs being placed in the brain-case, send down, from all along their course, through many holes in the bones on which they lie, nervous cords, which divide and subdivide, and run, some to the vertical central partition, some to the top scroll-bone, and some to the roof of the chamber. Their distribution, of course, indicates where the sense of smell resides, that is, not in the main channel of the air, which passes along the floor of the passage, but in the upper part of the chamber. Hence, when we want to smell anything, we take means to get the gas driven upward into the upper part of the nose. This is effected by contracting the nostrils, and drawing the air suddenly and sharply in, so that it is directed upwards instead of along the floor of the passage.

It has been remarked that the membrane of the nose is very full of blood-vessels, and this is important, because the presence of much warm blood, distributed over a surface purposely folded to give it a greater extent, has a tendency to warm the cold air as it passes through the complicated channels before it is introduced into the lungs. That cold air, introduced through the nose, instead of through the mouth, is less likely to be injurious, is so far recognised, that respirators are used by delicate persons in cold air, while it is not thought necessary thus to protect the nose.

There are curious connections between the nasal chambers and the hollows in many of the bones of the face and head, which are analogous to the air cavities of birds' bones. The nose has also another office, in that it serves as a sewer for the eye. Two little ducts from the inner corner of the eye join and form a tube, which, after passing through a bony canal, delivers its drainage into the lower meatus of the nose by a small orifice, shown in the engraving. Hence, violent blowing

of the nose is often resorted to in order to clear the eye from dust and tears.

So far as concerns ourselves, the use of the olfactory organ is rather to teach us what to avoid than what to seek, and the pleasures of smell are rather incidental to other healthful conditions than much prized on their own account; yet the varied fragrance of a thousand flowers, so delicately diffused as not to pall the sense, or to surcharge the pure air, is no small addition to the delights of the garden and the country. If, however, we endeavour to imprison these odours, and make them our own, they are nearly always suggestive of a sickly effeminacy, and have called down sneers on their possessors. Thus, Cowper writes—

"His better hand, more busy, gives the nose
Its burgamot;"

and Tennyson—

"His essences turned the live air sick;"

and again Shakespeare—

"He was perfumed like a milliner."

LESSONS IN ENGLISH.—VIII.

PREFIXES (continued). I

Apo, of Greek origin, *from*; as *apostle*, from the Greek *απο* (pronounced ap'-o), *from*, and *στέλλω* (pronounced stel'-lo), *I send*; that is, a person sent from one to another, a messenger.

Apo has the force of our English prefix *un*, as in *uncover*. This is its exact import in the word *apocalypse*, a *revelation*, from the Greek *απο*, and *καλυπτω* (pronounced ka-lupe'-to), *I conceal*; that is, according to the Latin, an *unveiling*; and according to the Greek, an *uncovering*.

"O for that warning voice which he who saw
Th' *apocalypse*, heard cry in heaven aloud."—Milton.

Arch (*ch* sounded like *k*), of Greek origin (from *αρχη*, pronounced ar'-ke, a *beginning*), in the forms *arch*, *arche*, and *archy*, denotes the *origin*, the *head*, and hence *government*. It is the second syllable in *monarch*, *monarchy*; and as the letter which in Greek represents the *ch* is pronounced like *k*, *arch* thus introduces a Greek pronunciation into our tongue. Hence you may learn the error which pronounces *architect* (from *αρχη*, *first*, or *head*, and *τεκτων*, pronounced teek'-ton, a *maker* or *builder*), as if its *arch* was pronounced like the monosyllabic word *arch*; that is, the *arch* in a *building*.

Besides a *type* and an *antitype*, theology recognises an *archetype*, or *original type*, an original mould or model, in which, in virtue of which, and after the likeness of which, all created beings were formed, as was taught by the Greek philosopher Plato.

"There were other objects of the mind, universal, eternal, immutable, which they called original ideas, all originally contained in one *archetypal* mind or understanding, and from thence participated by inferior minds and souls."—Cudworth.

This word *arch* (from *αρχη*) is found also pronounced in the ordinary English manner, as in *archbishop*—that is, a *chief* bishop, the chief bishop of a province. In its signification of *chief* it is used also to denote something questionable, bad, or humorous.

"Doggett thanked me, and after his comic manner spoke his request with so *arch* a leer that I promised," etc.—Tatler.

"Come, tell us honestly, Frank," said the squire with his usual *archness*, 'suppose the church, your present mistress, drest in lawn sleeves, on one hand, and Miss Sophia, with no lawn about her, on the other, which would you be for?'"—Goldsmith.

Auto, of Greek origin, equivalent to *self*, is found in *autocrat*, from the Greek *αυτος* (pronounced aw'-tos), one's *self*, and *κρατια* (pronounced krat'-e-a), *power*, *government*, one who governs of himself and by himself; hence *autocracy* is arbitrary power, despotism.

"The divine will is absolute; it is its own reason; it is both the producer and the ground of all its acts. It moves not by the external impulse, or inclination of objects, but determines itself by an absolute *autocracy*."—South.

Be, of Saxon origin, in the forms *be* and *by*, connected pro-

bably with the verb *to be* and the preposition *by*, denoting the active power or agent, as a prefix, performs the part of an intensive, and increases, sometimes in a bad sense, the inherent import of a word; e.g., *beloved*, *bedaub*, *besmear*, *bepraise*. In other cases it seems to do little more than aid in forming words, as an adverb out of an adjective; as *behind* (*hind*, *hinder*), *before*, *below*, *beneath*. The adverb *betimes* (*early*) is made up of *by* and *time*, *bytime*; that is, *in time*.

"He that goes out *betimes* in the morning is more like to dispatch his journey than he that lingers till the day be spent."—Bishop Hall.

By means also, *near*, as "Stand *by me*."

"And as he (Jesus) passed *by*, he saw Levi" (Mark ii. 14).

Hence the phrase *by and by* denoted *immediately*, as may be seen in Mark vi. 25, in which, and in other passages of Scripture, it is the representation of a Greek word which signifies *straightway*, *forthwith*. The repetition of the *by* may have had emphasis for its object. Hence is explained the word *by-stander*, that is, one who stands near. At present, *by and by* seems in conversation to intimate some little distance of time from the actual moment.

Bene, a prefix of Latin origin (from *bonus*, *good*; *bene*, *well*), is found in union with words of Latin origin; thus with *facio*, *I do*, and its parts *facere*, *factum* (in combination *a* may pass into *i*), it forms *benefaction*, *benefit*, *beneficial*, *beneficent*; so in union with *dico*, *I say* (*dicere*, *dietum*), *bene* forms *benediction*, and with *volo*, *I am willing*, it forms *benevolent*. Hence, one who is benevolent is one who *wishes* well; and one who is beneficent is one who *does* well; a benediction is a *goal word*, a blessing, and a benefaction is a *good deed*, a gift. The opposite prefix is the Latin *male* (pronounced ma'-le), *ill* or *evil*. The contrast is well illustrated in these words, where, as in other instances, the old spelling is retained, as offering so many historical facts—

"The king, willing to show that this *benefit* was to him much acceptable, and not worthy to be put in oblivion, called this grant of money a *benevolence*, notwithstanding that many with grudge and *malevolence* gave great summs toward the new *founde* (*found*) *benevolence*."—Hall, "Edward IV."

Bi, in the forms of *bi* and *bis*, of Latin origin (*bis*, *twice*), has in English the force of *two* or *twice*; *biped* (*pes*, Latin, a *foot*), *two-footed*, *biscuit* (*cuire*, French, *to cook*), *twice-cooked*.

"The inconvenience attending the form of the year above mentioned, was in a great measure remedied by the Romans in the time of Julius Cæsar, who added one day every fourth year; which (from the place of its insertion, viz., after the sixth of the calends of March) was called *bissextile* or leap-year."—Priedly, on *History*.

Cata, of Greek origin (*κατα*, pronounced kat'-a, *down*), properly denotes motion in a downward direction, and appears in the word *catacact* (from the Greek *κατα* and *ρασω*, pronounced ras'-so, *I strike* or *dash*), which, according to its derivation, signifies a *breaking-down*; that is, of the rock which leads to a downfall of water. This prefix is found in other words of Greek origin, as in *cataclysm* (from the Greek *κατακλυσμος*, pronounced kat-a-klus'-mos, a *deluge*, from the verb *κατακλυω*, pronounced kat-a-klu'-zo, *to inundate*), a term applied to the deluge.

"The *catacombs* are subterranean streets or galleries from four to eight feet in height, and from two to five in breadth, extending to an immense and almost unknown length, and branching out into various walks under the city of Rome."—Eustace, "Italy."

Cent, of Latin origin, from *centum*, a *hundred*, is found in *centenary*, a *hundred* or *hundredth*; *centuple*, a *hundred-fold*; *centurion*, a commander of a *hundred* soldiers in the Roman army. The old Saxon word *hundredor* may be compared with *centurion*.

"Hundredors, aldermen, magistrates, etc."—Spelman.

The import of *hundredor* or *hundreder* may be learnt from the following words, describing the ancient civil division of England for the purpose of government:—

"As ten families of freeholders made up a town or tithing (a tenth), so ten tithings composed a superior division, called a *hundred*, as consisting of ten times ten families."—Blackstone, "Commentaries."

Circum, of Latin origin (Latin, *circus*, a *circle* or *ring*), signifies around, as in *circumstances* (from *circum*, and the Latin verb *sto*, *I stand*), literally *the things which stand around you*; what has

been called "a man's surroundings." *Circum* enters into the composition of many words; e.g., *circumnavigation*, *circumlocution*, *circumspect*, *circumscribe*, etc.

"The *circumscription* of a thing is nothing else but the determination or defining of its place."—More, "Soul."

Cis, of Latin origin, signifying *on this side of* (Rome being considered the centre), is found in *Cisalpine*, *this side of the Alps*, in opposition to *Transalpine*, *on the other side of the Alps*. *Gallia Cisalpina* was what we call Lombardy; *Gallia Transalpina* was Gaul or France.

Co, of Latin origin (*cum*, *with*), occurs in the forms *cog*, *col*, *com*, *con*, *cor*.

Co, as in *coalesce* (from *co* and *aleo*, Latin, *I grow*), to *grow together*; it is found in the derivatives *coalesce*, *coalition*.

"No *coalition* which, under the specious name of independency, carries in its bosom the unreconcilable principles of the original discord of parties, ever was or will be a healing coalition."—Burke, *on the Nation*.

Cog, as in *cognate* (from *cog*, and *natus*, Latin, *born*), *born with*, of the same family or kind; *cog* is found also in *cognition* (Latin *cum*, *with*, and *nosco*, *I know*), *knowledge*; a means of knowing, a *cognisance* or token.

"For which cause men imagined that he gave the sunne in his full brightness for his *cognisance* or badge."—Hall, "Henry IV."

Col, as in *colloquial* (Latin *cum*, *with*, and *loquor*, *I speak*), *relating to conversation*; as also in *collusion* (from *col*, and *ludo*, Latin, *I play*), *a playing together*; that is, to deceive.

"Well, let us now leve the cloked *collusion* that remayned in France, and return to the open dissimulation which now appeared in Englande."—Hall, "Henry VI."

Com, as in *commemorate* (from *com*, and *memor*, Latin, *mindful*), *to keep in mind*, *to recall to mind*; found in *commensurate*, *commutate*, *commute*, *compact*, etc.

"A different spinning every different web
Asks from your glowing fingers; some require
The more *compact*, and some the looser wreath."

Dyer, "Fleece."

Cor, as in *correct* (from *cor*, and *rego*, Latin, *I rule*), and *correspond*, *corrode*, *corrupt*, *corrugate* (from *cor*, and *ruga*, Latin, *a wrinkle*).

"The full lips, the rough tongue, the *corrugate* cartilaginous palate, the broad, cutting teeth of the ox, the deer, the horse, and the sheep, qualify this tribe for browsing upon their pasture."—Paley, "Natural Theology."

Contra, of Latin origin (*contra*, *over against*), as in *contraband* (*bannum*, low Latin, *a decree, law*), *against the law*, *smuggled*; and in *contradict*, *contrary*. *Contra* appears in another form—namely, *counter*, *counterfeit* (from *counter*, *contre*, and *faire*, French, *to make*), and in *counterpane*, *a covering*.

"On which a tissue *counterpane* was cast,
Arachne's web the same did not surpass,
Wherein the story of his fortunes past
In lively pictures neatly handled was."

Drayton, "The Barons' Wars."

De, of Latin origin, denoting motion downward, has, in combination, the following meanings, being modifications of its original import.

1. *Down*, as in *decrease*, *develop* (Latin, *volvo*, *I roll*); *de-throne*, *to put down a king*.

"The question of *dehroning* or cashiering of kings will always be an extraordinary question of state, and wholly out of the law."—Burke, "French Revolution."

Also in *debase* (from *de*, and *battere*, French, *to beat*), which originally meant to lower in regard to material things; e.g. :—

"King Edward III., in the sixteenth year of his reign, proclaimed that no man should sell wool-fels or leather under such a price, so that these staple commodities might not be *debased*."—State Trials, 1606.

The application of the word *debase* to a moral influence is exemplified in this citation :—

"Sam. So let her go. God sent her to *debase* me,
And aggravate my folly, who committed
To such a viper his most sacred trust
Of secrecies, my safety, and my life."

Milton, "Samson Agonistes."

2. *From*, as in *debar*, *to bar or keep from*, *to prevent*.

"His song was all a lamentable lay,
Of great unkindness, and of usage hard,
Of Cythia, the lady of the sea,
Which from her presence faultless him *debarred*."—Spenser.

3. *Out, thoroughly*, as in *declare* (*de* and *clarus*, Latin, *clear*), in which the prefix has the form of an intensive; *to make clear*, that is, by utterance.

4. *Not*, with a force like *un* in *undo*, reversing the sense; as, *decompose*, *to do the opposite of composing*, that is, *compounding*; *decollation* (*de* and *collum*, Latin, *the neck*), *un-necking*, that is, *beheading*, *decorticate* (*de* and *cortex*, Latin, *bark*), *to strip off the bark*; *defame*, etc.

"Bless ye men that curse you, ye ye for men that *defamen* you."—Wiclif, "Test.," Luke vi.

Deca, of Greek origin, meaning *ten*, is found in *decade*, a period of *ten years*; in *decatalogue* (from the Greek *deka*, pronounced *deck'-a*, *ten*, and *λογος*, pronounced *log'-os*, *word, discourse*), *the ten words or commandments of God*. *Deca* is found also in the Latin form of *decem*, as in *decemviri* (Latin, *decem*, *ten*, and *vir*, *a man*), *the decemvirs*.

"By this time were the ambassadors returned with the Athenian laws. And therefore the tribunes (at Rome) were so much the more earnest and urgent that once at length they would set on to describe and put down some laws. And agreed it was that there should be created *decemvirs* above all appeale."—Holland, "Livy."

Demi, of Latin origin, in the forms *demi*, *semi*, *hemi*, *a half*, is found in *demy*, in *sembreue*, and in *hemisphere*.

"Thou wouldst make an absolute courtier, and the firm fixture of thy foot would give an excellent motion to thy gait, in a *semi-circled* farthingale."—Shakespeare, "Merry Wives of Windsor."

A farthingale is a hooped petticoat or gown.

Dia, of Greek origin, *through* (so as to divide), is found in *diameter*, *a measure through*, from one side of the circle to the opposite; in *diagonal* (from the Greek *dia*, pronounced *dy'-er*, *through*, and *γωνια*, pronounced *gon'-i-cr*, *a corner or angle*), *a line drawn from corner to corner*; in *dialogue* (from *dia* and *logos*, Greek, *a discourse*), etc.

Var. How dost, fool?

Ape. Dost dialogue with thy shadow?

Var. I speak not to thee.—Shakespeare, "Timon."

Dia is abbreviated into *di*, as in *dichotomy* (from the Greek *dia*, *through*, and *τεμνω*, pronounced *tem'-no*, *I cut*), *a twofold division*, or class.

"All things reported are reducible to this *dichotomie*: 1. the fountain of invention; 2. the channell of relation."—Fuller, "Worthies."

Dis, or *dia* in another form, may be rendered by the phrase, *in two directions*, or in different ways, as in *distract* (from *dis* and *traho*, *I draw*); *to distract* is to draw a person's mind in two or more directions so as to produce confusion and pain. *Dis* is found in these forms, namely, *di*, *dif*, *div*.

Di, *dif*, etc., as in *diverse* (from *di* and *versus*, *turned*), *turned in opposite directions*, *different*, *opposed*—

"And for there is so great *diversitie*

In English, and in writing of our tong,

So pray I God that none miswritè thee,

Ne misse the metre for default of song."

Chaucer, "Troilus."

Dif, as in *difficult*, where the *dif* (*dis*) has a reversing force; *difficult* comes from *dis* and *facilis*; *facilis* is the Latin for *easy*, the *a* being changed into *i*, as is customary in compounds of *facio*; so that *difficult* is equivalent to our *uneasy*; that is, *not easy*.

Dir (of Latin origin), as in *dirge*, *a sacred song*, so called from the beginning of the Psalm, "Dirige nos, Domine" (*Direct us, O Lord*), and accustomed to be sung at funerals.

"The raven croaked, and hollow shrieks of owls,

Sung *dirges* at her funeral."

Ford, "Lover's Melancholy."

Down, of Saxon origin, is the expression of *descent*; hence motion from a higher to a lower level; and hence, perhaps, the application to "the downs," that is, hillocks viewed in relation to their declivities. *Down* was formerly used as a verb.

"The hidden beauties seemed in wait to lie,

To *down* proud hearts that would not willing die."

Sir P. Sidney, "Arcadia."

Dun, in Saxon, signifies an elevation, a hill, and even a mountain; it may be the origin of our *ton* as in *Broughton, a fortified height*. *Downs* may be hence derived. In "Webster's Dictionary" *Downs* are defined as "*ridges of high land, such as lie along the coasts of Essex and Sussex, in England; hence roads in which ships lie off these hilly coasts at anchor.*" What is called "*Salisbury Plain*" is, in the parts near the city, a chalky *down*, famous for feeding sheep.

The student will do well to continue his study of the Saxon elements of our language. For this purpose I recommend to him the poetry of Wordsworth, the simpler portions of which are pre-eminently Saxon. In order that he may have a specimen under his eyes, the opening stanzas of "*Lucy Gray*," by Wordsworth, are given in the following

EXERCISE.

1. Parse the following stanzas:—

Oft I had heard of Lucy Gray;
And, when I crossed the wild,
I chanced to see at break of day
The solitary child.
No mate, no comrade, Lucy knew;
She dwelt on a wide moor,

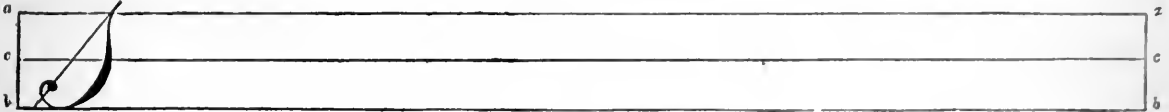
The sweetest thing that ever grew
Beside a human door!
You yet may spy the fawn at play,
The hare upon the green;
But the sweet face of Lucy Gray
Will never more be seen.

2. Form sentences having in them the following words:—

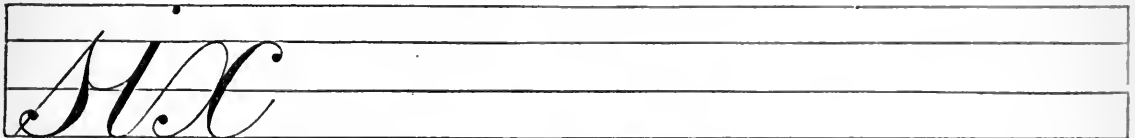
Compound, simple, primitive, derivative, departure, substitution, suffix, prefix, distinction, ahead, amain, affection, allow, attract, ambiguity, anarchy, antichrist, antechamber, apothecary, autocrat, benefactor, malefactor, conversion, collusion, contravene, dialogue, distraction.

3. Write a theme on each of the following subjects:—

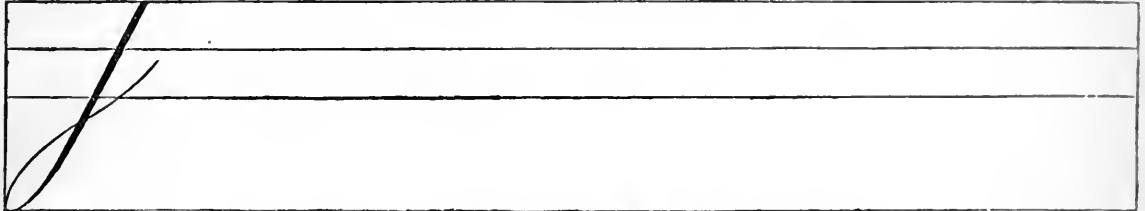
1. The Conversion of St. Paul. 2. The Battle of the Boyne. 3. The Structure of the Eye. 4. Jacob's Journey to Padan-aram.



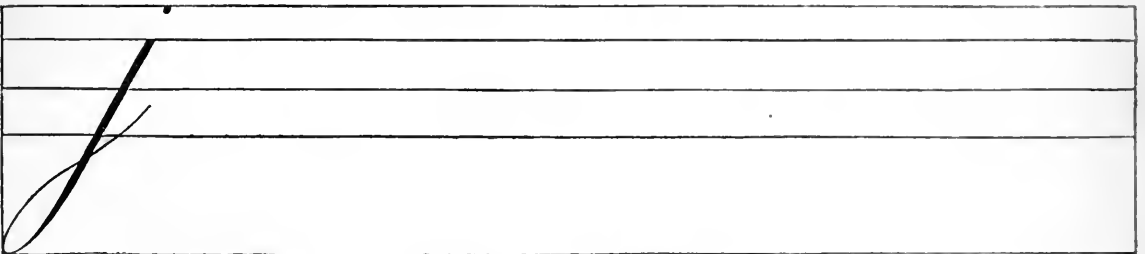
COPY-SLIP NO. 50.—THE LETTER S.



COPY-SLIP NO. 51.—THE WORD SIX.



COPY-SLIP NO. 52.—ELEMENTARY LOOPED STROKE, BOTTOM-TURN.



COPY-SLIP NO. 53.—THE LETTER j.

LESSONS IN PENMANSHIP.—XV.

THE last of the four letters that may be considered as being modifications of the letter *o* is the letter *s*, examples of which are given in Copy-slips Nos. 50 and 51. That its form is based in a great measure on the letter *o*, may be seen by drawing a fine line through the middle of this letter diagonally from right to left, from the point in which a line drawn in the direction of the slope of the letter (as in our early copy-slips), and touching its right side, would cut the line *a a*, to the point in which a line, also drawn in the direction of the slope of the letter, and touching its left side, would cut the line *b b*. The letter *s* is formed in the following manner:—First, a hair-stroke is carried upwards diagonally from left to right, a little above the line *a a*; the pen is then brought downwards, and a curved down-stroke is made, which is turned upwards to the left when it has reached the line *b b*, and terminated in a dot made about midway

between the lines *b b*, *c c* on the diagonal hair-line with which the letter was commenced. The letter *s* is connected with any letter that follows it by a hair-stroke carried to the right from the middle of the curved down-stroke on the right of the letter, as may be seen in Copy-slip No. 51. When *s* is preceded by any letter which terminates in a bottom-turn, the hair-line of the bottom-turn is carried into the diagonal up-stroke with which the letter is commenced; but when the letter that precedes it does not end in a bottom-turn, as *b*, *f*, *o*, *r*, *v*, and *w*, the connecting hair-stroke is carried into the direction of the diagonal up-stroke midway between the lines *a a*, *c c*, the lower part of the diagonal up-stroke being of necessity omitted, and the letter is finished in the usual manner, as will be seen in Copy-slip No. 59. When double *s* occurs in any word, the first *s* is sometimes made by a hair-line looped above the line *a a*, like the *t* of the letter *f*, turned at the top to the left, and conveyed gradually into a thick down-stroke, which is brought down

below the line *b b*, and finished with a loop like the elementary stroke in Copy-slip No. 52. This stroke and the various letters into whose composition it enters, one of which is the letter *j*, in Copy-slip No. 53, will form the subject of our next lesson.

LESSONS IN LATIN.—VIII.

THE THIRD DECLENSION.

We pass on to the third declension. In the third declension we find, in the nominative case, so great a variety of terminations, that we must endeavour to arrange the nouns in certain classes. The genitive singular, however, is the characteristic case, and it ends in *is*.

Before classifying these nouns, I must give you some explanations. *Parisyllabic* is a word I have to use. It consists of three words, which I will mark thus—

1 2 3
pari syl lab(ic);

of these the two latter are of Greek origin. The former is Latin. As the word is thus made up of terms from two languages, it is a sort of hybrid. No. 2 signifies *with*; No. 3 signifies *to take*; the *ic* is merely the termination. If you put 2 and 3 together you have *syllab*, which with the termination *ble* makes *syllable*. A syllable, then, is so much of sound as may be taken or uttered at once. No. 1 means *equal* (*pari* found in the English *par* and *pair*); *parisyllabic*, then, signifies that which is *equal in its syllables*; and nouns are called *parisyllabic* which have the same number of syllables in all the cases of the singular number. I say of the singular number, because the plural of all nouns is not *parisyllabic*, inasmuch as the genitive plural, as in the cases of *arum* and *orum*, has a syllable more than the other cases. Now nouns which have in the genitive singular a syllable more than they have in the nominative singular are called *imparisyllabic*. In this word, as here given, you find an additional syllable, namely, *im* from *in*—the *n* becoming *m*, before the *p*—which signifies *not*. *Imparisyllabic*, then, is *not-parisyllabic*; and the words denote those nouns which in the genitive singular have not the same number of syllables as they have in the nominative. *Piscis*, a fish, is *parisyllabic*; for in the genitive it is *piscis*, having two syllables as in the nominative. But *cantor*, a singer, is *imparisyllabic*, for in the genitive it is *cantōris*, having three syllables, whereas the nominative has but two. Here then we have one distinction—namely, nouns of the third declension are either *parisyllabic* or *imparisyllabic*.

Now, inquiry has shown that *parisyllabic* nouns have a *vowel* stem, and *imparisyllabic* nouns a *consonant* stem; that is, that the stem of the former ends in a vowel, and the stem of the latter ends in a consonant. Of the stem of a noun and a verb I have already said something. It is better to repeat than not to be understood. Take *nubes*, a cloud, and form the genitive; the genitive is *nubis*. You get the stem by cutting off the sign of the genitive, which in this case is *s* (as in the English *cloud*, *cloud's*). You thus obtain *nubi*. *Nubi* has two syllables, the same as the nominative *nubes*. It is therefore *parisyllabic*, and ends in a vowel. Take also *dolor*, grief; genitive, *doloris*. Cut off *is*, the sign of the genitive, and you obtain *dolor*. *Dolor* ends, you see, in a consonant, and is a consonantal stem. The word is also *imparisyllabic*, because it increases in the genitive singular. *Imparisyllabic* nouns, then, have consonantal stems. In this case the stem and the nominative are the same, both being *dolor*. But in women, a name, genitive *nominis*, stem *nomin*, the nominative and the stem are unlike. Of consonantal stems, then, there are two classes: first, those of which the stem is identical with the nominative; second, those in which it is different. The consonants in which the stem terminates are:—

c.	g.	t.	d.	p.	b.	mutæ.
l.	m.	n.	r.			liquids.
s.						the sibilant.

From these stems the nominative is formed with or without the addition of *s*. An instance of the formation of the nominative with the addition of *s*, is found in *nom. rex*, a king, gen. *regis*, stem *reg*; add *s* and you have *regs*, which is pronounced *rex*. An instance of the formation of the nominative without the addition of *s* you find in *nom. leo*, a lion, gen. *leōnis*, stem *leōn*, shortened into *leo*.

THIRD DECLENSION.

Sign is.

CASE-ENDINGS.

Cases.	Singular.	Cases.	Plural.	
			M. and F.	N.
N.	(vazious)	N.	ēs	ā or iā
G.	is	G.	um or ium	um or ium
D.	i	D.	ibūs	ibūs
Ac.	ēm	Ac.	ēs	ā or iā
V.	(like the nom.)	V.	ēs	ā or iā
Ab.	ō or ī.	Ab.	ibūs	ibūs.

The genders of the nouns of the third declension may be stated thus, though the rules are not without exceptions:—First, nouns ending in *o*, *on*, *os*, *er*, and *imparisyllabic* in *es*, are masculine; second, nouns ending in *as*, *is*, *aus*, *us* (gen. *utis* or *udis*) and *x*, and those which end in *s* blended with the preceding consonant, as well as *parisyllabic* in *es*, are feminine; third, nouns ending in *a*, *e*, *c*, *l*, *en*, *ar*, *ur*, *ut*, and *us* (gen. *ōris*, *ēris*, *ūris*), are neuter. By practice you will in time become familiar with these somewhat complex facts.

I proceed to set down specimens in classes.

CLASS I.

NOUNS WITH CONSONANTAL STEMS; IMPARISYLLABIC.

1.—Without the termination s.

(i.) The stem and the nominative are the same; stems end in *r* and *l*.

Thus: nom. *dolor*; gen. *doloris*; stem, *dolor*.

EXAMPLES.

MASCULINES.

Cases.	Singular.	Plural.	
			N.
G.	<i>doloris, of grief.</i>	<i>ansēris, of a goose.</i>	<i>vomērīs, of a ploughshare.</i>
D.	<i>dolori, to grief.</i>	<i>anseri, to a goose.</i>	<i>vomeri, to a ploughshare.</i>
Ac.	<i>dolorem, grief.</i>	<i>anserem, a goose.</i>	<i>vomerem, a ploughshare.</i>
V.	<i>dolor, O grief!</i>	<i>anser, O goose!</i>	<i>vomer, O ploughshare!</i>
Ab.	<i>dolore, by grief.</i>	<i>ansere, by a goose.</i>	<i>vomere, by a ploughshare.</i>
Cases.			
N.	<i>dolores, griefs.</i>	<i>anseres, geese.</i>	<i>vomeres, ploughshares.</i>
G.	<i>dolorum, of griefs.</i>	<i>anserum, of geese.</i>	<i>vomerum, of ploughshares.</i>
D.	<i>doloribus, to griefs.</i>	<i>anseribus, to geese.</i>	<i>vomeribus, to ploughshares.</i>
Ac.	<i>dolores, griefs.</i>	<i>anseres, geese.</i>	<i>vomeres, ploughshares.</i>
V.	<i>dolores, O griefs!</i>	<i>anseres, O geese!</i>	<i>vomeres, O ploughshares!</i>
Ab.	<i>doloribus, by griefs.</i>	<i>anseribus, by geese.</i>	<i>vomeribus, by ploughshares.</i>

NEUTERS.

Cases.	Singular.	Plural.	
			N.
G.	<i>gutturis, of a throat.</i>	<i>calcaris, of a spur.</i>	<i>animalis, of an animal.</i>
D.	<i>gutturi, to a throat.</i>	<i>calcari, to a spur.</i>	<i>animali, to an animal.</i>
Ac.	<i>guttur, a throat.</i>	<i>calcar, a spur.</i>	<i>animal, an animal.</i>
V.	<i>guttur, O throat!</i>	<i>calcar, O spur!</i>	<i>animal, O animal!</i>
Ab.	<i>gutturo, by a throat.</i>	<i>calcari, by a spur.</i>	<i>animali, by an animal.</i>
Cases.			
N.	<i>guttura, throats.</i>	<i>calcaria, spurs.</i>	<i>animalia, animals.</i>
G.	<i>gutturum, of throats.</i>	<i>calcarum, of spurs.</i>	<i>animalium, of animals.</i>
D.	<i>gutturibus, to throats.</i>	<i>calcaribus, to spurs.</i>	<i>animalibus, to animals.</i>
Ac.	<i>guttura, throats.</i>	<i>calcaria, spurs.</i>	<i>animalia, animals.</i>
V.	<i>guttura, O throats!</i>	<i>calcaria, O spurs!</i>	<i>animalia, O animals!</i>
Ab.	<i>gutturibus, by throats.</i>	<i>calcaribus, by spurs.</i>	<i>animalibus, by animals.</i>

Here observe, that as in the neuter nouns of the second declension, the neuter nouns of the third declension have in both the singular and the plural three cases alike,—namely, the nominative, the accusative, and the vocative. In animal, the nominative plural is *ia*, instead of *a*. This is owing to its being originally from a vowel stem—as, nominative, animal; genitive, animalis; stem, animal.

VOCABULARY.

Agger, aggēris, m., a mound or dam.	Fulgur, fulgūris, n., lightning.	Passer, passēris, m., a sparrow.
Color, colōris, m., colour.	Illī, to him.	Pulvinar, pulvināris, n., a couch.
Diligo, 3, I love or like.	Illis, to them.	Rumor, rumōris, m., report.
Error, errōris, m., error.	Mater, matris, f., a mother.	Tibi, to thee.
Frater, fratris, m., a brother.	Mihi, to me.	Vectigal, vectigālis, n., a tax.
	Nobis, to us.	Vobis, to you.
	Odor, odōris, m., odour, smell.	

Obs.—Est mihi, I have, used with the noun as nom. to est; thus, guttur est mihi, I have a throat; so in the plural, guttura sunt nobis (throats are to us), we have throats. In the same way,

guttur est tibi (a throat is to thee), thou hast a throat; guttur est illi (a throat is to him), he has a throat; guttura sunt vobis (throats are to you), you have throats; guttura sunt illis (throats are to them), they have throats.

EXERCISE 25.—LATIN-ENGLISH.

1. Magnus dolor est mihi. 2. Nonne tibi est magnus dolor? 3. Sunt magni dolores matribus. 4. Color pulvinaris pulcher est. 5. Estne pulcher pulvinaris color? 6. Funestus error est illi. 7. Cur funesti errores sunt patri? 8. Frater est mihi. 9. Fratribus sunt magni dolores. 10. Fulgura terrent animalia. 11. Nonne matres terrent fulgura? 12. Fulgura terrent passerose.

EXERCISE 26.—ENGLISH-LATIN.

1. I have a spur. 2. Hast thou a goose? 3. They have geese. 4. Have you a mound? 5. The odour of the lightning is on the cushion. 6. I do not like taxes. 7. Rumours are troublesome. 8. Have they a couch? 9. They have not a goose. 10. You have a father, a brother, and a mother. 11. They have griefs. 12. Thou hast a great cushion.

(ii) The stem and the nominative are different; stem in *n* and *r*.

MASCULINES AND FEMININES.

Cases.		
Singular.		
N. leo, a lion.	homo, a man.	pater, a father.
G. leonis, of a lion.	hominis, of a man.	patr's, of a father.
D. leoni, to a lion.	hominii, to a man.	patri, to a father.
Ae. leonem, a lion.	hominem, a man.	patrem, a father.
V. leo, O lion!	homo, O man!	pater, O father!
Ab. leone, by a lion.	homine, by a man.	patre, by a father.
Cases.		
Plural.		
N. leones, lions.	homines, men.	patres, fathers.
G. leonum, of lions.	hominum, of men.	patrum, of fathers.
D. leonibus, to lions.	hominibus, to men.	patribus, to fathers.
Ae. leones, lions.	homines, men.	patres, fathers.
V. leones, O lions!	homines, O men!	patres, O fathers!
Ab. leonibus, by lions.	hominibus, by men.	patribus, by fathers.

NEUTERS.

Cases.		
Singular.		
N. corpus, a body.	nomen, a name.	genus, a race.
G. corporis, of a body.	nominis, of a name.	generis, of a race.
D. corpori, to a body.	nomini, to a name.	generi, to a race.
Ae. corpus, a body.	nomen, a name.	genus, a race.
V. corpus, O body!	nomen, O name!	genus, O race!
Ab. corpore, by a body.	nomine, by a name.	genere, by a race.
Cases.		
Plural.		
N. corpora, bodies.	nomina, names.	genera, races.
G. corporum, of bodies.	nominum, of names.	generum, of races.
D. corporibus, to bodies.	nominibus, to names.	generibus, to races.
Ae. corpora, bodies.	nomina, names.	genera, races.
V. corpora, O bodies!	nomina, O names!	genera, O races!
Ab. corporibus, by bodies.	nominibus, by names.	generibus, by races.

In two of the words declined above, *corpus, corporis, corpor*, and *genus, generis, gener*, the stems—namely, *corpor* and *gener*—seem to end in *r*. The *r*, however, is only the representative of *s*, for between two vowels, as in *corporis*, the *s* by the laws of pronunciation passes into *r*. Thus, instead of *corpus, corporis*, we have *corpōis*, the *s* being changed into *r* and the *u* into *o*. Similar changes take place in *tellus (tellūsis) tellūris, the earth*; *pulvis, pulvērīs, dust*; *mas, maris, a male*; *æs, aris, brass*; *flos, flōris, a flower*.

VOCABULARY.

Carbo, carbōnis, m., charcoal.	Littus, littērīs, a shore.	Pectus, pectōris, n., a breast.
Cardo, cardinis, m., a hinge.	Lumen, luminis, n., light.	Pignus, pignōris, n., a pledge.
Carmen, carminis, n., a poem.	Occasio, occasōnis, f., an opportunity.	Pulvis, pulvērīs, m., dust.
Cinis, cinērīs, m., ashes.	Ops, opēris, n., work.	Regio, regiōnis, f., a region or district.
Decus, decōris, n., becomingness.	Ordo, ordīnis, m., order, series.	Vulnus, vulnērīs, n., a wound.
	Pavo, pavōnis, m., a peacock.	

EXERCISE 27.—LATIN-ENGLISH.

1. Carbonem timeo. 2. Pavones ferit puer. 3. Pulchre sunt regiones. 4. Occasio est tibi. 5. Movemus cinerem. 6. Cardio moritur. 7. Ordinis decus delectat matres. 8. Magnus est pulvis cineris. 9. In littore sunt pavones. 10. Carmina non sunt nobis. 11. Vulnus est in pectore. 12. Regionis magnum est lumen. 13. Illi est nomen magnum. 14. Pignora non laudantur.

EXERCISE 28.—ENGLISH-LATIN.

1. Dost thou fear charcoal? 2. Why does the mother strike the boy? 3. They have no becomingness. 4. Thou hast a wound. 5.

Their fathers have wounds. 6. Wounds frighten mothers. 7. Poesms flourish in the region. 8. Thou hast a great name. 9. I have not a pledge. 10. They have an opportunity. 11. The man's opportunity is great.

KEY TO EXERCISES IN LESSONS IN LATIN.—VII.

EXERCISE 21.—LATIN-ENGLISH.

1. Good men love good boys. 2. Good boys are loved by good men. 3. A good boy loves school. 4. The good masters of good boys are loved. 5. Hast thou a good master? 6. The war is deadly. 7. I have a good female friend. 8. The boys are in school. 9. Are not the boys in school? 10. Many foreigners sail into Britain. 11. The boar of my friend is great. 12. There is play on the river's bank. 13. Scholars love (like) letters. 14. There are frogs on the banks. 15. The goat is great. 16. There are deadly wars in the island.

EXERCISE 22.—ENGLISH-LATIN.

1. Bonos discipulos amo. 2. Boni discipuli a bonis viris amantur. 3. Amasne amicum? 4. Aper est mihi. 5. Tibi est caper. 6. Capri sunt in ripā. 7. Est in insula magnam et funestum bellum. 8. In Britannia sunt agri multi. 9. Funesti sempe sunt apri? 10. O viri, amatisne pueros? 11. Amicis meli peregrinos non amant. 12. Ludus amat pueri. 13. Amantne pueri ludum? 14. Estne tibi amica? 15. Magnus aper non est mihi. 16. Amica epistola est in horto.

EXERCISE 23.—LATIN-ENGLISH.

1. The horse neighs. 2. The horse's mane is beautiful. 3. The flies are troublesome. 4. Are the flies troublesome? 5. Good scholars are not troublesome. 6. Long wars are troublesome. 7. Horses run quickly. 8. A man guides the horse. 9. A horse is guided by a man. 10. I am delighted by a beautiful horse. 11. The fields are fruitful. 12. The herbs of the fields are various. 13. The husbandman commits to the fields grains of corn. 14. The husbandman tills the fields. 15. How beautifully the fields flourish. 16. Various herbs flourish in the fields.

EXERCISE 24.—ENGLISH-LATIN.

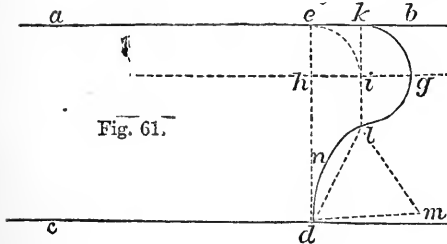
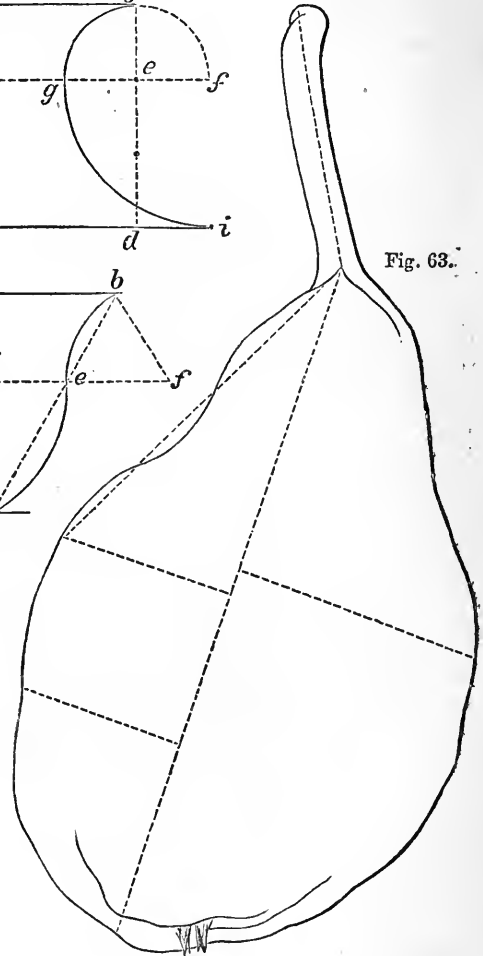
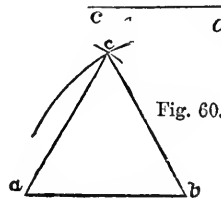
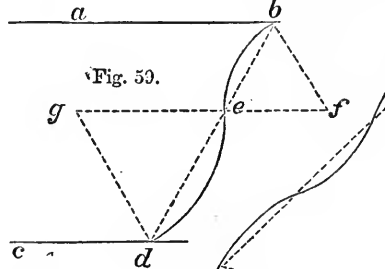
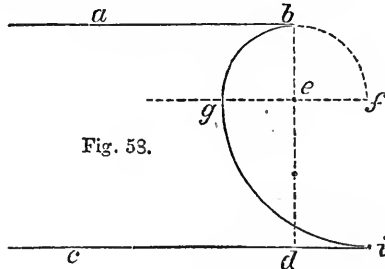
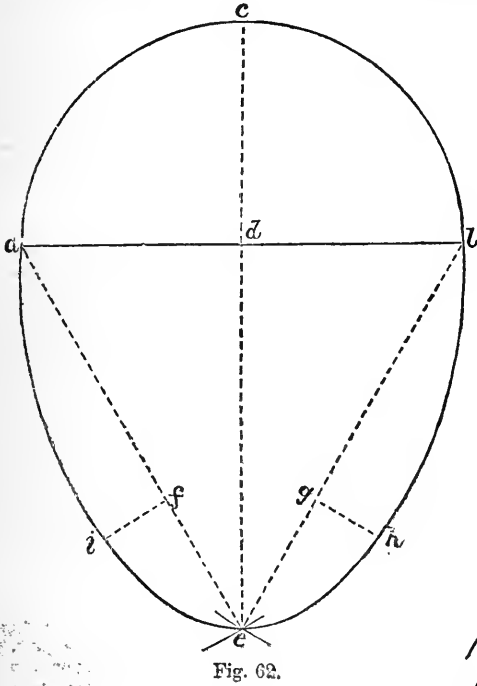
1. Fecundus est ager. 2. Suntne agri fecundi? 3. Bella fecunda non sunt. 4. Agri coluntur. 5. Dea colis. 6. Dii coluntur a Thullo. 7. Equus et equa a viro reguntur. 8. Celeriter currunt apri. 9. Curruntne capri celeriter? 10. In pulchro horto sunt muscae. 11. Equum agro committis. 12. Boni discipuli coluntur. 13. O mi fili! diis et deabus committuntur tepla. 14. O Antoni! dii deaque in templis coluntur. 15. O bone Daus! in fecundis agris coleris. 16. Boni viri a filiis et filiabus coluntur.

LESSONS IN DRAWING.—VIII.

HAVING gone thus far in our instructions for drawing an outline, we think it necessary to detain the pupil a little longer upon this early and most important part of our subject, for reasons that will be apparent as we proceed. So essential is good drawing, that without a correct outline the most laboured performance in other respects will be a failure; it may be very neat in its execution, carefully shaded, or perhaps cleverly coloured; but if it fail in the outline by not giving a truthful representation of the form of the object, it is then for all practical purposes useless. We know what a great temptation it is to the young to begin to paint, but they do not consider that to be able to paint well they must be able to draw well. Fainting, in its practice—that is, the execution—is nothing more than placing colours, as we have said of lines, in their right places, and the power of handling the brush successfully depends upon the pupil's ability for handling the pencil. Of course we make no allusion to the arrangement of colours themselves, their harmony and tones; we mean simply the power of using the brush where it is necessary to perfect the form of the object being painted, without having to lay down the brush to resume the pencil. We wish also to warn the pupil against that slovenly, dangerous, and unsatisfactory manner of drawing which is generally termed *sketching*, that is, producing a hurried, careless outline, its correctness being the last thing considered. Sketching, with an imperfect power of drawing, in the majority of cases amounts to nothing more than scribbling; there may be thousands of individuals who can sketch, but amongst these there are comparatively few who can draw. The dogs, horses, and ships with which the schoolboy adorns the pages of his dictionary, or the margins of his exercises, may, on the whole, bear a strong resemblance to the general character of the class of animals or objects intended; but this is not drawing: it is quite another thing to give the individuality of these objects: in this is the test of ability. It is true that the hand of a master may by a few

lines express an idea with great force and power, but for a learner to begin the art by sketching is altogether a mistake. We once heard an eminent landscape painter say that "sketching is the ruin of hundreds of young artists; it is beginning at the wrong end; let them draw well first and secure the power, then afterwards they may sketch." Sketches are clever and valuable only when they are done by men who can really draw well; the unfortunate result of the habit of sketching by an inexperienced hand may be compared to that of the very objectionable system which compels schoolboys to write out pages of Latin or English for punishment. There are many who acknowledge in after years that their handwriting was

under our notice, to draw which we shall be materially assisted by principles borrowed from geometry. But though we cannot employ compasses to draw the forms of flowers and leaves, yet by the practice of geometry we easily associate lines, angles, and centres with curves, although they are not visible upon the object. Instruments are usually depended upon for drawing architectural curves, mouldings, and the like, because they must be constructed according to received proportions. We propose now to place before our readers some examples of architectural curves, with the rules for constructing them; our reason for doing so being simply to show the pupil a way of making his eye familiar with the construction of curves on geometrical prin-



spoiled by these "tasks" or "impositions," and who were never able afterwards, with all their efforts, to write well. Let the pupil therefore give up all idea of sketching, and seek to draw well, if he at all hopes to make the art useful for practical purposes, or to secure in its practice a pleasurable resource in leisure hours.

There is much to be said upon the advantage to be gained by a knowledge of geometrical drawing, a branch which depends for its accuracy upon the use of compasses, scales, and rulers. We have already explained a method of drawing curves by hand, that is, by previously placing points in the course of the intended curve, and then drawing the line through these points. There are innumerable instances of curves which may be better drawn without the aid of instruments than with them. Leaves and flowers, for instance, afford an inexhaustible supply of curved lines, to copy which we usually depend entirely on the eye and the hand; while there are curves which frequently come

under our notice, to draw which we shall be materially assisted by principles borrowed from geometry. From long experience we have found it to be the case that they always make the best and quickest draughtsmen, and do their work with the least labour, who have dipped deeply into geometrical drawing and lineal perspective. In their practice they have acquired a habit of precision, and have learnt the means to arrive at it readily, and have become fully impressed with its importance; they know the reasons why in such and such directions lines must be drawn; the mind and the eye have acquired a keener perception of the principles of proportion; a feeling for arrangement has grown from the use of instruments in geometrical exercises, and then in the end the hand readily takes up the practice.

The curve called the Scotia (Fig. 58).—Let $a b$ and $c d$ be the two lines between which the curve is to be formed. Draw $b d$ perpendicular to $c d$, and divide it into three equal parts; through e draw the line $g f$ parallel to $a b$; from e , with the radius $e b$, draw the arc $b g$, and at the same time mark the

point f ; from f , with the radius fg , draw the arc gi ; bg will be the curve required.

The curve called the *Cyma Recta* (Fig. 59).—Let the curve be formed between the lines ab and cd ; draw the line bd , and divide it into five equal parts; mark the second division from b , viz., e ; upon be describe the equilateral triangle bef , and upon ed describe the equilateral triangle deg ; from f , with the radius fb , draw the arc be , and from g , with the radius ge , draw the arc ed ; bed will be the curve required.

The pupil can draw an equilateral triangle upon a given line by the following method. Let ab (Fig. 60) be the line upon which the triangle is to be described; from a and b as centres, with the radius ba , describe two arcs intersecting each other in the point c ; join ca and cb ; the triangle abc is an equilateral triangle. (See Lessons in Geometry, VII., page 209.)

The curve called the *Ogee* (Fig. 61).—Let it be drawn between the lines ab and cd ; draw de perpendicular to cd , and divide it into four equal parts; through the first from e —namely, h —draw the line hi parallel to ab , make hi equal to hc ; draw the line ki parallel to cd , and from i , with the radius ik ,

of a little help from geometry; we advise him also to draw all these lines of arrangement with a light hand, that they may be more easily effaced when done with.

To draw the pear (Fig. 63), we will first draw a line to represent the length or axis, and from this line "offsets" or each side as shown by dotted lines. The pupil may please himself as to the number of these "offsets" and their whereabouts; he will not be long before he finds that such lines are best arranged opposite, and to meet, angles, and the greatest distance of curvature from the axis. He will then proceed to draw the outline through the extremities of these offsets, especially observing the kind of line requisite between each point: in some parts the outline is more outwardly curved than in others, in some it is nearly straight, in others the curve is inward. If the pupil will exercise his observation in this way when looking at solids and natural objects, which he can do at all times, whether he has a pencil in his hand or not, even when out for a walk, he will be not a little surprised should he make this his general practice, to find how rapidly he will gain confidence and power, and be able to produce truthfully

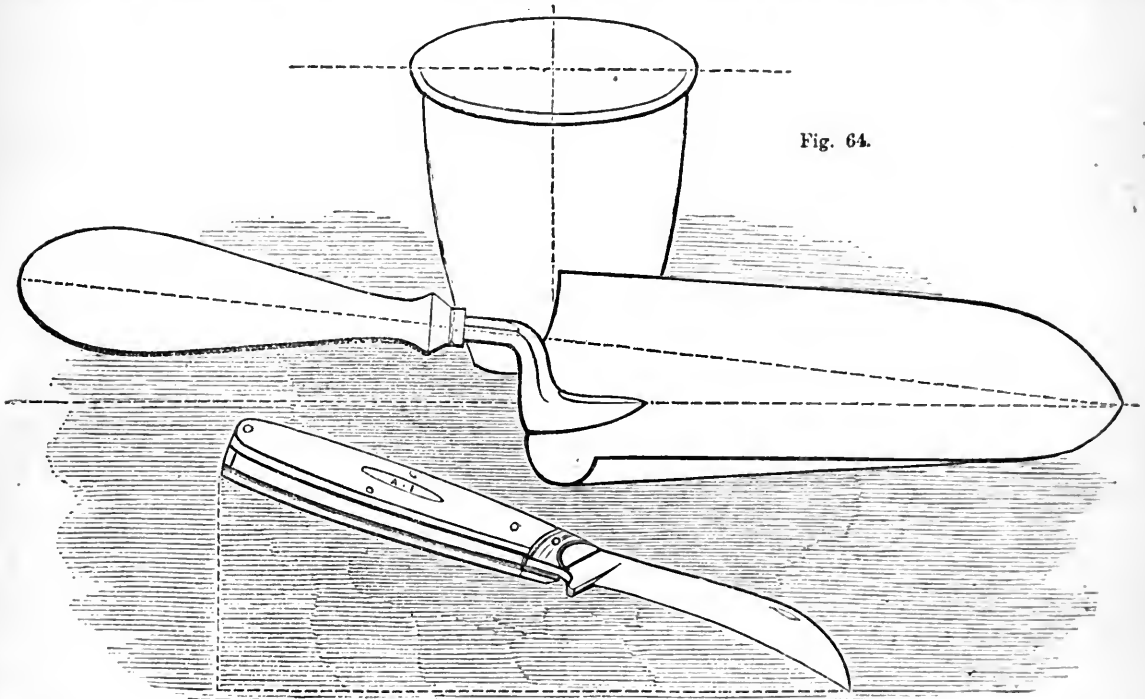


Fig. 64.

draw the semicircle kg ; join ld , and upon it draw the equilateral triangle lm ; from m as centre, with the distance md or ml as radius, draw the arc dn ; the line dnl will be the curve required. By recommending the practice of geometrical drawing, we only wish to direct the pupil where to find further assistance in free-hand drawing; we will now show, by a few examples, how these principles may be applied. An oval or egg-shaped figure (Fig. 62) would be very difficult to draw, if the boundary line only were to be attempted without some assistance from geometry; there would be a great deal of rubbing out and alteration before it was finished. Let the pupil try the figure in the following manner: first by the help of compasses, then by hand only. Draw the straight line ab , and divide it into two equal parts in the point d . Through d draw ede at right angles to ab , and make dc equal to ad or db . Construct upon ab the equilateral triangle acb , and take the point g at one-third of the distance from e to b , and determine the point f in the same way. Then from the points f, g , draw the lines fi, gh , perpendicular to ac and eb respectively, and make each of them equal to one-half of cf or eg . After this arrangement has been made, draw the semicircle acb and the arcs be and ae through h and i . It will be necessary to repeat it a few times, when the pupil will begin to see the advantage

and useful drawings. We will give him another example (Fig. 64), for which he must arrange the scaffolding himself, with one exception, because it includes a principle which we will merely allude to now, as we shall have better and more frequent opportunities by-and-by to enlarge upon it. The exceptional assistance we offer in this case, is that of the dotted line which runs through the centre of the handle of the trowel, and passes in a direct course to the point of the blade. We may here observe that an implement of this kind, to be really useful, ought to be so constructed; and if we look at it with an artistic eye, the composition of lines which make up this very simple subject, must strike any one as being more symmetrical than if the handle and the blade had been united at any other angle. This remark upon so insignificant an object as a garden trowel may appear trivial, but it is the principle we contend for, and which is, in reality, of the greatest importance. It is true we might have selected a more noble object, but it would not have better illustrated our meaning, or have made it more evident, and at the same time have provided the pupil with an example for his practice more suited to the experience he has at present attained as a draughtsman. Nature teaches us this lesson, and it is evident everywhere that harmony of line and proportion always accompany the greatest utility and strength.

LESSONS IN ARITHMETIC.—XV.

DECIMALS (continued).

10. Division of Decimals.

CASE 1.—Divide 120.3033 by 3.27.

$$120.3033 \div 3.27 = \frac{1203033}{10000} \div \frac{327}{100} = \frac{1203033}{327} \times \frac{100}{10000} = \frac{3679}{100}$$

3679 is the quotient arising from dividing the dividend by the divisor as if they were whole numbers, and the denominator 100 shows that there must be two decimal places in the quotient. These two decimal places arise, as will be seen by the fraction $\frac{100}{10000}$, from the fact of there being two decimal places more in the dividend than in the divisor.

CASE 2.—If the number of decimal places in the divisor and dividend were the same, the result would be exactly the same as if the divisor and dividend were whole numbers. Thus,

$$1203.033 \div .327 = \frac{1203033}{1000} \div \frac{327}{1000} = \frac{1203033}{327} \times \frac{1000}{1000} = 3679.$$

CASE 3.—Suppose that there are more decimal places in the divisor than in the dividend.

Take, for example, 120303.3 ÷ .327.

$$120303.3 \div .327 = \frac{1203033}{10} \div \frac{327}{1000} = \frac{1203033}{327} \times \frac{1000}{10} = 367900.$$

The true* quotient in this example is an integer, but it will not be so in all cases.

It will be better in practice, before commencing the operation, to annex ciphers to the dividend sufficient to make the number of decimal places equal to the number in the divisor, in which case the result will be exactly the same as if the division had been in whole numbers.

ADDITIONAL EXAMPLE OF CASE 2.—Divide 411.95 by 1.25.

$$\begin{array}{r} 1.25 \overline{) 411.95,00} \quad (329.56 \\ \underline{375} \\ 360 \\ \underline{250} \\ 1195 \\ \underline{1125} \\ 700 \\ \underline{625} \\ 750 \\ \underline{750} \\ \dots \end{array}$$

Dividing as in whole numbers, we get a quotient 329, and a remainder 70. Now annex ciphers to the dividend, which will not alter its value, and continue the division. We now find that the true quotient is 329.56.

ADDITIONAL EXAMPLE OF CASE 3.—To divide 556.7 by 2.31.

Annexing a cipher to 256.7 before commencing the operation, we have—

$$\begin{array}{r} 2.31 \overline{) 556.70} \quad (154 \\ \underline{231} \\ 1257 \\ \underline{1155} \\ 1020 \\ \underline{924} \\ 96 \end{array}$$

The part of the true quotient already obtained is an integer, the division being in fact the same as that of $\frac{55670}{361}$. If more ciphers be annexed to the dividend, we shall get decimal places in the quotient, and the more we obtain the nearer to the true quotient shall we arrive.

11. These examples will sufficiently illustrate and explain the following

Rule for the Division of Decimals.

Divide as if the divisor and dividend were whole numbers.

If the number of decimal places in the dividend exceed the number in the divisor, cut off from the quotient as many

* We shall use the expression true quotient to indicate the total result obtained by the division of one number by another, thus distinguishing it from the quotient defined in Lesson V., Art. 1 (page 69), which is only the integral part arising from a division.

decimal places as are equal in number to this excess, prefixing ciphers if necessary.

If the number of decimal places in the dividend and divisor be equal, the division will be the same as in whole numbers.

If the number of decimal places in the dividend be less than the number in the divisor, annex as many ciphers to the dividend as will make the number equal to the number in the divisor, and then proceed as in whole numbers.

12. We subjoin other examples of division of decimals.

EXAMPLE.—Divide 1 by 10.473, carrying the quotient to 5 places of decimals.

We are at liberty to write 1 thus—1.00000, putting as many ciphers after the decimal point as may be required. Since there are to be 5 decimal places in the quotient, and since there are 3 in the divisor, we must add 8 ciphers.

$$\begin{array}{r} 10.473 \overline{) 1.00000000} \quad (9548 \\ \underline{94257} \\ 57430 \\ \underline{52365} \\ 50650 \\ \underline{41892} \\ 87580 \\ \underline{83784} \\ 3796 \end{array}$$

Hence the required answer is .09548, prefixing a cipher in order to get 5 decimal places in the quotient.

13. EXAMPLE.—Divide .8 by .00002.

Annexing 4 ciphers to .8, since there are 5 decimal places in the divisor, we have—

$$\begin{array}{r} .00002 \overline{) .80000} \quad (40000 \\ \underline{80000} \end{array}$$

the division by the rule being, in fact, the same as that of 80000 by 2.

14. It will be observed that we are not required in some cases to find more than a certain number of figures of the quotient when it is a decimal. Sometimes, by continuing the division far enough, we shall find that there is no remainder—i.e., that the quotient can exactly be found in the form of a decimal. But if by continually dividing we cannot arrive at a stage where there is no remainder, then we can only get what is termed an approximation to the result. The more figures of the quotient we take, the nearer we shall be to the value of the true quotient.

Thus, in the division above performed in Art. 12, if we stopped at four decimal places in the quotient, the result would be .0954. Carrying on the operation one step further, we see that 8 is the next figure of the quotient, and therefore—this 8 meaning $\frac{8}{10000}$ —we are nearer to the true quotient by $\frac{8}{100000}$. Where we are required to find a quotient to a given number of places, it is customary to carry on the division to one place more than is actually required, in order to see whether the next figure is greater or less than 5. If it is greater than 5, then we shall be nearer to the true result if we increase the last figure of the required number of places by unity.

Thus, in the case above given, finding that the fifth decimal place is 8, the quotient to four decimal places will be more, accurately written .0955 than .0954, because .0955—or, what is the same thing, .09550—is nearer to .09548 than .09540 is. Now .09550 is $\frac{10}{100000}$ more than .09548; whereas .09540 is $\frac{10}{100000}$ less than .09548.

The same method is applied whenever a limited number of decimals is employed. We shall return to this subject hereafter.

EXERCISE 33.

1. Find the quotients of the following examples in division of decimals:—

- | | | |
|--------------------|-------------------------|------------------------|
| 1. 5.64 ÷ 4. | 10. 4.32067 ÷ .001. | 19. 634234.6 ÷ 2382. |
| 2. 5.64 ÷ .4. | 11. 1673.2 ÷ .002. | 20. 7.231063 ÷ .12. |
| 3. 5.64 ÷ .04. | 12. .000045 ÷ 9. | 21. 26.3845 ÷ .125. |
| 4. 46.34 ÷ 7.9. | 13. 4 ÷ .00001. | 22. 6 ÷ .0000001. |
| 5. 1.658 ÷ .25. | 14. .018769 ÷ .0000127. | 23. .8 ÷ .0000002. |
| 6. 4.00334 ÷ 6.31. | 15. 67234 ÷ .85. | 24. 6541.234567 ÷ 21. |
| 7. .00023 ÷ .011. | 16. 73.8243 ÷ .061. | 25. 7461.37765 ÷ 112. |
| 8. 236.041 ÷ 175. | 17. 300.492 ÷ 12.1. | 26. 325.67543 ÷ 20.02. |
| 9. 60.0001 ÷ 191. | 18. .00006 ÷ .003. | 27. 2189.054 ÷ .993. |

2. Find correctly to 4 places of decimals the quotients resulting from the following divisions:—

- | | |
|----------------------------|---------------------------|
| 1. $.4134 \div .3243$. | 3. $2.3748 \div 1.4736$. |
| 2. $.079085 \div .83497$. | 4. $180 \div 3.14159$. |

3. How many boxes will it require to pack 71.5 pounds of butter, if you put 5.5 pounds in a box?

4. How many suits of clothes will 29.6 yards of cloth make, allowing 3.7 yards to a suit?

5. If a man can walk 30.25 miles per day, how long will it take him to walk 150.75 miles?

6. How many loads will 134642.156 pounds of hay make, allowing 1622.2 pounds for a load?

7. If a team can plough 2.3 acres in a day, how long will it take to plough 63.75 acres?

8. How many bales of cotton are there in 56343.75 pounds, allowing 375 pounds to a bale?

9. Determine the quotient in the following examples in division of decimals by removing the point in such dividend to the left, and adding ciphers when necessary:—

- | | |
|---------------------------|---------------------------------|
| 1. $4672.3 \div 100$. | 5. $42343.621 \div 100000$. |
| 2. $.8 \div 10000$. | 6. $6723000.45 \div 10000000$. |
| 3. $672345.67 \div 10$. | 7. $1.2300456 \div 100000$. |
| 4. $10342.306 \div 100$. | 8. $2.0076346 \div 1000000$. |

10. Multiply the following numbers together by removing the decimal points:—

- | | |
|-------------------------------------|--|
| 1. 85.4321×100 . | 8. $.5 \times 1000$. |
| 2. 42930.213401×10 . | 9. $.75 \times 100000$. |
| 3. 1067.2350123×100 . | 10. $65 \text{ ten thousandths} \times 1000$. |
| 4. 608.34017×1000 . | 11. $48 \text{ hundred thousandths} \times 100000$. |
| 5. $30.467214067 \times 10000$. | 12. $248 \text{ thousandths} \times 100000$. |
| 6. $446.3214022 \times 100000$. | |
| 7. $21.3456782106 \times 1000000$. | |

11. Multiply $.863541$ by $.10983$, retaining 5 decimal places.
12. Multiply 1.123674 by 1.123674 , retaining 6 decimal places.
13. Multiply $.26736$ by $.28758$, retaining 4 decimal places.
14. Multiply $.1347866$ by $.288793$, retaining 7 decimal places.
15. Multiply $.681472$ by $.01286$, retaining 5 decimal places.
16. Multiply $.053407$ by $.047126$, retaining 6 decimal places.
17. Multiply $.3857461$ by $.0046401$, retaining 6 decimal places.

LESSONS IN FRENCH.—XV.

SECTION I.—FRENCH PRONUNCIATION (continued).

72. THERE are a few exceptions to the preceding illustrated pronunciation, which will be given, namely:—

Ennuï. According to Rule 2 (page 214), the first *en* of this word would not be nasal, because the *n* is doubled. In this word, however, *en* is a nasal.

Ennuï	Anh-nuee	Tediousness.
In the following words the <i>en</i> is a nasal, viz. :—		
Ennuyant	Anh-nuee-eeanh	Annoying.
Ennuyement	Anh-nuee-eeuhz-manh	Tediously.
Ennuyeu	Anh-nuee-eeuh	Tedious.
Ennuyeux	Anh-nuee-eeuh	”
Ennuyeuse	Anh-nuee-eeuhz	”

In the word *ennuyer*, the *en* is nasal. The same is true of all derivatives from that word.

Ennuyer	Anh-nuee-ey	To annoy.
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73. There are some exceptions, also, to the pronunciation illustrated under the nasal *en* (page 214), in the following words, in which the *m* is doubled, but the nasality is not destroyed, namely:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Emmagasinage	Anh-mag-az-ee-nazh	Warehousing.
Emmagasiner	Anh-mag-az-ee-nay	To warehouse.
Emmagirir	Anh-may-grer	To grow lean.
Emmaillement	Anh-mah-eehl-ot-manh	Swaddling.
Emmaillotter	Anh-mah-eehl-yo-tay	To swaddle.
Emmanchement	Anh-man-shik-mauh	Putting on a handle.
Emmancher	Anh-man-shay	To put a handle to.
Emmancher	Anh-man-shay (naval term)	To enter a channel.
Emmancheur	Anh-man-shouhr	Handle-maker.
Emmanchure	Anh-man-shure	Arm-hole.
Emmanqueûner	Anh-man-kee-nay	To put into a basket.

FRENCH.	PRONUNCIATION.	ENGLISH.
Emmantelé	Anh-manht'-lay	Hooded.
Emmariné	Anh-ma-re-nay	Sea-hardened.
Emmarmine	Anh-ma-re-nay	To man a ship.
Emmâler	Anh-may-lay (2nd syll. long)	To entangle.
Emménagement	Anh-may-nazh-manh	Furnishing a house.
Emménagements	Anh-may-nazh-manh	Ship's conveniences.
Emménager	Anh-may-na-zhay	To furnish a house.
Emménagogue	Anh-may-na-gog	Emmenagogue.
Emmener	Anh-may-nay	To take away.
Emmenotter	Anh-may-nay	To handoff.
Emmiellé	Anh-moa-lay	Sweetened with honey.
Emmieller	Anh-moa-lay	To sweeten with honey.
Emmitouffer	Anh-mee-too-flay	To wrap up.
Emmitraire	Anh-mee-tray	To consecrate a bishop.
Emmortaiser	Anh-mor-tay-zay	To mortise.
Emmotté	Anh-mo-tay	Banked with earth.
Emmuseler	Anh-muz'-lay	To muzzle.

It is believed the above list comprises nearly every word in the French language which departs from the general rule of nasals in *en*.

74. The following words are exceptions to the first general rule concerning nasals (page 214), namely:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Enivrant	Anh-nee-vranh	Intoxicating.
Enivrement	Anh-nee-vr'-mahn	Intoxication.
Enivrer (and all derived from it)	Anh-nee-vray	To intoxicate.
Enorgueillir (ditto)	Anh-or-guayl'-yeer	To render proud.

SECTION XXV.—IDIOMATIC USES OF VERBS, ETC.

1. The verb *aller* is used, in French, in the same manner as the verb *to go*, in English, to indicate a proximate future.

Allez-vous écrire ce matin? Are you going to write this morning?
Je vais écrire mes lettres, I am going to write my letters.

2. The verb *venir* is used idiomatically, in French, to indicate a past just elapsed. It requires, in this signification, the preposition *de* before another verb.

Je viens d'écrire mes lettres, I have just written my letters.
Nous venons de recevoir des lettres, We have just received letters.

3. *Aller trouver*, *venir trouver*, are used in the sense of *to go to*, *to come to*, in connection with nouns or pronouns representing persons.

Allez trouver le ferblantier, Go to the tinman.
J'ai envie d'aller le trouver, I have a desire to go to him.
Venez me trouver à dix heures, Come to me at ten o'clock.

4. *Aller chercher* means *to go for*, *to go and fetch*.
Allez chercher le médecin, Go and fetch the physician.
Je vais chercher du sucre et du café, I am going for coffee and sugar.

5. *Envoyer chercher* means *to send for*, *to send and fetch*.
Envoyez chercher le marchand, Send for the merchant.
J'envoie chercher des légumes, I send for vegetables.

6. The first and second persons of the plural of the imperative are, with few exceptions, the same as the corresponding persons of the present of the indicative. The pronouns *nous*, *vous*, are not used with the imperative.

7. PLURAL OF THE IMPERATIVE OF ALLER, ENVOYER, AND VENIR.

Allons, let us go.	Envoyons, let us send.	Venons, let us come.
Allez, go.	Envoyez, send.	Venez, come.

8. *Tous*, *m.*, *toutes*, *f.*, followed by the article *les* and a plural noun, are used in French in the same sense as the word *every* in English.

Votre frère vient tous les jours, Your brother comes every day.
Vous allez à l'école tous les matins, You go to school every morning.

9. *Tout*, *m.*, *toute*, *f.*, followed by *le* or *la* and the noun in the singular, are used for the English expression *the whole*, coming before a noun.

Il reste ici toute la journée, He remains here the whole day.

10. A day of the week or of the month, pointed out as the time of an appointment or of an occurrence, is not preceded by a preposition in French.

Venez Lundi ou Mardi, Come on Monday or Tuesday.
Venez le quinze ou le seize Avril, Come on the fifteenth or sixteenth of April.

11. When the occurrence is a periodical or customary one, the article *le* is prefixed to the day of the week or the time of the day.

Il vient nous trouver le Lundi, *He comes to us on Mondays.*
 Il va trouver votre père l'après-midi, *He goes to your father in the afternoon.*

RÉSUMÉ OF EXAMPLES.

Je vais parler à M. votre père. *I am going to speak to your father.*
 Nous venons de recevoir de l'argent. *We have just received money.*
 Que venez-vous de faire ? *What have you just done ?*
 Je viens de déchirer mon habit. *I have just torn my coat.*
 Votre frère va-t-il trouver son ami ? *Does your brother go to his friend ?*
 Il va le trouver tous les jours. *He goes to him every day.*
 Il vient me trouver tous les Lundis. *He comes to me every Monday.*
 Allez-vous chercher de l'argent ? *Do you go and fetch money ?*
 Je n'en vais pas chercher. *I do not. (Sect. XXIII. 12.)*
 Allez-vous chez cette dame Lundi ? *Do you go to that lady's house on Monday ?*
 J'ai l'intention d'y aller Mardi. *I intend to go there on Tuesday.*
 J'y vais ordinairement le Mercredi. *I generally go there on Wednesdays.*
 Il va à l'église le Dimanche. *He goes to church on Sundays.*

VOCABULARY.

Année, <i>f.</i> , year.	Demain, <i>to-morrow.</i>	Mardi, <i>m.</i> , Tuesday.
Apprend-re, <i>4, ir.</i> , to learn.	Dimanche, <i>m.</i> , Sunday.	Mercredi, <i>m.</i> , Wednesday.
Après-midi, <i>f.</i> , after-noon.	Écossais, <i>-e</i> , Scotch.	day.
Commenc-er, <i>1, to com-mence.</i>	Écri-re, <i>4, ir.</i> , to write.	Musique, <i>f.</i> , music.
Compagne, <i>f.</i> , com-panion.	Enseign-er, <i>1, to teach.</i>	Parceque, <i>because.</i>
Connaissances, <i>f.</i> , ac- quaintances.	Excepté, <i>except.</i>	Prochain, <i>-e</i> , next.
	Irlandais, <i>-e</i> , Irish.	Rest-er, <i>1, to remain, to live.</i>
	Jeudi, <i>m.</i> , Thursday.	Samedi, <i>m.</i> , Saturday.
	Journée, <i>f.</i> , day.	Teinturier, <i>m.</i> , dyer.
	Lundi, <i>m.</i> , Monday.	Vendredi, <i>m.</i> , Friday.
	Malade, <i>sick.</i>	

EXERCISE 45.

1. Qu'allez-vous faire ? 2. Je vais apprendre mes leçons. 3. N'allez-vous pas écrire à vos connaissances ? 4. Je ne vais écrire à personne. 5. Qui vient de vous parler ? 6. L'Irlandais vient de nous parler. 7. Quand l'Écossaise va-t-elle vous enseigner la musique ? 8. Elle va me l'enseigner l'année prochaine. 9. Va-t-elle commencer Mardi ou Mercredi ? 10. Elle ne va commencer ni Mardi ni Mercredi ; elle a l'intention de commencer Jeudi, si elle a le temps. 11. Votre compagne va-t-elle à l'église tous les Dimanches ? 12. Elle y va tous les Dimanches et tous les Mercredis. 13. Qui allez-vous trouver ? 14. Je ne vais trouver personne ? 15. N'avez-vous pas l'intention de venir me trouver demain ? 16. J'ai l'intention d'aller trouver votre teinturier. 17. Envoyez-vous chercher le médecin ? 18. Quand je suis malade, je l'envoie chercher. 19. Reste-t-il avec vous toute la journée ? 20. Il ne reste chez moi que quelques minutes. 21. Allez-vous à l'école le matin ? 22. J'y vais le matin et l'après-midi. 23. Y allez-vous tous les jours ? 24. J'y vais tous les jours, excepté le Lundi et le Dimanche. 25. Le Samedi je reste chez nous, et le Dimanche je vais à l'église.

EXERCISE 46.

1. What is the Irishman going to do ? 2. He is going to teach music. 3. Has he just commenced his work ? 4. He has just commenced it. 5. Who has just written to you ? 6. The dyer has just written to me. 7. Does your little boy go to church every day ? 8. No, Sir, he goes to church on Sundays, and he goes to school every day. 9. Do you go for the physician ? 10. I send for him because my sister is sick. 11. Do you go to my physician or to yours ? 12. I go to mine, yours is not at home. 13. Where is he ? 14. He is at your father's or at your brother's. 15. Do you intend to send for the physician ? 16. I intend to send for him. 17. Am I right to send for the Scotchman ? 18. You are wrong to send for him. 19. Do you go to your father in the afternoon ? 20. I go to him in the morning. 21. Does your brother go to your uncle's every Monday ? 22. He goes there every Sunday. 23. Are you going to learn music ? 24. My niece is going to learn it, if she has time. 25. Am I going to read or to write ? 26. You are going to read to-morrow. 27. Does he go to your house every day ? 28. He comes to us every Wednesday. 29. At what hour ? 30. At a quarter before nine. 31. Does he come early or late ? 32. He comes at a quarter after nine. 33. What do you go for ? 34. We go for vegetables, meat, and sugar. 35. We want sugar every morning.

LESSONS IN GEOGRAPHY.—VIII.
DISCOVERIES OF THE NINETEENTH CENTURY.

SIR JOHN ROSS, who sailed in the *Victory* in 1829, on an expedition to the north, again explored Baffin Bay, Lancaster Sound, and Prince Regent Inlet; discovered land which he called Boothia Felix, from the name of his patron; and explored the coasts of this new country, until he was so hemmed in by the ice, that he could neither advance nor return. The expedition accordingly remained in this condition during the space of four years, the longest period on record of the detention of navigators in the northern regions. While thus detained the members employed their time in making excursions which enlarged our geographical and meteorological knowledge, and added to philosophy the fine discovery of the north magnetic pole. Besides the isthmus and peninsula of Boothia Felix, the expedition discovered King William Land, and the western sea called after the same sovereign. As to the north-west passage, he found that this did not exist in Prince Regent Inlet, nor to the south of latitude 70° N.; but Sir John Ross failed in discovering a free passage in the frozen seas of America, by which he could find his way to Behring Strait; in fact, the peninsula which separates Prince Regent Inlet from this northern sea, at the place where the expedition made its principal researches, is not only very narrow, but is chiefly covered with lakes which reduce the isthmus between the two seas to a breadth of three miles.

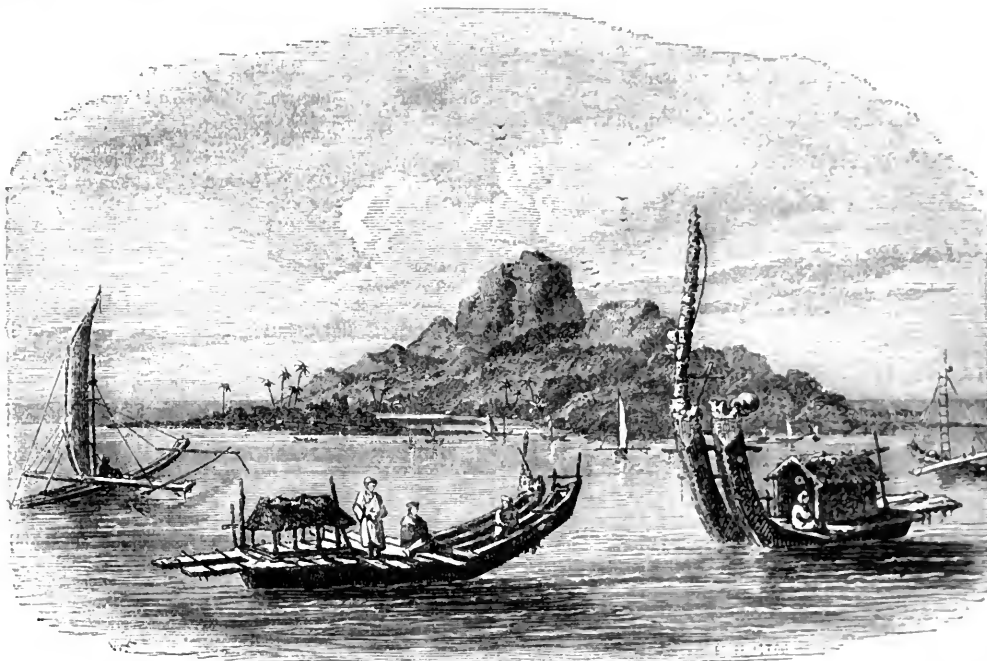
Other expeditions, no less dangerous, and equally difficult, if not more so, had been undertaken by land, with a view of exploring the northern regions of America, and the coast of the Polar Sea, in order to assist in the discovery of the passage so ardently sought for during so many ages. Samuel Hearne, employed by the Hudson Bay Company, in 1771 commenced his expedition at Prince of Wales Fort, and discovered the Coppermine River, which he traced to its embouchure in the Polar Sea. Franklin, in 1820-21, made an expedition by land along the same coast, between the Coppermine River and Cape Turnagain. This adventurous expedition, accomplished amidst a thousand dangers, among which famine was not the least formidable, was highly useful in a geographical point of view. Two years afterwards the same officer undertook another expedition to the north, and explored the country between the Mackenzie River and Cape Back; at the same time Dr. Richardson, one of the party, explored that part between the Mackenzie River and the Coppermine River. The part of the coast left unexplored between the limits of Captain Beechey and Captain Franklin's discoveries, extending to 150 miles, was nearly completed in this respect by Captain Back, and after him by Messrs. Dease and Simpson, so that the northern shores of North America are now geographically known almost throughout their whole extent.

Our geographical knowledge of the interior of the continent of North America was greatly increased by some other important expeditions. Lewis and Clarke travelled to the sources of the Missouri among the Rocky Mountains, and reached the Pacific Ocean by descending along the course of the Columbia River. Pike, in exploring the sources of the Mississippi, discovered those of the Arkansas and the Red River. Major Long, James Peak, Messrs. Cass and Schoolcraft, travelled over this vast region, so remarkably studded with lakes and rivers, and belonging partly to Britain and partly to the United States. Mackenzie, in 1789, went from Montreal, and travelling to the north-west, descended along the course of the river which bears his name, and found that its source was in the Slave Lake, and its termination in the Arctic Ocean; he then crossed the chain of the Rocky Mountains, and reached the Pacific. In South America, Baron von Humboldt began his explorations, and accompanied by M. Aimé Bonpland, the celebrated botanist, visited Columbia, now divided into the republics of Venezuela and Ecuador, and the Granadian Confederation, studying during his travels all the phenomena of nature, tracing the geography of the country, measuring the heights of the Andes, examining the craters of volcanoes, delineating on maps the courses of rivers, and, in short, exploring the greater part of this magnificent country. On the river Amazon, he made observations equally curious and important. He proceeded from Peru to Mexico, and made similar observations in the latter country; and he has described his scientific discoveries in these regions in a style both effective

and interesting; so that in no portion of the globe have greater advances been made in the knowledge of physics and geography, and of all the sciences connected with them. Botanical geography may, in fact, be said to have originated with Baron von Humboldt. If to this we add that the author of the "Tableaux de la Nature" studied the countries in which he travelled both in an economical and political point of view, his merit as a scientific traveller stands unrivalled.

The travels of La Condamine in Peru and on the river Amazon; of Smith and Maw, on the same river; of Messrs. Spix, Martins, and Auguste St. Hilaire, in Brazil; of Don Felix Azara, in Paraguay; of Captains King and Fitzroy, in Patagonia and Tierra del Fuego; of M. Stephenson, in Chili and Peru; of M. Gay, in Chili; and of M. Schomburgk, in Guiana, have all contributed to the perfection of our knowledge of the geography, the productions, the geology, and the population of South America. Among these later travellers must be mentioned M. A. d'Orbigny, a learned French geologist, who, in 1826, after a sojourn of seven months at Buenos Ayres, ascended the Parana

stone, some of which weigh eighty tons. The great gates are each composed of one single mass; and there are colossal images rudely sculptured, showing that at a very early period there must have been some communication between the Old World and the New. The traveller above mentioned then visited in succession the cities of Cochabamba and of Santa Cruz de la Sierra; courageously penetrated into the province of the Chiquitos, which he surveyed in every direction to the river Paraguay and the Brazilian province of Matto-Grosso; noted the manners of the Guarayos, a tribe still entirely savage; traversed the province of the Moxos, to the north-east of Upper Peru; passed some time in the forests inhabited by the Yuracares Indians; discovered the points of discharge of the Rio Beni and Rio Mamoré, tributaries to the Amazon; returned to Santa Cruz; visited Potosi, the city of inexhaustible mines; and finally sailed for France from the coast of Peru. This remarkable expedition lasted for the space of eight years, and produced valuable results for the geographer, the natural historian, and the geologist.



OTAHETE OR TAHITI, THE "GEM OF THE PACIFIC."

as far as 1,000 miles from its mouth, travelled over the province of Corrientes, and other parts of the Argentine Confederation, visited the hordes of savages which people the Grand-Chaco, and returned to a civilised territory, passing through the provinces of Entre-Ríos and Santa-Fe. He then travelled into Patagonia, ascended the Rio Negro, and sojourned eight months in that country amongst the stalwart savages, whose Herculean forms and size had been described with so much exaggeration by Pigaletta, Drake, Sarmiento, Lemaire, Byron, Bougainville, and many other navigators. This intrepid naturalist then proceeded to Chili, having doubled Cape Horn and reached Bolivia, sometimes called Upper Peru, of which he explored the western region, rendered so remarkable by the labours of the ancient Quichuas. He ascended the summits of the Andes, and on his reaching the opposite sides of these amazing heights, beheld a magnificent panorama of snowy peaks, and of immense chains of mountains. He at last reached the vast table-land on which is situated the great Lake of Titicaca, 150 miles long, rendered so famous by the Temple of the Sun, built by the Incas, on an island in its centre. At the village of Tiahuanacu, near the banks of this lake, are also to be seen the remains of the stupendous palace erected by the ancient Peruvians. The interior courts, 360 feet square, are built of enormous blocks of

From the extremity of South America let us pass on to the regions which surround the Antarctic pole. There we see navigators of all nations braving the storms and the icebergs of those seas which are covered with everlasting mists, in order to enrich geography with important observations and discoveries. After the immortal name of Cook, came those of William Smith (1818), of Lieutenant Bamsfield, of the Russian officers Bellinghausen and Lazareff (1819), of Botwell (1820), of Weddell and Palmer (1822), of Biscoe (1830), and of Balleny (1839). It is to these navigators, some commissioned by the government of the nations to which they belonged, and others who were simply whalers or seal-catchers, that we owe the successive discoveries of New South Shetland, the South Orkneys, Palmer Land, Trinity Land, the islands of Peter and Alexander, Enderby Land, Adelié Land, Graham Land, and the islands of Biscoe and Balleny. Three voyages in the southern circumpolar seas—those of Dumont d'Urville, of Captain James Clarke Ross, and of the American Commodore Wilkes—deserve particular notice. The French expedition, under the command of Captain Dumont d'Urville, after a careful exploration of the Strait of Magellan, proceeded in 1838 towards the icy regions, and was stopped by an iceberg in latitude 64° S. The two vessels endeavoured to overcome the obstacles which opposed their progress, but they

were blockaded by the ice during five successive days, and only secured their safety by a sudden change of the wind to the south, and the immediate efforts of the crews, who cleared their way through the immense blocks of ice with which they were surrounded. Sailing in a different direction, they discovered Louis Philippe Land; and returning northward, Captain D'Urville visited, agreeably to his instructions, the island of Juan Fernandez, the Marquesas Islands, Otaheite or Tahiti—which has gained the name of the "Gem of the Pacific" from the exquisite beauty of its scenery—Samoa, Varavoo, Hapace, and the Feejee Islands. He then touched at Banks Island, the Vanikoro, Solomon, and Caroline Islands, and others, and arrived at the hospitable port of Guam. He then sailed through the great Asiatic Archipelago, and explored the banks of New Guinea, Australia, and the isles of Sunda; he made the tour of Borneo, and stayed a short time at Hobart Town, in Tasmania. In January, 1840, the vessels of the same expedition, *L'Astrolabe* and *La Zélée*, sailed again towards the icy regions of the south, and swept over the immense space from 120° to 170° E., which had not hitherto been fully explored by navigators. Having discovered some land and coasts which they supposed to belong to the yet undiscovered Antarctic continent, they returned to New Zealand, and explored its coasts, and those of the islands of the Louisiade Archipelago and New Guinea, including the dangerous reefs of Torres Strait.

The object of the expedition under Captain, afterwards Sir James Ross, was to investigate the problem of the Antarctic continent of which D'Urville was considered to have seen the shores. He sailed for this purpose, with the *Erebus* and *Terror* under his command, and early in 1840 he discovered land in latitude 70° 47' S., and longitude 174° 56' E., consisting of a collection of peaked mountains, varying from 9,000 to 12,000 feet in height, covered with snow, and surrounded with immense masses of ice which jutted into the ocean like huge promontories. An island discovered in the vicinity of this land was called Victoria. In latitude 76° S., and longitude 170° 32' E., they discovered another island; and next day they beheld a mountain 12,400 feet high belching forth, at an immense elevation, flames and smoke; to this volcano they gave the name of Mount Erebus. Having reached latitude 78° 4' S., the farthest south point yet reached in the Antarctic Ocean, the expedition proceeded on its way in a retrograde direction, coasting, as it were, the land first discovered, it being impossible to get on shore on account of the ice in which it was enveloped. It was thus ascertained that this land extended in latitude from 70° S. to 79° S.; and it was named Victoria Land. A second voyage of Captain Ross was fruitless, and a third ended in the discovery of a small volcanic island in latitude 64° 12' S., and in longitude 54° 29' W. The expedition of Wilkes, the American navigator already mentioned, was practically useless; as it was proved that his claim to the discovery of the Antarctic continent could not be supported even by the testimony of his own officers. Recent attempts to penetrate into the land around the south pole have proved unsuccessful.

LESSONS IN GERMAN.—XIV.

SECTION XXV.—THE INFINITIVE, ETC.

WHEN not governed by an auxiliary verb of mood, the infinitive takes the preposition zu (§ 146) before it, as:—Ich habe Zeit zu lesen, I have time to read. Er geht in die Schule, um zu lernen, he goes to school, in order to learn. Er geht auf den Markt, um Fleisch zu kaufen, he goes to market, in order to buy meat. Um, in order, is, as in English, often omitted, as:—Er geht auf den Markt, Fleisch zu kaufen, he goes to market to buy meat.

1. Können often signifies to know, to have learned a thing, and may be followed by a noun in the accusative, as:—Können Sie Deutsch? Do you know (understand) German? Followed by a verb, können signifies either to be able (see Sect. XXIV. 1), or to know how, as:—Kann er schreiben? Can he write? or, does he know how to write, has he learned to write?

2. Wissen, to know, is frequently placed before an infinitive with zu, and corresponds to our phrase "to know how," as:—Er weiß zu schreiben, he knows (how) to write. Er weiß zu leben, he knows (how) to live. Er weiß sich zu helfen, he knows (how) to get on.

3. Kennen also signifies to know, but only in the sense of to

be acquainted with, as:—Kennen Sie diese Leute? Do you know these people? Ich kenne sie, I know them, I am acquainted with them.

4. The indefinite pronoun man has no exact correspondent in English. It is variously translated, according to its position; thus, Man sollte immer ehrlich handeln, one should always act honourably. Man läuft, they are running. Man schreit, they are crying. Ertragen muß man, was der Himmel sendet; what (the) Heaven sends, must we endure (§ 59. 1, 2). Man is often nominative to an active verb, which latter is best rendered by a passive one, as:—Man weiß, wo er ist, it is known where he is. Man hat den Dieb gefangen, the thief has been caught.

The above use obtains especially in the phrase "man sagt" (French *on dit*), which, though more literally "one says," is often better rendered by "it is said, rumoured, reported," etc.

VOCABULARY.

Elend, wretched.	lateinisch, Latin.	Sessen, shall.
Heidel- berg, n. Heidel- berg.	Maßen, to make, to do.	Sprache, f. language.
Holen, to go for.	Schnitten, to cut.	Um (§ 114. 4).
Käse, m. cheese.	Schule, f. school.	Wahl, f. choice.
		Wiese, f. meadow.

RÉSUMÉ OF EXAMPLES.

Er ist fleißig, nicht nur um das Lob seines Lehrers zu erwerben, sondern um seine Kenntnisse zu erweitern.	He is diligent, not only to obtain the praise of his teacher, but in order to extend his knowledge.
Wir essen, um zu leben; aber wir leben nicht, um zu essen.	We eat in order to live, but we do not live in order to eat.
Ein kluger Mann weiß zu schweigen.	A judicious man knows (how) to be silent.
Ein unbeflecktes Herz ist ein stiller See, dem man auf den Grund sieht.	An unspotted heart is a still clear sea, which one sees to the bottom.
Ein Freund ist eine Münze; man prüft sie, ehe man sie nimmt.	A friend is a coin, it is proved before it is received.

EXERCISE 39.

1. Ich muß auf die Briefe gehen, Sie zu holen. 2. Was soll Ihr Bruder in der Schule thun? 3. Er soll in die Schule gehen, um die lateinische (§ 5, 8) Sprache zu lernen. 4. Der Mensch muß ehrlich oder edel sein. 5. Was soll ich thun? 6. Sie können thun, was Sie wollen, und sollten thun, was Sie können. 7. Warum sind Sie nicht gestern zu uns (Sect. XXIII.) gekommen? 8. Ich wollte, aber ich konnte nicht; ich mußte zu Hause bleiben und lesen. 9. Wied' er Schneider mir einen Rock machen wollen? 10. Er wird Ihnen einen machen wollen, aber er wird es nicht thun können. 11. Warum wird er es nicht thun können? 12. Er wird morgen auf das Land gehen müssen, seinen kranken Bruder zu besuchen. 13. Was will der Knabe mit seinem Messer? 14. Er will Brod und Käse schneiden. 15. Haben Sie Zeit, in den Stall zu gehen? 16. Ich habe Zeit, aber ich will nicht gehen, ich will zu Hause bleiben. 17. Was haben Sie zu Hause zu thun? 18. Ich habe Briefe zu lesen und zu schreiben. 19. Müssen Sie sie heute schreiben? 20. Ich muß sie heute schreiben, weil ich morgen nach Heidelberg gehen will. 21. Man muß in der Wahl seiner Freunde vorsichtig sein. 22. Dieser Knabe hat heute gar nichts gelernt. 23. Haben Sie auch nichts gelernt? 24. Ich habe etwas gelernt, aber nicht viel.

VOCABULARY.

Aus, out of, from.	Dorf, n. village.	Neuigkeit, f. news.
Bair., m. Bavarian.	Fenster, n. window.	Schachtel, f. box.
Berg, m. mountain.	Hinte, f. gun.	Schloß, n. castle,
Böhme, m. Bohemian.	Hausknecht, m. house- servant.	palace.
Beunen, m. well.	Hesse, m. Hessian.	Ungarn, n. Hungary.
Dienstmädchen, n. ser- vant-girl.	Kraufau, n. Cracow.	Warschau, n. War- saw.

EXERCISE 40.

1. Zu wem gehen Sie? 2. Ich gehe zu meinem Bruder. 3. Mit wem geht dieser Knabe? 4. Er geht mit seinem Vater nach der Stadt. 5. Von wem haben Sie diese Neuigkeiten gehört? 6. Ich habe sie von meinem alten Freunde gehört. 7. Mit wem gehen Sie nach dem Dorfe? 8. Ich gehe nicht nach dem Dorfe, ich gehe mit meinem Vater nach der großen Stadt. 9. Wann gehen Sie aus der Stadt zu unsern Freunden? 10. Wie gehen nicht zu Ihren Freunden, wir kommen morgen wieder nach Hause. 11. Ich gehe heute weder zu meinem Freunde, noch nach dem Dorfe, noch aus dem Hause. 12. Der Graf hat ein großes Schloß mit kleinen Fenstern. 13. Der Fluß kommt aus den Bergen. 14. Hat Ihr Vater etwas von

seinem Bruder gehört? 15. Ja, dieser Mann ist aus Ungarn, und hat meinem Vater eine Schwachtel von meinem Oheim gebracht. 16. Geht er nach Wien? 17. Nein, er geht nach Warschau, und von Warschau nach Krakau. 18. Der Bauer, der Wöme und der Hesse kommen aus Deutschland. 19. Der Jäger mit seiner Kinte kommt aus dem Walde. 20. Der Knecht geht nach der Stadt. 21. Ich habe von meinen Brüdern gehört, sie gingen zu ihrem Brennte. 22. Das Dienstmädchen kommt vom Brunnen, und der Hausknecht geht zum Fleischer.

EXERCISE 41.

1. If we desire to be happy, we must not deviate from the path of virtue. 2. I know that he is not your friend, but I know likewise [auch] that he is a man of probity [Rechtlichkeit]. 3. Let them know that this news is only a rumour [Gerücht]. 4. They must not say everything they know. 5. You must be very careful in the choice of your friends. 6. We ought to know to whom we apply. 7. Will you tell the tailor, when he has finished your coat, to call on me? 8. Have you time to go with me to the city? 9. If he had not been able to perform [nicht hätte zu Stande bringen können] the work he would not have undertaken [unternommen haben] it. 10. Have you time to read this letter? 11. He goes to school, in order to learn the Latin language.

SECTION XXVI.—SEPARABLE PARTICLES.

The particles ab, an, auf, aus, bei, mit, nieder, um, voraus etc. (§ 89, 1, § 90, § 92), are often compounded with verbs, and, as they may stand apart from the verb, they are called separable particles.

1. In principal sentences (§ 160) the particle is separated from the verb and placed at the end. In subordinate sentences, however, the particle and the verb remain always in union, as:—Er wirft den Wagen um, he overturns the wagon. Der Wagen, den er um wirft, the wagon which he overturns. Ich heb den Stein auf, I lifted the stone up. Der Stein, welchen ich aufheb, the stone which I lifted up. Der Mann geht aus, the man goes out. Der Mann, welcher ausgeht, the man who goes out. Er schrieb den Brief ab, he copied the letter. Der Brief, den er ab schrieb, the letter which he copied. Er brach die Blumen ab, he broke off the flowers. Sie ist traurig, weil er die Blumen abbrach, she is sad, because he broke off the flowers.

In the above words, "overturn and uplift," it will be seen that the usage of the two languages is similar. In nearly all other English compounds, however, this resemblance to the German does not exist; thus, for "ich fann den Wagen umwerfen," we may say, I can overturn the wagon, or, I can turn the wagon over. The sentence, Er fann ausgeben, however, we can only translate by placing the particle at the end of the sentence; as, he can go out.

2. In the infinitive mood, the particle is never separated from the verb, except by zu, which, when used, stands between the two, as:—Er will ausgehen, he will go out. Kann sie abschreiben? can she copy? Er ist bereit den Wagen um zuwerfen, he is ready to overturn the wagon.

3. In the past participle, the augment, ge, comes between the particle and the radical; the particle of course being always prefixed, as:—Er hat den Brief ab ge schreiben, he has copied the letter. Er hat den Wagen um gewerfen, he has overturned the wagon. Ich habe den Brief, welchen er abgeschrieben hat, I have the letter which he has copied.

VOCABULARY.

Aufgeschieten, separated.	Aufziehen, to attract.	Blitz, m. lightning.
Aufsetzen, to dispose of, sell.	Aufheben, to revoke, give up.	Doch, yet.
Aufsteigen, to descend, dismount.	Aufrichten, to elevate, support.	Drohung, f. threaten- ing.
Anwenden, to indicate, declare.	Aufschreiben, to defer, put off.	Drüsen, to afflict, op- press.
Anpreisen, to praise, extol.	Aufspeichern, to gar- ner, store up.	Eile, f. haste, speed.
Anspornen, to incite.	Aufsteigen, to ascend, mount.	Einsammeln, to col- lect.
Anreiben, to urge, drive.	Ausstreichen, to thrash.	Einschließen, to shut up, confine.
Anwenden, to apply, employ.	Ausicht, f. prospect.	Entlassen, to dis- charge, pay off.
Anzeigen, to point out, show.	Beendigung, f. termi- nation.	Ermit, m. hermit.
	Belohnung, f. reward.	Erfüllen, to fill.
	Bibel, f. Bible.	Ertrudelt, f. fruit of the field.

Gebet, n. prayer.	Mitgehen, to go with.	Erstgen, to arise.
Gebirge, n. chain of mountains.	Müde, tired, weary.	Süden, m. South.
Grünspan, m. verdigris.	Norden, m. North.	Unterlegen, to go down, set.
Klaufe, f. cell.	Best. f. plague, pesti- lence.	Unterirdisch, subterra- nean.
Kunde, m. customer.	Rachtsüchtig, revenge- ful.	Verbringung, f. pro- mise.
Licht, n. light.	Reichlich, rich.	Wegfliegen, to fly away.
Liebe, f. love.	Reiter, m. rider.	Wegraffen, to carry off, destroy.
Magnet, m. load- stone.	Retten, to save, res- cue.	Welt, f. world.
Magnetnadel, f. mag- netic needle.	Sanft, mild, soft.	Zeisig, m. greenfinch.
Mehr, more.	Sonne, f. sun.	
	Ertrudelt, n. adage.	

RÉSUMÉ OF EXAMPLES.

Das Gewissen ist die Stimme der Seele; die Leidenschaften sind die Stimmen des Körpers; auf welche von beiden Stimmen soll man hören? Und sie gingen Jonathan nach, als er hinaus'eg zu David. The conscience is the voice of the soul, the passions are the voices of the body; to which of these (both) voices shall one listen? And they went after Jonathan as he drew (forth) toward David.

Das geht mich nicht an (Sect. LXXVIII. 6). Die Sonne geht um fünf Uhr auf. Die Sonne ist schon aufgegangen. That does not concern me. The sun rises (goes up) at five o'clock. The sun has already risen.

EXERCISE 42.

1. Die Reiter trieben bei dieser Nachricht ihre Pferde zu größerer Eile an. 2. Der schöne Zeisig ist dem (§ 129. 3) Anaben weggeflogen. 3. Die Aussicht einer reichlichen Belohnung freute sie an, das Kind des reichen Greismannes zu retten. 4. Der Bauer hat seine Feldfrucht eingesammelt, ausgerathen und aufgeschichtet. 5. Der Rachtsüchtige wendet gern (Sect. XLIII. 1) das Ertrudelt an: „aufgeschoten ist nicht aufgehoben.“ 6. Abgeschieten von den Menschen lebt der Eremit in seiner Klause. 7. Der Krieg hat viele Menschen weggerafft, aber doch noch mehr die Best. 8. Die Sonne ist untergegangen. 9. Der König hat nach Beendigung des Krieges viele Soldaten entlassen. 10. Der Magnet zieht das Eisen und den Blig an. 11. Die Magnetnadel zeigt dem Steuermann Nord und Süd an. 12. Die Drehungen sowohl als die Verheisungen in der Bibel deuten die Fiele Gottes an. 13. Der kurserne Kessel hat Grünspan angezogen. 14. Der Müller hat sein Mehl abgesetzt. 15. Der Vater hat den Hund in sein Zimmer eingeschlossen. 16. Der Kaufmann reißt das Tuch seinen Kunden an. 17. Das Gebet richtet ein gerüthtes Herz auf. 18. Der Wind steigt hinter dem Gebirge auf und erfüllt die Erde mit seinem sanften Lichte. 19. Ich steige in den Wagen. Sie steigen aus dem Wagen, und er steigt auf das Pferd. 20. Die müthen Reiter steigen von ihren Pferden ab. 21. Wollen Sie mich mitnehmen, wenn Sie nach Deutschland reisen? 22. Ich glaube nicht, daß Sie mitgehen wollen.

EXERCISE 43.

1. After the termination of the war, the soldiers will be paid off. 2. I shall go with your brother to the hermit, who lives separated from the world. 3. The farmer has collected the corn in the field. 4. The citizens are shut up in the town from the enemy. 5. The war and the plague have destroyed a great many people. 6. The weary rider dismounts his horse. 7. The merchant has disposed of his stock. 8. The sun rises in the east. 9. The sun rises at twenty minutes past five o'clock, and sets at half-past six. 10. You must incite your scholars to be more studious. 11. Will you defer your visit for to-morrow? 12. The magnetic needle points to the north. 13. The scholar has copied his lessons.

OUR HOLIDAY.

GYMNASTICS.—V.

THE PARALLEL BARS.

The parallel bars afford advantages similar to those of the horizontal bar, which was the subject of our last paper; and also give scope for a still higher and more attractive series of exercises which are highly beneficial in strengthening the muscles of the arms, chest, and back. The form and construction

of this valuable addition to the apparatus of the gymnasium are shown in Fig. 15. Two bars, made of deal, ash, or any light wood, rounded so as to be readily grasped by the hand, and from six to eight feet in length, are fixed on strong upright supports, either firmly embedded in the ground, or standing on a solid frame like that represented in the illustration. The distance between the bars is generally about a foot and a half, or such that the shoulders of the individual practising may readily pass between them. The bars should

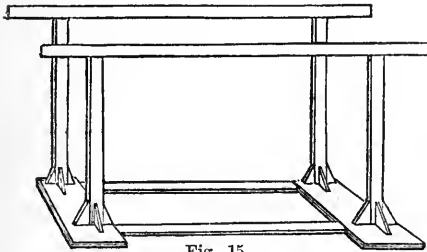


Fig. 15.

also be about the height of the shoulders from the ground. The gymnast starts from one of the cross-pieces which are seen at either end of the figure. Placing the hands firmly on the bars, he springs up into the position illustrated in Fig. 16. This is known as *the rest*. The heels should be close together, the toes turned out, the head erect, and the chest thrown forward. The hands may be with the knuckles outward, as in the cut, or with this grasp reversed; or, again, with the palms and fingers extended flat on the tops of the bars; according to convenience or inclination in executing the different movements.

From this position you may (1) *travel* along the bars from end to end by the movement of the hands. Keep the legs still, and let the progressive movements of the arms be equal on either side. Do this first with the ordinary, and then with the reversed grasp.

2. From the rest, give a rapid turn, releasing one hand and bringing it to the same bar that is held by the other. This is called *facing*, and after performing the movement you may travel as before, but grasping the one bar only.

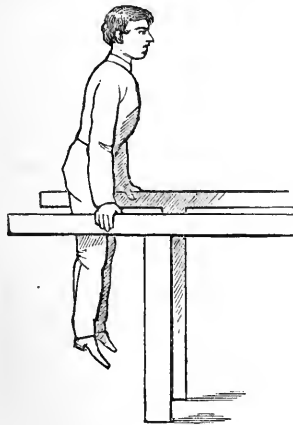


Fig. 16.

3. Other rests are the rest on the fore-arms, in which they are placed flat along the top of the bar; and the *drop rest*, in which the weight is thrown upon the hands, while the body sinks partially down, the elbows being raised above the shoulders.

4. Raising the legs should be practised in the following manner. With a firm grasp in the rest, begin by swinging them slowly backwards and forwards, to acquire freedom of action. Then raise first one and next the other alternately. Lastly, raise them gradually in front of you, keeping them close

together and stiffly extended, and endeavour to bring them so high that they form a straight line parallel to the line of the bars, but two or three inches higher, while the body is, as it were, in a sitting position. This will try your muscles, and you must not expect to do it at the first or the second attempt, but you will derive benefit in practising it until you are able to accomplish it with ease. When you have succeeded, open the legs, moving them from side to side, and still keeping them on a perfect level.

5. Next, from the rest, raise the legs the reverse way—i.e., backwards. With a gradual movement this will not be so easy as the last exercise; but with a swinging motion the body may be brought to the position shown in Fig. 17. Again open the legs, and stretch out as in swimming.

6. The last exercise brings us to the actual *swing*, which

must be practised cautiously, and the movement gradually increased according to the strength and skill of the beginner. The expert are able to swing so high, simply grasping the bars in the ordinary manner, that the feet in the forward movement rise above the level of the head, and in the backward progression the body is brought almost into the perpendicular position, the head being nearly level with the hands. But we do not advise any one who practises for health's sake alone to attempt this, although he may see others perform it.

Here we must note, once for all, that in these and other exercises the young gymnast must keep steadily before him the object with which he set out, namely, to develop and strengthen the physical powers, thereby securing health and activity; and not to equal or exceed some other and perhaps more expert gymnast or gymnasts in the performance of striking feats. If this is not borne in mind, and the practice regulated accordingly, it is not only possible, but *certain*, that more harm than good will result to the learner from the usual routine of either a public or a private gymnasium.

7. The following is the method of accomplishing the *turn over*. You start from a standing position, and, grasping the bars firmly, bring the legs forward and upward with a spring,

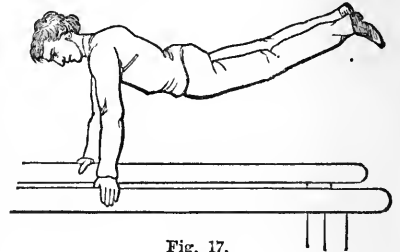


Fig. 17.

until the body hangs perfectly level below the bars. This we will call the first stage of the turn; and each stage should be well practised before proceeding to the next. Now, from this horizontal position, the weight resting upon the hands, carry the legs upward until the body resumes the perpendicular, but with the head downmost; thus half the circle is described. Then bring the legs downward, the reverse way from the previous movement, until the body again hangs horizontally, but the face directed towards the ground. This is the third stage of the turn, which will be completed by a light spring downwards, bending the knees as the feet touch the earth. The quick and regular performance of each of these movements in succession constitutes the perfect turn backwards, which will not be difficult after the preliminary exercises have been thoroughly mastered. The turn over forwards is accomplished by reversing these movements, the legs being thrown behind you in starting.

8. To perform the *roll* you sit astride the bars, bend the body forwards until the head is between them, the arms being placed outside, and then throw the legs upward, and turn quickly over, legs outside, which brings you back to the straddling position. This may be done again and again, until you have traversed the length of the bars, when you may reverse the roll and go back to the other end; but for the backward roll let the forearms rest upon the bars, which should be grasped firmly behind you.

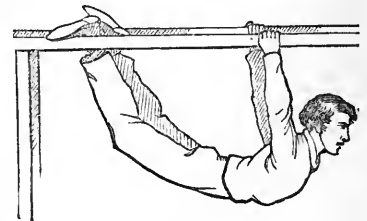


Fig. 18.

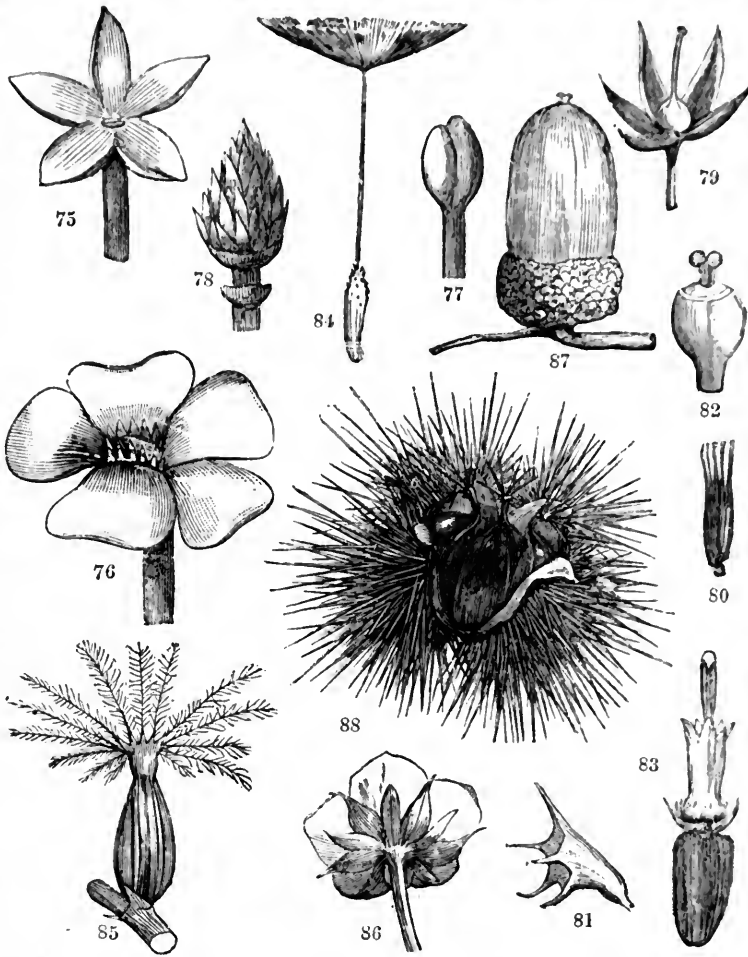
9. The *sling* or *hammock* (Fig. 18) must be performed by the backward turn as previously described, but instead of bringing the legs between the bars in the descent, let the feet rest on them, and the body hang from the bars by the hands and feet in the manner shown in the illustration.

10. To vault out of the bars, raise the legs slightly above them, and then turn and jump downwards cleanly to the ground, either over the right bar or the left, throwing the weight upon the arm, and not touching the bar with the body as you descend. The light vault downward from the rest at the end of the bars will need no explanation.

LESSONS IN BOTANY.—VIII.

SECTION XV.—PARTS OF AN INDIVIDUAL FLOWER.

HAVING already described the chief arrangement which flowers assume, we may now proceed to examine the parts of which flowers themselves are made up. For the purpose of our first examination it will be well to select a flower in which the various parts are all developed; for this co-existence of all the parts necessary to constitute a perfect flower is not invariable; in certain species one or more of these parts are wanting, and conversely in certain species the parts are redundant. Thus botanical productions are very apt to assume monstrous appearances, sometimes by the suppression of organs, at other times by their change, or their presence in increased numbers. In point of fact, the greater number of garden flowers are, botanically speaking, monsters, care and cultivation having succeeded in effecting remarkable changes. They are beautiful for a mere lover of flowers to look at, and often the objects of much solicitude, but quite unfit for the purpose of being the subjects of a young botanist's first investigations. Thus, how striking is the difference between the wild and cultivated roses! The flower-leaves of the former are few and distant, the flower-leaves of the latter numerous and tightly packed. Yet the additional flower-leaves, called *petals*, of the garden rose are only modifications of the *stamens*, or little thread-like growths of the wild flower. In saying, therefore, that we will commence our study of the parts of a flower by examining a perfect specimen, we mean the perfection of nature, not the perfection of the gardener.



75. CALYX OF RANUNCULUS. 76. COROLLA OF RANUNCULUS. 77. STAMEN OF RANUNCULUS. 78. CARPELS OF RANUNCULUS. 79. CALYX OF THE PIMPERNEL. 80. QUINCEPID CALYX OF THE GENTIAN. 81. IRREGULAR CALYX OF THE DEAD-NETTLE. 82. CALYX OF THE MADDER. 83. ADHERENT CALYX OF THE SUNFLOWER. 84. CALYX OF THE DANDELION. 85. CALYX OF THE CENTRANTHUS. 86. INVOLUCRE OF THE STRAWBERRY. 87. ACORN AND CUP. 88. SPINY INVOLUCRUM OF THE CHESTNUT.

yellow flower-leaves (Fig. 76), each of which is termed a *petal*' from the Greek *πεταλον* (pronounced *pet'-a-lon*), a leaf, and the whole five collectively are termed the *corolla*, from the Latin *corolla*, a diminutive of *corona*, a crown or garland. These portions of this, or any other flower, are not its reproductive portions, but are merely to be regarded as protective coverings for the reproductive organs within. The term *perianth*, from the Greek *περι* (*peri*), around, and *ανθος* (*an'-thos*), a flower, is frequently given to the calyx and the corolla of a flower taken collectively, on account of the fructifying portions of a flower being surrounded by these parts. Proceeding still

with our examination, we next arrive at many whorls or circular rows of *stamens* (from the Latin *stamen*, a thread or fibre), or male parts of the flower. Our diagram (Fig. 77) represents one of them cut off. Lastly, we arrive at several whorls of *carpels*, from the Greek *καρπος* (*kar'-pos*) fruit, or *pistils*, from the Latin *pistillum*, a pounder, and so called from their likeness to the pestle used by druggists (Fig. 78); each consisting of the *ovary*, or seed-vessel (from the Latin *ovum*, an egg), below; and terminating above in what is called the *stigma*, from the Latin *stigma*, a mark or brand, the intermediate portion being called the *style*, from the Latin *stylus*, an iron pen used for writing on tablets by the Romans.

Let the reader, then, not fail to remember that the stamens are the male parts of plants, and the carpels or pistils are the female parts. The carpels or pistils we have already stated to be each composed of ovary below, style in the middle, and stigma above. Each stamen is also divided into a *filament* or thread-like portion, and *anther* or head. This anther or head is filled with a dust, called *pollen*, from the

Latin *pollen*, fine flour, which, by falling upon the stigma, causes the ovary to expand, the fruit to open, and the seed to grow. This pollen the reader, we doubt not, has seen a thousand times over. It is very easily recognisable in most large flowers, especially tulips, into which if we thrust our fingers or our noses, one or the other, as the case may be, comes back covered with a yellow powder. This yellow powder is pollen, without which the tulip plant would be totally incapable of producing seed.

SECTION XVI.—DIFFERENT FORMS WHICH THE CALYX AND THE COROLLA MAY ASSUME.

First of all, as to the calyx. In our example—the buttercup

The reader cannot do better than select a ranunculus or buttercup as the subject of his first floral dissection.

On examining this flower it will be seen to consist of several circular rows of organs, or *whorls*, as they are termed. Commencing externally, we first meet with the whorl (Fig. 75), made up of five parts coloured greenish-yellow. These five parts collectively form what is termed the *calyx*, from the Greek *καλυξ* (pronounced *ka'-lux*), a husk, or shell, and each individual of the five parts is termed a *sepal*, said by Professor Henslow to be derived from a Latin word *sepalum*, a leaf, obtained by substituting *s* for *π* (*p*) in the Greek word *πεταλον*, which also means a leaf.

Proceeding with our dissection, we next arrive at the bright

—we have seen it to consist of five separate portions, and to be coloured yellowish-green; but the calyx is not always thus, being subject to modification both as to shape and to colour. In the pimpernel (Fig. 79) the calyx is divided into five separate portions, as we find it in the buttercup. Such a calyx is called *polysepalous*. In the gentian tribe it is no longer divided into five distinct sepals, but the calyx displays five clefts or fissures. Hence it is said, in botanical language, to be *monosepalous*, or composed of one piece, and *quinquefid*, or with five divisions (Fig. 80). In the lychnis tribe there is a calyx in which the rudiments only of these fissures are apparent, giving rise to the appearance of five teeth; hence such a calyx is said to be *quinquedentate* (Latin *dens*, a tooth). The calyx is termed *regular* when the sepals of which it is composed, whether equal or unequal, form a symmetrical whorl, as in the pimpernel (Fig. 79); but *irregular* when the sepals do not form a symmetrical whorl, as in the dead-nettle (Fig. 81). The calyx is said to be *free* when it is not attached to the pistil, *adherent* (from the Latin *ad*, to, and *hæreo*, to stick to) when it is partly or wholly consolidated with the pistil. Although in our example, the buttercup, and in most other examples, the calyx is easily recognisable, yet in certain other flowers it grows so tightly to the ovary that its discovery is rather more difficult. In the madder (Fig. 82) the calyx seems to have altogether disappeared, so tightly has it become attached; in the sunflower (Fig. 83) the calyx adheres to the ovary, which it quite surrounds, but eventually becoming free, separates in thread-like prolongations. In each of the little florets of the dandelion (Fig. 84) the calyx is at first attached, but separated eventually in the form of an aigrette or plume. In the centranthus (Fig. 85) the calyx, first adherent, separates in various feathery branches.

The real calyx is made up of an association of sepals; but a sort of imitation calyx, called the *involucrum*, a term which has been already explained, is made up of bracts, those little modified leaves which we have already spoken of as being often found on the peduncles or flower-stalks. The extra calyx on the strawberry flower (Fig. 86) is made up of these. The acorn-cup (Fig. 87) and the spiny involucre of the chestnut (Fig. 88) are also different modifications of the same thing.

READING AND ELOCUTION.—VIII.

ANALYSIS OF THE VOICE.

If we observe attentively the voice of a good reader or speaker, we shall find his style of utterance marked by the following traits. His voice pleases the ear by its very sound. It is wholly free from affected suavity; yet, while perfectly natural, it is round, smooth, and agreeable. It is equally free from the faults of feebleness and of undue loudness. It is perfectly distinct in the execution of every sound, in every word. It is free from errors of negligent usage and corrupted style in pronunciation. It avoids a measured, rhythmical chant, on the one hand, and a broken, irregular movement, on the other. It renders expression clear, by an attentive observance of appropriate pauses, and gives weight and effect to sentiment, by occasional impressive cessations of voice. It sheds light on the meaning of sentences, by the emphatic force which it gives to significant and expressive words. It avoids the "school" tone of uniform inflections, and varies the voice upward or downward, as the successive clauses of a sentence demand. It marks the character of every emotion, by its peculiar traits of tone; and hence its effect upon the ear, in the utterance of connected sentences and paragraphs, is like that of a varied melody, in music, played or sung with ever-varying feeling or expression.

The analysis of the voice, for the purposes of instruction and practice in reading and declamation, may be extended, in detail, to the following points, which form the *essential properties of good style in reading and speaking*:—

1. Good "Quality" of Voice.
2. Due "Quantity," or Loudness.
3. Distinct Articulation.
4. Correct Pronunciation.
5. True Time.
6. Appropriate Pauses.
7. Right Emphasis.
8. Correct "Inflections."
9. Just "Stress."
10. "Expressive Tones."
11. Appropriate "Modulation."

I. QUALITY OF VOICE.

The chief properties of a good voice are—

1. Roundness.
2. Smoothness.
3. Versatility.
4. Right Pitch.

1.—Roundness.

This property of voice is exemplified in that ringing fulness of tone, which belongs to the utterance of animated and earnest feeling, when unobstructed by false habit. It is natural and habitual in childhood; it is exhibited in all good singing, and in the properly cultivated style of public reading and speaking.

To obtain roundness and fulness of voice, it is exceedingly important that the student observe the following suggestions. Be attentive to the position of the body. No person can produce a full, well-formed sound of the voice, in a lounging or stooping posture. The attitude of the body required for the proper use of the voice is that of being perfectly upright, without rigidity. The head must never be permitted to droop; it should be held perfectly erect. The back must be kept straight, and the shoulders pressed backward and downward. The chest must be well expanded, raised, and projected; so as to make it as roomy as possible, in order to obtain full breath and full voice. Breathe freely and deeply; keep up an easy fulness of breath, without overdoing the capacity of your lungs. Make your utterance vigorous and full, by giving free play to the muscles situated below the bony part of the trunk; these should move energetically, in order to drive the breath upward with due force, and thus give body to the sounds of the voice. Keep the throat freely open, by free opening of the mouth, so as to give capaciousness and rotundity to every sound. A round voice can never proceed from a half-shut mouth.

The large and full effect of vocal sound, produced by the due observance of the preceding directions, forms what is called by great authorities in elocution, the "orotund" (round, or, literally, round-mouthed) voice, which is considered the ample style of oratory, or public reading, in contrast with the limited utterance of private conversation. The attitude of body, and the position and action of the organs, demanded by "orotund" utterance, is likewise highly favourable to health and to easy use of the voice; while stooping and lounging postures, a sunken chest, and drooping head, tend both to suppress the voice and injure the organs, besides impairing the health.

Practice in the style of vehement declamation, is the best means of securing a round and full tone. The following exercise should be repeatedly practised, with the attention closely directed to the management of the organs, in the manner which has just been described, as producing the "orotund," or resonant quality of voice.

Exercise on the "Orotund."

Who is the man that, in addition to the disgraces and mischiefs of the tomahawk and scalping-knife of the savage?—to call into civilised alliance the wild and inhuman inhabitant of the woods?—to delegate to the merciless Indian the defence of disputed rights, and to wage the horrors of this barbarous war against our brethren?—My lords, we are called upon as members of this house, as men, as Christians, to protest against such horrible barbarity!—I solemnly call upon your lordships, and upon every order of men in the state, to stamp upon this infamous procedure the indelible stigma of the public abhorrence!

2.—Smoothness of Voice, or "Purity" of Tone.

Smoothness of voice, in reading and speaking, is the same quality which, in relation to vocal music, is termed "purity" of tone.

This property of voice consists in maintaining an undisturbed liquid stream of sound, resembling, to the ear, the effect produced on the eye by the flow of a clear and perfectly transparent stream of water. It depends, like every other excellence of voice, on a free, upright, and unembarrassed attitude of the body,—the head erect, the chest expanded. It implies natural and tranquil respiration (breathing); full and deep "inspiration" (inhaling, or drawing in the breath); and gentle "expiration" (giving forth the breath); a true, and firm, but moderate exercise of the "larynx" (or upper part of the throat); and a careful avoiding of every motion that produces a jarring, harsh, or grating sound.

"Pure" tone is free from (1) the heavy and hollow note of the chest; (2) the "guttural," choked, stifled, or hard sound of the swollen and compressed throat; (3) the hoarse, husky, "harsh," "reedy," and grating style, which comes from too forcible "expiration," and too wide opening of the throat; (4) the nasal twang, which is caused by forcing the breath against the nasal passage, and, at the same time, partially closing it; (5) the wiry, or false ring of the voice, which unites the guttural and the nasal tones; (6) the affected mincing voice of the mouth, which is caused by not allowing the due proportion of breath to escape through the nose. The natural, smooth, and pure tone of the voice, as exhibited in the vivid utterance natural to healthy childhood, to good vocal music, or to appropriate public speaking, avoids every effect arising from an undue preponderance, or excess, in the action of the muscles of the chest, of the throat, or of any other organ, and, at the same time, secures all the good qualities resulting from the just and well-proportioned exercise of each. A true and smooth utterance derives resonance from the chest, firmness from the throat, and clearness from the head and mouth.

Without these qualities, it is impossible to give right effect to the beauty and grandeur of noble sentiments, whether expressed in prose or in verse.

Childhood and youth are the favourable seasons for acquiring and fixing, in permanent possession, the good qualities of agreeable and effective utterance. The self-taught cannot exert too much vigilance, nor take too much pains, to avoid the encroachments of faulty habit in this important requisite to a good elocution.

The subjoined exercise should be frequently and attentively practised, with a view to avoid every sound which mars the purity of the tone, or hinders a perfect smoothness of voice.

Exercise in Smoothness and "Purity" of Voice.

No sooner had the Almighty ceased, but all
The multitude of angels, with a shout,
Loud as from numbers without number, sweet,
As from blest voices uttering joy;—heaven rung
With jubilee, and loud hosannas filled
The eternal regions;—lowly reverent,
Towards either throne they bow; and to the ground,
With solemn adoration, down they cast
Their crowns, inwove with amaranth and gold.—
Then crowned again, their golden harps they took,
Harps ever tuned,—that, glittering by their side,
Like quivers hung, and with preamble sweet
Of charming symphony they introduce
Their sacred song, and waken raptures high.

The various passions and emotions of the soul are, to a great extent, indicated by the "quality" of the voice. Thus, the *malignant* and *all excessive* emotions, as, *anger, hatred, revenge, fear, and horror*, are remarkable for "guttural quality," and strong "aspiration," or "expiration," accompanying the vocal sound, and forming "impure" tone; substituting a "harsh," husky, aspirated utterance, for the "orotund," or the "pure" tone; while *pathos, serenity, love, joy, courage*, take a soft and smooth "oral," or head tone, perfectly pure, or swelling into "orotund." *Awe, solemnity, reverence, and melancholy*, take a deep "pectoral" murmur; the voice resounding, as it were, in the cavity of the chest, but still keeping perfectly "pure" in tone, or expanding into full "orotund."

The young student cannot be too deeply impressed with the importance of cultivating early a pure and smooth utterance. The excessively deep "pectoral" tone sounds hollow and sepulchral; the "guttural" tone is coarse, and harsh, and grating to the ear; the "nasal" tone is ludicrous; and the combination of "guttural" and "nasal" tone is repulsive and extremely disagreeable. Some speakers, through excessive negligence, allow themselves to combine the "pectoral," "guttural," and "nasal" tones in one sound, for which the word *grunt* is the only approximate designation that can be found. Affectation or false taste, on the other hand, induces some speakers to assume an extra fine, or double-distilled, "oral" tone, which mimes every word in the mouth, as if the breast had no part to perform in human utterance.

The tones of serious, serene, cheerful, and kindly feeling, are nature's genuine standard of agreeable voice, as is evinced in the utterance of healthy and happy childhood. But prevalent neglect permits these to be lost in the habitual tones of boys

and girls, men and women. Faithful advisers may be of much service to young students in this particular.

3.—*Versatility or Pliancy of Voice*
signifies that power of easy and instant adaptation, by which it takes on the appropriate utterance of every emotion which occurs in the reading or speaking of a piece characterised by varied feeling or intense passion.

To acquire this invaluable property of voice, the most useful course of practice is the repeated reading or reciting of passages marked by striking contrasts of tone, as loud or soft, high or low, fast or slow.

The following exercises should be repeated till the student can give them in succession, with perfect adaptation of voice in each case, and with instantaneous precision of effect.

Exercises for Versatility or Pliancy of Voice.

Very Loud.

And dar'st thou, thou,
To beard the lion in his den,—
The Douglas in his hall?
And hop'st thou hence unscathed to go?
No! by St. Bride of Bothwell, no!—
Up, drawbridge, groom! What! warder, ho!
Let the portcullis fall!

Very Soft.

I've seen the moon climb the mountain's brow,
I've watched the mists o'er the river stealing,—
But ne'er did I feel in my breast till now,
So deep, so calm, and so holy a feeling:—
'Tis soft as the thrill which memory throws
Athwart the soul in the hour of repose.

Very Low.

I had a dream, which was not all a dream,
The bright sun was extinguished; and the stars
Did wander darkling in the eternal space,
Rayless, and pathless; and the icy earth
Swung blind and blackening in the moonless air.

Very High.

I awoke:—where was I?—Do I see
A human face look down on me?
And doth a roof above me close?
Do these limbs on a couch repose?
Is this a chamber where I lie?
And is it mortal, yon bright eye,
That watches me with gentle glance?

Very Slow.

Of old hast Thou laid the foundation of the earth; and the heavens are the work of Thy hands. They shall perish, but Thou shalt endure; yea, all of them shall wax old, like a garment; as a vesture shalt Thou change them, and they shall be changed: but Thou art the same; and Thy years shall have no end.

Very Quick.

I am the Rider of the wind,
The Stirrer of the storm!
The hurricane I left behind
Is yet with lightning warm;—
To speed to thee, o'er shore and sea
I swept upon the blast.

4.—*True Pitch of Voice.*

The proper pitch of the voice, when no peculiar emotion demands high or low notes, is—for the purposes of ordinary reading or speaking—a little below the habitual note of conversation, for the person who reads or speaks. Public discourse, being usually on graver subjects and occasions than mere private communication, naturally and properly adopts this level.

But, through mistake or inadvertency, we sometimes hear persons read and speak on too low a key for the easy and expressive use of the voice, and sometimes, on the other hand, on a key too high for convenient or agreeable utterance.

The following sentences should be repeated till the note on which they are pitched is distinctly recognised, and perfectly remembered, so as to become a key to all similar passages.

Exercise on Middle Pitch.

In every period of life, the acquisition of knowledge is one of the most pleasing employments of the human mind. But in youth, there are circumstances which make it productive of higher enjoyment. It is then that everything has the charm of novelty; that curiosity and fancy are awake, and that the heart swells with the anticipations of future eminence and utility.

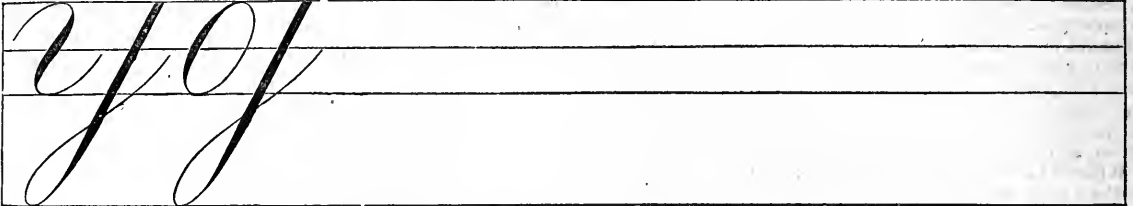
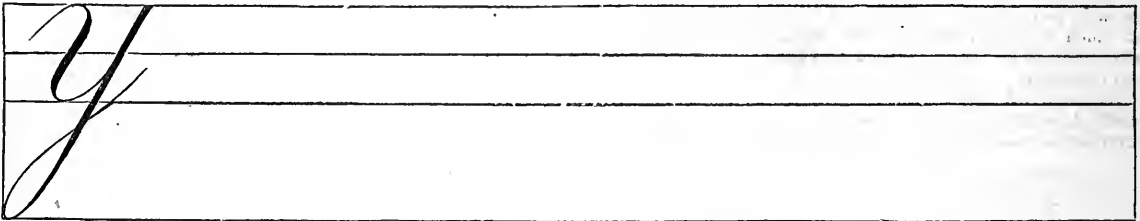
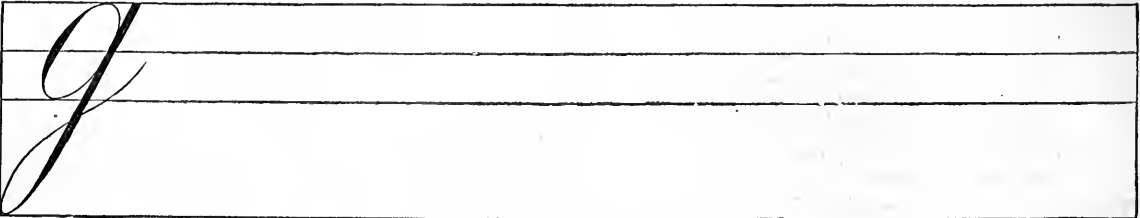
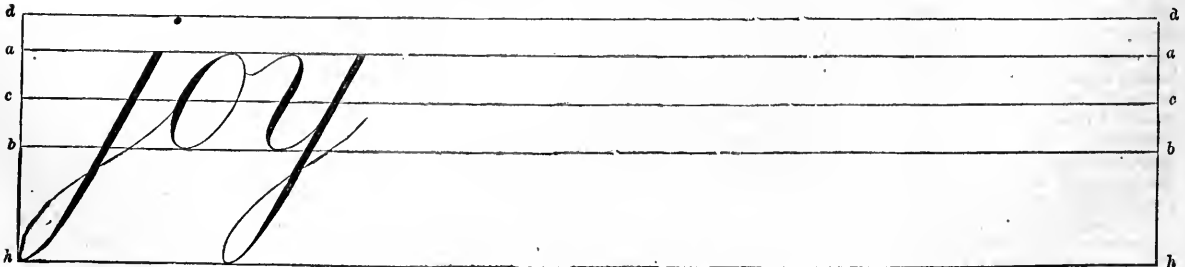
Contrast this pitch with that of the pieces before quoted, as examples of "high" and "low."

LESSONS IN PENMANSHIP.—XVI.

In our last lesson, in Copy-slip No. 52, we gave an example of the elementary looped stroke which enters into the composition of the letters *j*, *y*, and *g*, and, with a little modification, into the formation of the letter *z*. To make this new elementary stroke, a thick down-stroke must be commenced at the line *a a*, as in Copy-slip No. 57, for example, and carried downwards in a slanting direction towards the left. As the stroke approaches the line *b b*, the pressure on the pen must be lessened and gradually reduced until the thick stroke narrows into a hair-

turned in an easy and flowing stroke. To show the necessity of this, the learner has only to turn the loop before reaching the line *h h*, when he will find that this imparts a stunted appearance to the stroke, or to any letter into whose composition it enters, which is far from satisfactory.

To form the letter *j*, it is only necessary to place a dot above the elementary looped stroke that has just been described, on the line *d d*, which is, as it has been stated in a previous lesson (page 61), three-sixteenths of an inch above the line *a a*. In Copy-slip No. 54 the elementary strokes entering into the composition of the letters *y* and *g* are shown, the first of these

COPY-SLIP NO. 54.—ELEMENTARY STROKES FORMING *y* AND *g*.COPY-SLIP NO. 55.—THE LETTER *y*.COPY-SLIP NO. 56.—THE LETTER *g*.COPY-SLIP NO. 57.—THE WORD *joy*.

line, which is turned at the line *h h*, and brought upwards over the line *b b*, in a direction slanting upwards towards the right, crossing the down-stroke in a graceful curve a little below the last-named line.

The distance between the lines *b b* and *h h* should be exactly nine-sixteenths of an inch. The learner, on referring to Copy-slips No. 30 (page 133) and No. 39 (page 173) will see that letters carried below the line *b b* terminate on a line at the distance of seven-sixteenths of an inch below it, when the stroke below *b b* is of uniform thickness throughout, as in the letter *p*, or has a bottom-turn to the right, as in the letter *q*. In the formation, however, of looped letters, an eighth of an inch more is required to give space enough to admit of the loop being

letters consisting of the top-and-bottom-turn and the elementary looped stroke, while the second is formed by a combination of this stroke and the letter *o*. In Copy-slips No. 55 and 56, the letters *y* and *g* are given, showing how the elementary strokes of which they are composed are joined together, while in Copy-slip No. 57 an example is given of the method in which the letter *j* is joined to any letter that follows it, and the letter *y* to a letter that precedes it.

The learner has now been taught how to make nineteen out of the twenty-six letters of the writing alphabet, and these we shall bring under his notice in a single lesson, after giving a few more examples for practice in writing letters looped below the line *b b*, and combining them with others.

LESSONS IN GERMAN.—XV.

SECTION XXVII.—SEPARABLE PARTICLES—(continued).

Wo refers to the place where anything may be supposed to exist or transpire, as—Wo ist mein Messer? Where is my knife? Wo laufen die Kinder? Where (in what place) are the children running?

Da is used in answer to wo; that is, to designate some particular place, as:—Da ist es, here it is. Da laufen sie, they are running here.

Sin denotes direction, or motion from the speaker, as:—Warum laufen die Kinder hin? Why are the children running thither?

Her is the opposite, in signification, to hin; denoting motion or direction toward the speaker, as:—Warum laufen die Kinder her? Why are the children running hither?

Sier signifies "in this place," as:—Warum bleiben die Kinder hier? Why do the children remain here?

These words are frequently compounded, one with the other; thus, from wo and hin, wo hinf; from wo and her, woher; from da and hin, dahin; from da and her, daher; from hier and hin, hiehin; and from hier and her, hieher (sometimes contracted to hieher). (§ 103. 3.)

Examples of the use of wo, da, hin, her, and hier compounded.

Wo reisen unsere Freunde hin? Where do our friends travel to? or, Wohin reisen unsere Freunde? Whither do our friends travel? Sie reisen dahin, wo ihre Verwandten wohnen. They travel thither, where their relatives reside. Wo kommen diese Zugvögel her? Where do these birds of passage come from? or, Woher kommen diese Zugvögel? Whence do these birds of passage come? Sie kommen daher, wo es jetzt zu kalt für sie ist. They come from (there) where it is now too cold for them.

VOCABULARY.

Bachstube, f. bake-house.	Kopf, m. head.	Schwimmen, to swim.
Bald, soon.	Liegen, to lie.	Seiler, m. rope-maker.
Bilder-gallerie, f. picture-gallery.	Mütze, f. cap.	Sitzen, to sit.
Frosch, m. frog.	Nirgends, nowhere.	Springen, to spring.
Gans, f. goose.	Dgleich, although, notwithstanding.	Leap.
Hin-gehen, to go to.	D'ernhaus, n. opera-house.	Stehen, to stand.
Hirt, m. shepherd.	Ritter, m. knight.	Teich, m. pond.
Argentwe, somewhere.	Schau-spieler, m. actor.	Werkstatt, f. work-shop.
Jetzt, now.	Schon, already.	Wohin? whither? what way?
	Schwager, m. brother-in-law.	Zuf'erbäder, m. confectioner.

RÉSUMÉ OF EXAMPLES.

Wo ist das größte Glück; an dem Hofe eines tyrant'nischen Königs, oder in der Hütte eines zufried'nen Tagelöhners?	Where is the greatest happiness: at the court of a tyrannical king, or in the cottage of a contented day-labourer?
Wo gehen Sie hin? an den Hof oder in die Hütte?	Whither do you go? to the court or into the cottage?
Der Feldherr sitzt auf dem Pferde und reitet ruhig längs den Reihen der Soldat'en hin und her.	The commander-in-chief upon the horse rides tranquilly along the ranks of the soldiers to and fro.
Morgen reitet er mit seinen Schaaren auf das Schlachtfeld.	To-morrow he rides with his troops to the battle-field.
In der Hoffnung finden die Un-glücklichen Trost.	The unfortunate find consolation in hope.
Der Vater ist da, aber der Bruder ist in der Stadt.	The father is here, but the brother is in the city.
Ich gehe heute dahin, wohin ich schon gestern gehen wollte.	I go to-day (thither) where I wished (already) to go yesterday.

EXERCISE 44.

1. Wo ist der Schwager? 2. Er sitzt an dem (am) Tische. 3. Wo geht der Zuf'erbäder hin? 4. Er geht in die Backstube. 5. Wo ist sein Freund, der Schauspieler? 6. Er ist in dem Drempelhaufe. 7. Wo geht sein Freund, der Seiler, hin? 8. Er geht in seine Werkstatt. 9. Wo ist der Hirt? 10. Er ist auf dem Berge. 11. Wo geht der Hirt hin? 12. Er geht

auf den Berg. 13. Wo geht unser alter Nachbar hin? oder. Wohin geht unser alter Nachbar? (§ 89. 1.) 14. Er ist jetzt in dem kleinen Garten, aber er geht bald in den großen Garten. 15. Seine Frau ist in diesem Hause, aber sein Vetter geht in jene Bilder-gallerie. 16. Ich stehe an dem (am) Fenster, und sie kommen aus (§ 4. 2) Fenster. 17. Der Ritter sitzt schon auf seinem guten Pferde, und der Knacht springt auch so eben auf sein gutes Pferd. 18. Der Mann sitzt am (§ 4. 2) Tische, und das Buch liegt auf dem Tische. 19. Ich habe meinen Hut auf dem Kopfe. 20. Wo geht der Soldat hin? 21. Die Soldaten gehen aus (§ 4. 2) aus; sie sind schon auf dem Felde. 22. Er frocht springt in den Fluss und schwimmt in dem Flusse, und die Gans schwimmt auf dem Teiche. 23. Ich habe diese Worte irgendwo gelesen. 24. Ich kann meine Mütze nirgends finden, obgleich sie irgendwo in diesem Zimmer sein muß.

EXERCISE 45.

1. Where is the picture-gallery of this town? 2. Where was that gentleman born [geboren]? 3. He was born in Bohemia. 4. Where does your friend, the actor, reside? 5. He resides in the city. 6. Whither do these emigrants go? 7. Whence do these immigrants come? 8. They come from France. 9. Where much is given, much is required. 10. Here the revenge [Rache] and whetted dagger [gewegte Dsch] of a traitor enter not [bring nicht];—beneath [unter] the shade of this tree comes no king. 11. He threw down the book before me. 12. Whither art thou going? 13. I am going to my brother-in-law. 14. Will these emigrants go to America? 15. No, they will stop here. 16. There is water in the pond. 17. Where does she come from? 18. She comes from Germany.

VOCABULARY.

Aus-wanderer, m. emigrant.	Dahin-ziehen, to proceed thither.	Itali'ner, m. Italian.
Bedient'e, m. servant.	Gin-wanderer, m. immigrant.	Itali'nisch, adj. Italian.
Bekannt'e, m. acquaintance.	Englisch, English.	Milwaukee, n. Milwaukeee.
Böhmen, n. Bohemia.	Guro'pa, n. Europe.	Nie, never.
Bremen, n. Bremen.	Feldherr, m. commander-in-chief.	Spanien, n. Spain.
Dahin-gehen, to go thither.	Französisch, French.	Spanisch, Spanish.
Dahin-reisen, to travel thither.	Fremde, m. stranger.	Teil, m. part.
Dahin-schicken, to send thither.	Haere, n. Havre.	Venetig, n. Venice.
	Hierher-kommen, to come hither.	Wie viel? how much? how many?
		Wohl, well.

EXERCISE 46.

1. Die Soldaten sind hier, und der Feldherr kommt auch hieher. 2. Der Feind ist schon da, und unsere tapfern Brüder müssen dahin ziehen. 3. Wann gehen sie nach Spanien? 4. Ich will gar (Sect. XIV. 3) nicht dahin gehen, aber mein Vater will in nächster Woche dahin reisen. 5. Sind Sie schon da gewesen? 6. Nein, aber einer meiner Bekannten war da und will nie wieder dahin gehen. 7. Wie gehen auf den Berg, wollen Sie mit uns gehen? 8. Will der Russe seinen Bedienten in die Stadt schicken? 9. Er hat ihn schon dahin geschickt. 10. Werten die Truppen hierher kommen? 11. Sie werden nicht hierher kommen. 12. Wo kommen diese Fremden her? 13. Sie sind Ginwanderer und kommen aus Böhmen. 14. Ist dieses Schiff von Bremen oder Havre? 15. Es ist weder von Bremen, noch von Havre, es ist von Venetig. 16. Gehen diese französischen Ginwanderer nach Milwaukee? 17. Gin Teil von ihnen geht dahin, die andern bleiben in New-York. 18. Die Ginwanderer in America sind Auswanderer aus Guro'pa und aus andern Theilen der alten Welt. 19. Wann wollen Sie auf das Feld gehen? 20. Ich bin schon auf dem Felde gewesen, und kann nicht wieder dahin gehen, aber ich muß jetzt hier in den Garten gehen, denn mein Lehrer ist da und will mich sehen. 21. Warum will dieser Italiener nicht englisch sprechen? 22. Er möchte es doch (Sect. XLIII. 4) sprechen, aber er kann es noch nicht; er spricht nur italienisch und spanisch. 23. Wie viel Sprachen können Sie sprechen? 24. Ich spreche nur zwei, aber ich will noch andere lernen.

EXERCISE 47.

1. When did he live? 2. He lived in the fourteenth century [im vierzehnten Jahrhundert]. 3. My friend told me he would never go there again [wieder]. 4. Do you go to Spain? 5. No, I shall not go thither. 6. The commander-in-chief has sent his troops where the danger was most [die meiste Gefahr]. 7. Is this ship from Spain or from Havre? 8. No, it is neither [weder] from Spain nor [noch] from Havre; it comes from Hamburg. 9. These immigrants are going to Milwaukee, and are emigrants from Bohemia and Venice. 10. Can you leap over that gate [Ther]?

11. I could when I was young. 12. He bade [bat] me go thither, that he might speak to me about it.

SECTION XXVIII.—SEPARABLE PARTICLES—(continued).

Wo, da, hin, etc., besides being compounded one with another (Sect. XXVII.) are also united with prepositions; thus producing a separate class of adverbs, as:—Wovon sprechen Sie? Of what (whereof) are you speaking? Ich spreche von meinen Büchern; wovon Sie eins davon haben? I am speaking of my books; will you have one of them? (one thereof?) Ich bin auf dem Dache; kommen Sie herauf! I am on the roof; come up! Ich kann nicht hinauf gehen; kommen Sie herab! I cannot go up; you come down!

Hinab, hinauf, hinaus, herab, etc., when used with nouns, are translated by prepositions; and the adverb, unlike its English equivalent, is placed after the noun, as:—Ich gehe den Berg hinauf, I go up the mountain. Kommen Sie den Berg herab, come down the mountain.

1. The verb kommen frequently answers to our "get," as:—Wie ist er in diesen Garten gekommen? How did he "get" into this garden? Er weiß nicht, wie er heraus kommen soll, he does not know how to "get" out. Ich komme mit diesem Manne sehr gut fort, I "get" along with this man very well.

VOCABULARY.

Braufen, to roar.	Herüberkommen, to come over.	Hügel, m. hill, hillock.
Cajüte, f. cabin.	Heruntergehen, to hasten down.	Kreuzweg, m. crossway.
Caserne, f. barrack.	Herunterkommen, to come down.	Lauf, m. course, current.
Dampfsboot, n. steamboat.	Hinaufgehen, to go down.	Nachtwache, f. watch.
Dieb, m. thief.	Hinabspringen, to leap down.	Roth, n. roe.
Eisenbahn, f. railroad.	Hinauflaufen, to run up.	Schiffsbrücke, f. bridge of boats.
erschrecken, to terrify.	Hinausgehen, to go out.	Schweizer, m. Swiss.
Felsen, m. rock.	Hinauskommen, to come out.	Straße, f. street.
Hase, m. hare.	Hineingehen, to go in.	Strom, m. stream.
Herabstürzen, to precipitate.	Hinüberfahren, to pass over.	Stunde, f. hour.
Heraufkommen, to come up.	Hinübersehen, to look over.	Thüre, or Thür, f. door.
Herauskommen, to come out.	Hinuntergehen, to go down.	Trepp, f. stair.
Herausstürzen, to rush, spring out.		Treten, to tread, step.
Herein kommen, to come in.		Über, over, beyond.
Herein stürmen, to rush in.		Vaterland, n. native country.
Herüberfahren, to come over (in a vehicle).		Während, during, while.
		Wenn, if.
		Wieder, again.
		Zwischendeck, n. deck (between deck).

RÉSUMÉ OF EXAMPLES.

Sie sehen hinab' in das wilde Meer.	They look down into the wild sea.
Da gießt unend'licher Regen herab'.	There pours down interminable rain.
Die Knaben eilten den Berg hinauf'.	The boys hastened up the mountain.
Der Bergmann steigt herauf' aus der Tiefe des Schachtes.	The miner comes up out of the depth of the shaft.
Peter ging hinaus' und weinte bitterlich.	Peter went out and wept bitterly.
Und hinein' mit bedächt'igem Schritt ein Löwe tritt.	And thither (therein) with considerate step a lion strides.
Er wirft sich in die brausende Fluth.	He throws himself into the roaring flood.
Der Richter rief den Bauer herein'.	The judge called the peasant in.
Das Leben des Menschen schwankt, wie ein Rachen, hinüber und herüber.	The life of man, like a skiff, fluctuates hither and thither.
Der Dachdecker fiel vom Hause herunter.	The tiler fell down from the house.

EXERCISE 48.

1. Haben Sie meinen Freund gesehen? 2. Ja, er ist die Straße hinausgegangen. 3. Wollen Sie in die Cajüte hineingehen? 4. Nein, ich gehe in das Zwischendeck hinunter. 5. Fahren Sie heute mit (§ 112. 7) dem Dampfboote nach Mainz hinüber? 6. Ja, und diesen Abend werde ich mit der Eisenbahn über die neue Schiffsbrücke wieder herüber kommen. 7. Hin-

ab, hinauf geht unser Lauf. 8. Das Reth sprang den Berg hinab, während der Haje den Hügel hinaufstief. 9. Die Soldaten stürzten aus der Caserne heraus, als der Feind in die Stadt hineinfüremte. 10. Als die Nachtwache in das Haus trat, eilte der erschrockene Dieb die Treppe herunter. 11. Ich kann nicht aus den Kreuzwegen dieses Gartens hinauskommen. 12. Wissen Sie nicht, wie dieser Vogel hereingekommen ist? 13. Ja, aber er weiß nicht, wo er wieder hinauskommen kann. 14. Der junge Schweizer schaute hinüber nach den blauen Bergen seines Vaterlandes. 15. Kommen Sie heute nicht herunter? 16. Ja, wenn der Dheim heraufkommt, werde ich hinabgehen. 17. Haben Sie diesen Mann schon gesehen? 18. Ja, er kam zur Thüre herein, als ich hinausging. 19. Der Freund fuhr in einer Stunde den Fluß hinüber und herüber. 20. Der Strom stürzt mit großem Geräusch den Felsen herab.

EXERCISE 49.

1. The son hastened down to receive his father. 2. His speech lasted over two hours. 3. The roe sprang out from his hiding place. 4. Will you go over to Frankfort to-day by the steamboat? 5. No, I shall go over by the railroad and return by the steamboat. 6. Do not go beyond the crossway. 7. I saw your friend come in as your uncle went out. 8. These men who go over that bridge are in danger of their lives. 9. Will you go out to-day with your friend? 10. From this hill we can look over our country. 11. How did the thief get into your house? 12. Edward precipitated himself from the rock. 13. I shall pass your house this morning, and shall come in, without your asking me to do so.

LESSONS IN ARITHMETIC.—XVI.

DECIMALS (continued).

15. Terminating and Circulating Decimals. Reducing Fractions to Decimals.

It is evident, from what has been said, that vulgar fractions can be reduced to decimals by the process of the division of decimals. For we have only to write down the dividend with a decimal point, followed by a series of ciphers, and then divide by the divisor, according to the rule already given for the division of decimals. Thus, $\frac{7}{10}$ may be reduced to a decimal as follows:—

$$\begin{array}{r} 40 \quad 7 \cdot 000 \quad (\cdot 175 \\ \underline{40} \\ 300 \\ \underline{280} \\ 200 \\ \underline{200} \\ \dots \end{array}$$

Therefore $\frac{7}{10} = \cdot 175$

Decimals which, after continuing the division of the fractions from which they arise far enough, at last give a result without a remainder, are called terminating decimals.

16. To determine whether a Fraction will produce a Terminating Decimal or not.

Since a decimal is a fraction with 10 or power of 10 for its denominator, it is evident that if a given fraction will produce a terminating decimal, it must be capable of being expressed in the form of an equivalent fraction, which shall have a power of 10 for its denominator.

Now 10 is composed of the prime factors 2 and 5. Hence, if the denominator of the given fraction, when in its lowest terms, contains any factor besides 2 and 5, it cannot produce a terminating decimal. But if the denominator contains only 2's and 5's as its factors, then, by multiplying numerator and denominator of the fraction by a factor, we can always transform the fraction into an equivalent one, having a power of 10 for its denominator—that is, into a terminating decimal.

For example:— $\frac{217}{250}$ will produce a terminating decimal, because 250 is composed only of factors 2 and 5.

$$250 = 5 \times 5 \times 5 \times 2.$$

Hence, if we multiply this by 2×2 , i.e., 4, we shall make 250, the denominator, a power of 10.

$$\text{Therefore } \frac{217}{250} = \frac{4 \times 217}{4 \times 250} = \frac{868}{1000} = \cdot 868.$$

Similarly, $\frac{1}{8}$ gives a terminating decimal, for 8 is $2 \times 2 \times 2$,

and therefore by multiplying by $5 \times 5 \times 5$, we make it $10 \times 10 \times 10$, or 1000.

$$\text{Hence } \frac{3}{10} = \frac{3 \times 5 \times 5 \times 5}{10 \times 10 \times 10} = \frac{375}{1000} = \cdot 375.$$

17. We see from the preceding remarks the truth of the following

Rule for determining whether a given Vulgar Fraction will produce a Terminating Decimal.

Reduce the given fraction to its lowest terms, and split the denominator into its prime factors.

If the denominator have for its factors 2's or 5's, or both, and no other factors, the fraction will give a terminating decimal, but not otherwise.

18. To determine in this case the Decimal without actually dividing.

If one of the factors 2 and 5 occur fewer times than the other, multiply numerator and denominator of the fraction by that power of the factor which occurs the fewest times in the denominator, which will make the number of times it occurs equal to the number of times the other occurs.

Thus, in the instance already given, 250 is made up of three 5's and one 2 as factors. We therefore multiply numerator and denominator by the second power of 2.

Similarly, in $\frac{3}{8}$ being the third power of 2, we multiply numerator and denominator by the third power of 5.

Obs.—It will be perceived that the number of decimal places in the terminating decimal which is equivalent to a vulgar fraction, will be the same as the greatest number of times that either of the factors 2 or 5 is repeated in its denominator, when the fraction is reduced to its lowest terms.

EXAMPLE.—Determine the decimal which is equal to $\frac{382}{1750}$.

Reduced to its lowest terms this is $\frac{382}{125}$ or $\frac{382}{5^3}$. Multiplying numerator and denominator by 2^3 , or 8, the fraction becomes $\frac{3056}{1000}$, or $\cdot 3056$.

19. *Circulating or Recurring Decimals.*

Decimals in which the same series of figures is repeated indefinitely, are called circulating or recurring decimals; and the series of figures thus repeated is called the *period*.

Thus, $\cdot 321737373$, etc., . . . , where 73 is continually repeated *ad infinitum*, is a circulating decimal.

Similarly, $\cdot 01342342342$. . . , and $\cdot 6666$. . . , are recurring decimals.

A recurring decimal is indicated by writing a dot over each figure of the period, or, sometimes, where the period is long, by writing a dot over the first and last figures only of the period. Thus, the decimals we have given before as examples would be written—

$$\cdot 3\dot{2}1\dot{7}3, \cdot 01\dot{3}4\dot{2}, \text{ or } \cdot 0134\dot{2}, \text{ and } \cdot \dot{6}.$$

Decimals in which the period commences immediately after the decimal point, are sometimes called *pure* circulating or recurring decimals; others being entitled *mixed* circulating decimals.

Thus above $\cdot \dot{6}$ is a pure, while the other two are mixed circulating decimals.

20. *Fractions producing Circulating Decimals.*

We have seen that all vulgar fractions in their lowest terms, which have any other factors besides 2 and 5 in their denominators, will not produce terminating decimals; that is to say, in performing the division we shall never arrive at a remainder which is zero. We shall, however, arrive at a remainder which is the same as one of the remainders which has already occurred.

This is evident from the following considerations :—

The largest possible remainder in any division is the divisor diminished by unity, and therefore there cannot possibly be more than this number of *different* remainders. Hence, at the very farthest, after this number of remainders have occurred, a remainder will occur which is the same as one of the preceding remainders. Now it is plain that when this is the case, the whole of the operation which has been performed since that remainder last occurred will be repeated, and that the same remainder will occur again after exactly the same interval, and so on *ad infinitum*. Now to every remainder there will correspond a figure in the quotient, and therefore the figures in the quotient corresponding to the interval between two remainders which are the same will continually recur.

21. This will be made plainer by examples. Reduce $\frac{2}{7}$ to a decimal.

$$\begin{array}{r} 7 \overline{) 2\cdot0000} \quad (\cdot 28571428 \dots \\ \underline{14} \\ 60 \\ \underline{56} \\ 40 \\ \underline{35} \\ 50 \\ \underline{49} \\ 10 \\ \underline{7} \\ 30 \\ \underline{28} \\ 20 \\ \underline{14} \\ 60 \end{array}$$

Here it will be seen that at the point indicated by the star the remainder 2 occurs, and therefore the division will, after this point, be identical in every respect with that already performed. Hence the figures in the quotient, 285714, will continually recur, or the quotient is the pure circulating decimal, $\cdot 285714$.

It will be observed that the period here is as large as it could possibly be, for the greatest possible remainder is 6, and all the remainders from 1 up to 6 inclusive occur.

[The process has been exhibited in the form of Long Division, to allow of the remainders appearing in the operation.]

22. Reduce $\frac{1}{3}$ to a decimal.

We see at once that the quotient will be a circulating decimal, since $\frac{1}{3}$ being in its lowest terms, 3 is a factor of the denominator.

$$\begin{array}{r} 30 \overline{) 17\cdot0000} \quad (\cdot 566 \dots \\ \underline{150} \\ 200 \\ \underline{180} \\ 20 \end{array}$$

Here the remainder 20 is at once repeated, and therefore the quotient after the first figure 5 will consist of 6 continually repeated, or it will be the mixed circulating $\cdot 5\dot{6}$.

23. Reduce $\frac{1}{32}$ to a decimal.

$$\begin{array}{r} 55 \overline{) 129\cdot00} \quad (\cdot 34375 \text{ Answer.} \\ \underline{110} \\ 190 \\ \underline{165} \\ 250 \\ \underline{220} \\ 300 \\ \underline{275} \\ 25 \end{array}$$

Here the remainder 25 occurs again, and therefore the periodical part of the quotient will, after this point, consist of the figures 45 continually repeated.

EXERCISE 34.

1. Determine which of the following fractions will produce terminating decimals, and find the equivalent decimals without executing the division :—

$$\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \frac{7}{8}, \frac{8}{9}, \frac{9}{10}, \frac{10}{11}, \frac{11}{12}, \frac{12}{13}, \frac{13}{14}, \frac{14}{15}, \frac{15}{16}, \frac{16}{17}, \frac{17}{18}, \frac{18}{19}, \frac{19}{20}, \frac{20}{21}, \frac{21}{22}, \frac{22}{23}, \frac{23}{24}, \frac{24}{25}, \frac{25}{26}, \frac{26}{27}, \frac{27}{28}, \frac{28}{29}, \frac{29}{30}, \frac{30}{31}, \frac{31}{32}, \frac{32}{33}, \frac{33}{34}, \frac{34}{35}, \frac{35}{36}, \frac{36}{37}, \frac{37}{38}, \frac{38}{39}, \frac{39}{40}, \frac{40}{41}, \frac{41}{42}, \frac{42}{43}, \frac{43}{44}, \frac{44}{45}, \frac{45}{46}, \frac{46}{47}, \frac{47}{48}, \frac{48}{49}, \frac{49}{50}, \frac{50}{51}, \frac{51}{52}, \frac{52}{53}, \frac{53}{54}, \frac{54}{55}, \frac{55}{56}, \frac{56}{57}, \frac{57}{58}, \frac{58}{59}, \frac{59}{60}, \frac{60}{61}, \frac{61}{62}, \frac{62}{63}, \frac{63}{64}, \frac{64}{65}, \frac{65}{66}, \frac{66}{67}, \frac{67}{68}, \frac{68}{69}, \frac{69}{70}, \frac{70}{71}, \frac{71}{72}, \frac{72}{73}, \frac{73}{74}, \frac{74}{75}, \frac{75}{76}, \frac{76}{77}, \frac{77}{78}, \frac{78}{79}, \frac{79}{80}, \frac{80}{81}, \frac{81}{82}, \frac{82}{83}, \frac{83}{84}, \frac{84}{85}, \frac{85}{86}, \frac{86}{87}, \frac{87}{88}, \frac{88}{89}, \frac{89}{90}, \frac{90}{91}, \frac{91}{92}, \frac{92}{93}, \frac{93}{94}, \frac{94}{95}, \frac{95}{96}, \frac{96}{97}, \frac{97}{98}, \frac{98}{99}, \frac{99}{100}$$

2. Reduce the following fractions to decimals :—

$$\begin{array}{l} 1. \frac{1}{2}, \quad 2. \frac{1}{3}, \quad 3. \frac{1}{4}, \quad 4. \frac{1}{5}, \quad 5. \frac{1}{6}, \quad 6. \frac{1}{7}, \quad 7. \frac{1}{8}, \\ 8. 2\frac{1}{2} \times \frac{1}{13}, \quad 9. \frac{1}{4} \text{ of } 3\frac{1}{2}, \quad 10. 2\frac{1}{2} \text{ of } 12\frac{1}{10}, \\ 11. \frac{6}{27} \times \frac{3}{2}, \quad 12. \frac{1}{3} + 6\frac{1}{4} \text{ of } \frac{3}{13}, \\ 13. \frac{23}{5} + \frac{2734}{375} - \frac{12}{11} + \frac{21}{31} \end{array}$$

MECHANICS.—VII.

AXIS OF SYMMETRY—STABLE AND UNSTABLE EQUILIBRIUM—INTRODUCTION TO THE MECHANICAL POWERS, ETC.

AXIS OF SYMMETRY.

THERE is a large number of cases in which, though we may not be able actually to find the centre of gravity, we can say it is on some line in reference to which the body is symmetrically formed. In an egg, for example, the line joining the round and pointed ends

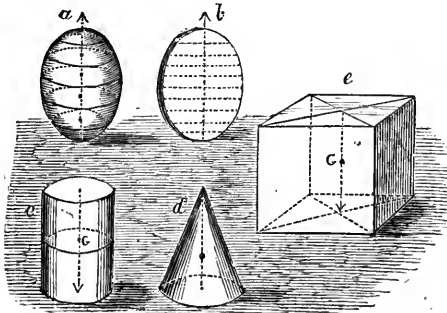


Fig. 33.

is an axis of symmetry. If we make cross sections of it perpendicular to this line, they will be all circles through the centres of which the line will pass. The ovoid at *a*, the cylinder at *c*, and the right cone at *d*, are instances. The cubical box at *e*, is another in which the cross section is a square, the line joining the meetings of the diagonals on the upper and lower faces being a symmetrical axis. The oval board at *b*, also, in which all the dotted lines are bisected by the arrow perpendicular to them, is another instance, the arrow being the axis of symmetry. Wherever two such axes exist, of course the centre of gravity is their point of intersection; but if there be *one only*, as in the portion of the ring in Fig. 34, the position of the centre on it must be ascertained by other means.

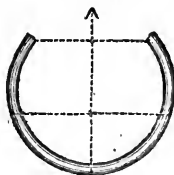


Fig. 34.

STABLE AND UNSTABLE EQUILIBRIUM.

In the last lesson, I showed you that when a body rests in equilibrium on a horizontal plane, the perpendicular from the centre of gravity falls within its base. This condition being satisfied, it will not upset of itself, but may be overturned from without by a force acting sideways. What are the conditions on which depend the ease, or the difficulty, with which it can be so upset? Let three cylinders, *a*, *b*, *c*, Fig. 35, be taken in illustration; the first of broad base and small height, the other

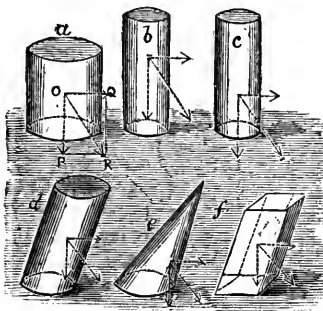


Fig. 35.

two of equal heights and bases, the latter narrow in each. Suppose that a force, say of one pound, represented by the dotted arrow pointing to the right, is applied transversely to each, and let the weights of the bodies be represented by arrows pointing downwards on the vertical lines in which their centres of gravity lie. Now, the resultant in each cylinder of these two forces, represented by the arrows slanting to the right, is the upsetting force. If this arrow strikes the ground *outside* the base of any cylinder, it will overturn; if *within*, it will remain standing as before.

1. Now, taking any one of the cylinders, say *a*, it is evident that the transverse force remaining the same, and the height at which it is applied the same, the greater its weight is the longer will the arrow *o p* be, and therefore the more will the resultant *o r* slope downwards towards *o p*, tending to fall within the base. Therefore, everything else being the same, the greater the weight of the body the less easily is it upset, that is, the more stable it is.

2. Again, supposing the weights of the two cylinders *a*, *c*, to be equal, but the base of the former greater than that of the latter, if equal transverse forces, be applied to both at equal heights, then *o r* being also equal in both and equally inclined to *o p*, the resultant will tend more to fall within the base in *a* than in *b*, that is, everything else being the same, the broader the base, the greater the stability.

3. Further, if, as in *b* and *c*, the bases and weights being the same, and the transverse force applied to each cylinder being still one pound, the force is applied higher up in one cylinder than in the other, then the resultant is more likely to meet the ground within the base in the latter than in the former; that is, the lower down the transverse force is applied, everything else being the same, the greater the stability.

4. Lastly, as is evident from *d*, *e*, *f*, in Fig. 35, when the bodies incline to one side, the perpendicular from the centre of gravity meets the base nearer to its circumference on that side; and, if the transverse force is applied in that direction, the resultant tends more to fall outside the base; that is, everything else being the same, the stability is least when the upsetting force acts in the direction in which the body leans.

These are truths known to everybody from *experience*, but of which here you see the "reason why," and what is of no less advantage, you obtain a rule by which you may measure the amount of stability or instability in any case that may come before you. If you draw figures for bodies of different weights, different bases, different transverse forces, and their heights of application, you will by trial feel your way, and soon clearly understand the subject.

But the cases to which the terms "stability" and "instability" are more commonly applied, are those in which there is only one point of support, and the slightest force from without causes disturbance. In

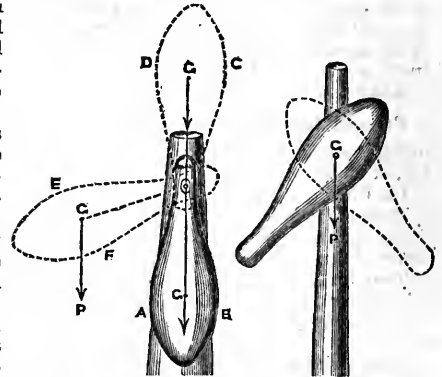


Fig. 36.

Fig. 37.

Fig. 36, as was shown in Lesson V., (page 188) the body supported at the point *o* is in equilibrium in the two positions *o a b* and *o c d*. Now the first of these is one of *stability*, the second of *instability*. What do these terms denote? This; that, if you pull the stable body out of its rest into any other position to right or left, say *o e f*, back it will return to *o a b*, as though by a free choice. In the disturbed position *o e f*, the weight acting downwards at *g* pulls it back; it can *descend*, but not *ascend*. Try the same on the position *o c d*; the body, no longer supported from below, cannot *re-ascend*; down it will rush to the *stable* position; and, after oscillating there for a few turns, come to rest. We see thus that in *stable* equilibrium the centre of gravity is in the *lowest possible position*; in *unstable* in the *highest*.

Now take the same body attached to the post at its centre of gravity, *g*, Fig. 37. However you turn it round, *g* is supported, and the body rests. The equilibrium, therefore, is neither stable nor unstable. It neither returns on disturbance to the first position nor rushes away from it. This is termed "neutral equilibrium;" the centre can neither ascend nor descend.

Now take the egg-shaped bodies, Fig. 38; that represented at *b* is *stable*, for the centre of gravity, supported from below, is in the *lowest possible* position. Disturb it into the position, *a*, this centre ascends, and the weight pulling downwards brings it back to *b*. The body in the position *c* is *unstable*. It is in

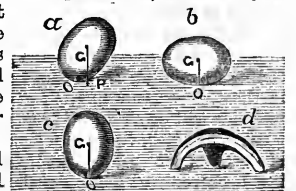


Fig. 38.

equilibrium, but on disturbance rolls through the position *c* into the position *b*. In this case also you see the centre, for stability, must be in its *lowest position*; for instability, in its *highest*. But perfectly round balls, such as in Fig. 27

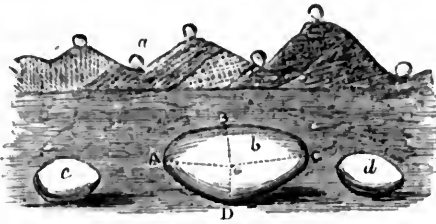


Fig. 39.

(page 220), are *neutral*, their centres, as you roll them on the ground, can *neither ascend nor descend*.

Take now the balls in *a*, Fig. 39, which represents a geological section of hills and valleys. Those on the tops of the hills are *unstable*, because their centres of gravity are in their highest positions. Disturb them, and down they roll into *stable* positions in the valleys, the *lowest* positions of these centres. But here now a new principle is brought to light. A body may admit of several positions of equilibrium, but an *unstable* is always between two *stabes*, and a *stable* between two *unstables*. The ball in the valley has a ball perched on the hill on either side, and the ball on the hill has a ball in the valley on either side.



Fig. 40.

Take another illustration. Let it be a convex body, like a seashore pebble, with one side, as in Fig 39, *b*, flatter than the other. I showed you in the last lesson that such a body should have as many positions of equilibrium on a plane as you can draw lines from its centre of gravity piercing its surface at right angles. Let such points in this pebble be *A, B, C, D*, the first and third more distant from the centre *G* than the other two. If I now try to make it rest on the ground at *A*, the centre being higher than it would be if the body touched the ground on either side of that point, it will roll down to either *B* or *D*, which are two stable positions. We thus learn that,



Fig. 41.

The Positions of Equilibrium of a convex body, supported from below, are alternately *stable* and *unstable*.

As a further illustration of the peculiarities of the centre of gravity, take an egg. Why does it generally rest with its pointed end downwards, as at *d*, Fig. 39, while an egg, as at *c*, turned in wood of the same size and form, rests broad-end down? Explain, also, the reason the prancing-horse toy, represented at Fig. 40, supported at the edge of a table, and having a wire attached to him, which carries a heavy ball at its other end, does not fall on the ground, but when disturbed, rocks backwards and forwards. Also, how a rocking-horse is set rocking by the child on his back. The four-oared boat and crew in Fig. 41, supported by the point of a needle on the iron upright below, imitates a boat's motion at sea, rising, and plunging, and going round, if the oars are loaded at their ends; explain this. Also, how the harlequin, Fig. 42, is balanced on his pedestal, as he twirls round and bows, leaning forward and falling backward at the imminent peril of coming to the ground. Instances of this kind could be multiplied without end, but as much as our space allows has been said on the centre of gravity, which we shall now leave to apply the principles so far set forth to practice, commencing with the Mechanical Powers.



Fig. 42.

INTRODUCTION TO THE MECHANICAL POWERS.

Before turning to the mechanical powers, the following principles, which are necessary to complete a knowledge of parallel forces—the first of them required for explaining the lever—must be established and understood. In the account given of parallel forces in Lesson IV. such only were considered as act in the same direction, pull or push together, each adding to the effect of every other; and of these the subject of the centre of gravity in Lessons V. and VI. furnished numerous exemplifications, the forces all pulling towards the earth's centre. Now you have to consider two forces, unequal and parallel, but acting in opposite directions.

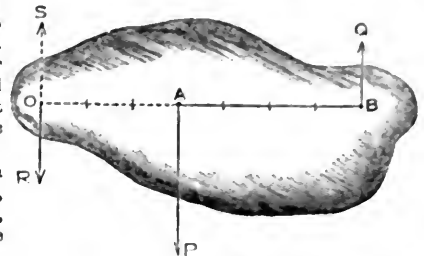


Fig. 43.

Suppose two such applied to a body, as in Fig. 43, where *A* and *B* are the points of application, and the arrows *A P, B Q*, represent their magnitudes and directions. Let *A P* be 7 pounds and *B Q* 3 pounds; how can we find their resultant? From a very simple consideration. Whatever it be, or at whatever point it acts, it must be such that a force at that point, equal and opposite to it, will balance it, and therefore make equilibrium with its components *A P, B Q*. Now, that point cannot be inside the line *A B*, for in that case the resultant of the two which pull together could not be *opposite* to the third. The point must, therefore, be outside *A B* and on the side of the greater force *A P*. Let the point therefore be *o*, and *o R* the resultant, *o S* being the force equal and opposite to it, which makes equilibrium with *A P* and *B Q*.

Then, since there is equilibrium, the resultant of the two that pull together, *B Q* and *o S*, must be equal and opposite to *A P*; and therefore, as proved in Lesson IV., *A P* is the sum of *B Q* and *o S*. But *A P* being 7 pounds, and *B Q* 3 pounds, evidently *o S* must be 4 pounds, the difference of these forces. The resultant in magnitude therefore is the *difference* of the components.

Now for the point of application. Since the resultant of 4 pounds at *o* and 3 pounds at *B* must cut *B O* at *A* inversely as the forces, if I divide *A B* into four equal parts, three of them will be in *A O*; or, which is the same thing, seven parts in *B O* and three parts in *A O*, showing that *o* is the point whose distances from *A* and *B* are *inversely* as the forces. Putting all together, we learn that—

1. The Resultant of two Unequal Parallel Forces which act at two points of a body in opposite directions is equal in magnitude to their difference.
2. Its point of application is outside of the greater force, at distances from the points of application of the components, which are *inversely* as these forces.

The rule to be observed practically in finding this centre is, to cut *A B* into as many equal parts as there are pounds, or other units, or fractions of a unit, in the difference of the forces, and then to measure outwards from *A* along the production of *A B* as many of these parts as there are pounds or other units in *B Q*; the point *o* so obtained is the parallel centre required. And you see that what is thus proved for the numbers 3 and 7 must hold equally for other numbers, whatever they be.

There is one particular case of this principle, which I shall just notice. Suppose *A P* becomes equal to *B Q*; what of their resultant? how large is it, and where applied? In magnitude it is *nothing*, being the difference of the forces; and the point of application is nowhere, at least within reach; for on *A B* produced no point *o* can be found such that *A o* be equal to *B o*. Pairs of forces of this kind are termed "*couples*," and they play an important part in Mechanics, in producing a tendency to rotation; but we shall not consider them here.

One consequence more: How find the resultant of any number of parallel forces, some acting in one direction, others in the opposite? Evidently by compounding *separately*, and finding the centres of, those which act in the opposite directions. You thus get two single parallel and opposite forces the resultants

of the opposing sets, and their centres of application; and therefore, by the aid of the principle above established, learn that—

1. The Resultant of a system of Parallel Forces, which act, some in one direction others in the opposite, is *in magnitude* the Difference of the Sums of the Opposing sets of Forces.

2. Its Point of Application is had by finding the parallel centre of each opposing set, and taking a point on the side of the greater sum, on the production of the line joining these centres whose distances from these points are inversely as the sums of the opposing forces.

For example: Suppose eight parallel forces are applied to the eight corners of a box, five of 2, 4, 6, 7, and 9 pounds directed to the east, and three of 10, 11, and 15 pounds to the west; the resultant will be 8 pounds, acting towards the west and at a point on the line joining the parallel centres of the two sets, and outside the greater, whose distances from these centres are inversely as 36 to 28.

These principles, with others previously established, we now apply to the Lever; first taking the cases in which the forces, usually termed the "Power" and the "Resistance," or "Weight," are parallel. The principle of leverage may be understood by the aid of Fig. 44. Two balls, say of iron,

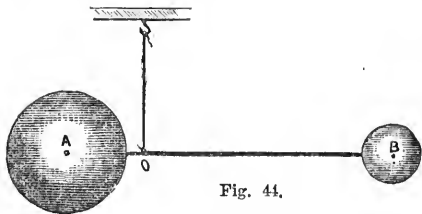


Fig. 44.

connected by a thin bar, are supported by a cord at a point *o*. How is this point to be selected so that the balls may equally balance each other, the weight of the rod not being taken into consideration? Again, having recourse to numbers, let the balls be 13 pounds and 4 pounds, and their centres the points *A* and *B*; how is *o* to be found? Evidently by cutting *AB* so that *AO* be to *BO* *inversely* as 13 to 4; or, on dividing that line into seventeen equal parts, so that four of them be in *A O* and thirteen in *B O*. If the bar be supported by the cord from above, or by a prop from below, at this point there is equilibrium. This is the principle of the Lever, of which the ball, *B*, may be considered the Power, and the ball, *A*, the Resistance. We say, therefore, that the support, or prop, commonly called the "fulcrum," must be so placed that the arms *A O*, *B O* of the lever on each side of it be to one another *inversely* as the Power and Resistance.

But, as inverse ratio puzzles some persons, I shall put the matter in another light. You observe that at the end, *A*, of this lever, there are only 4 equal parts in the arm, but 13 pounds in the resistance, while in the arm, *B O*, the parts are 13, and the pounds only 4. Now, suppose the parts were all inches, then if you at either end multiply the *number of inches* in an arm by the *number of pounds* on that arm, you get the same number—namely, 52, for product. Choose any other numbers different for 13 and 4, and the result is the same; the numbers at either end multiplied together give the *same* product. Therefore another way of stating the Condition of Equilibrium in a lever is, that the product of the Power and arm on one side should be equal to that of the Resistance and arm on the other.

But here be careful to be clear as to what is meant by "the product of Power and arm, Resistance and arm." This puzzles some persons extremely, from its never being clearly explained to them. Strictly speaking, the product of a force and a line, or of a resistance and an arm, is nonsense. Multiply a bag of flour by the iron beam from the end of which it hangs, and who can divine what the result of the operation is to be? neither flour nor iron, but something between! Well, then, to remove every possibility of confusion on this point, keep in mind (as the example above shows) that we multiply *numbers only*, not the Power and its arm, or the Resistance and its arm, but the *NUMBER which denotes the units of FORCE in one, by the NUMBER which denotes the units of LENGTH in the other*. Then you can make no mistake, there will be no confusion; and you can still say, knowing the meaning of your words, that the Power multiplied by its arm is equal to the Resistance multiplied by the other arm. This product is commonly termed the "Moment"

of the Power or Resistance, and the Condition of Equilibrium is stated as follows:—

For Equilibrium in a Lever the Moments of the Power, with reference to the fulcrum, and Resistance should be equal.

ANSWERS TO QUESTIONS IN LESSON V.

1. To prevent the perpendicular from his centre of gravity falling outside his base as he springs on the fore-foot to advance. On coming down to counterpoise the centre of gravity's falling forward.
2. He draws his feet under the chair, in order to get a base over which, by leaning forward, he brings his centre of gravity, and lifts that centre upwards by his muscular strength.
3. He leans to the opposite side in order to keep the *common* centre of gravity of himself and bucket over the base of support.
4. Else the perpendicular from his centre of gravity would meet the ground in advance of his feet.
5. Because the resultant of the forward motion, and the weight of horse and rider acting at their *common* centre of gravity, is then more apt to meet the ground outside the base of support of the horse's legs.
6. Because in that case the perpendicular from the centre of gravity, being lower down, is less apt to meet the ground outside the base when the road slopes to one side.

[It will be noticed that some of the figures which have been employed in Lesson VI. in Mechanics, have been introduced a second time in the present lesson. This has been done to spare the reader the trouble and annoyance of having to turn from one page to another when reference has been made in the course of a lesson to any figure which has been used before as a means of illustrating the text. Whenever, therefore, any figure is repeated, it must be understood that this is the reason for its repetition.]

LESSONS IN FRENCH.—XVI.

SECTION I.—FRENCH PRONUNCIATION (continued).

75. WE proceed with our illustrations of the nasal vowel sounds *im* and *in*, *om* and *on*:—

The *nh* in the pronunciation of *anh* and *onh* must have a short stopped sound, as in the *im* of *timbre*, and the *on* of *bon-bon*. The full sound of *n*, which would give *vann* for *vin*, and *bonn* for *bon*, should be studiously avoided.

IM.		
FRENCH.	PRONUNCIATION.	ENGLISH.
Imbécile	Anh-bay-seel	Footish.
Impénitence	Anh-pay-nee-tahns	Impenitence.
Impératoire	Anh-pay-rat-oahr or t'wahr	Master-wort.
Impossible	Anh-po-sibl'	Impossible.
Limbe	Lanhb	Limb.
Limpide	Lanh-peed	Limpid.

IN.		
FRENCH.	PRONUNCIATION.	ENGLISH.
Cinq	Sanhk	Five.
Chemin	Sh'manh	Road.
Fin	Fanh	End.
Instant	Anh-staunh	Instant.
Médecin	Mayd'sahn	Physician.
Vin	Vanh	Wine.

OM.		
FRENCH.	PRONUNCIATION.	ENGLISH.
Bombe	Bonhb	Shell.
Comble	Konhbl'	Consummation.
Lombard	Lonh-bar	Lombard.
Nombre	Nonh-br'	Number.
Flomb	Plonh	Lead (a metal).
Trompette	Tronh-pett	Trumpet.

ON.		
FRENCH.	PRONUNCIATION.	ENGLISH.
Bou	Bonh	Good.
Canton	Kahn-tonh	Canton.
Donc	Donh	Then.
Long-temps	Lonh-taunh	A great while.
Maison	May-zonh	House.
Mon	Monh	Mine.
Raison	Ray-zonh	Reason.
Répondit	Ray-ponh-dee	Replied.

76. The French word *monsieur* is pronounced by foreigners all sorts of ways, except the right way, in common conversation. The author knows of no one French word so much in use by those who speak the English language as this, and yet pronounced so variously and incorrectly. Let us analyse this word, and, if possible, set forth its correct sound.

Remember, then, that the *n* and *r* of the word *monsieur* are

always silent; the *n* is silent by the rule of custom, and the *r* is silent according to the general rule which obtains concerning final consonants.

Take out of the word the letters *n* and *r*, and we have *mosieu*. Divide it now into syllables, and we have *mo* and *sieu*. In the first syllable the *o* is short, like the letter *o* in the English word *not*, therefore the pronunciation of the first syllable, *mo*, is easily ascertained. But in the second and last syllable, *sieu*, we have a diphthong of three successive vowels, viz., *ieu*, divided thus, *i-eu*, but pronounced as one syllable, preserving the sounds of both divisions. The sound of *i* is short, like *i* in the English word *fig*, and the sound of *eu* is exactly like *e* mute or unaccented.

These are the elements of the different sounds in the French word *monsieur*, and are thus pronounced, viz., *mo-sieu*, or *mo-siuh*.

Sometimes it is pronounced *mos-sieu*, but incorrectly, because the Parisian critic and scholar gives it but one *s*, and that at the beginning of the second syllable.

Hence it will be perceived that it is simply ridiculous to pronounce this word *mong-seer* or *mon-seeuh*. The *on* in this word is not a nasal, because the *n* is silent. The *i* is not long, and cannot be illustrated by *ee*, but is short, as above explained.

77. We now proceed to examples in which the nasal vowel sounds *um* and *un* are found.

UM.

FRENCH.	PRONUNCIATION.	ENGLISH.
Humblement	Unh-bl'-manh	Humbly.
Parfum	Par-fuuh	Perfume.

The following are exceptions to the above illustrated pronunciation, viz. :—

FRENCH.	PRONUNCIATION.	ENGLISH.
Lumbago	Lounh-bag-o	Lumbago.
Rum, Rhum, and Rumb	Rum	Rum.
Umble	Onh-bl'	Umbler.

UN.

FRENCH.	PRONUNCIATION.	ENGLISH.
Aucun	O-kunh	Any.
Chacun	Shak-unh (first syll. short)	Each.
Commun	Ko-munh	Common.
Un	Unh	One.

The following are exceptions to the above illustrated pronunciation, viz. :—

Nuncupatif	Nonh-ku-pah-teef	Nuncupative.*
Nundinal	Nonh-de-nal	Nundinal.†

78. *Ym* and *yn* are now very seldom found in the French language; they are, however, pronounced like *im* and *in*, which have been already illustrated.

NASAL DIPHTHONGAL SOUNDS.

79. There are seven nasal diphthongal combinations, and they are thus divided and pronounced, viz. :—

ian	divided into i-an	and pronounced eanh.
ien	" i-en	" eanh.
ion	" i-on	" eonh.
uan	" u-an	" uanh or wanh.
uin	" u-in	" uanh or wanh.
ouan	" ou-an	" oanh or wanh.
ouin	" ou-in	" oanh or wanh.

SECTION XXVI.—PLACE OF THE PRONOUNS.

1. The personal pronoun used as the direct [§ 2 (2), § 42 (4)] object of a verb, † is in French placed before the verb, except in the second person singular or in the first and second persons plural of the imperative used affirmatively.

Il me voit, il l'aime, *He sees me, he loves him.*
 Il nous aime, il vous aime, *He loves us, he loves you.*

2. The personal pronoun representing the indirect object of the verb [§ 2 (3), § 42 (5)] answering to the dative of the Latin, and to the indirect object of the English with the preposition *to*

expressed or understood, is also in French placed before the verb :—

Il me parle, il lui parle, *He speaks to me, he speaks to him.*
 Il nous donne une fleur, *He gives us a flower.**
 Il vous parle, il leur parle, *He speaks to you, he speaks to them.*

3. The personal pronoun is generally placed after the following verbs: *aller, to go; accourir, to run to; courir, to run; venir, to come; penser à, songer à, to think of.*

Il vient à moi, *He comes to me.*
 Il pense à vous, à eux, *He thinks of you, of them.*

4. In the imperative used affirmatively, the pronouns follow the verb.

Aimez-les, parlez-leur, *Love them, speak to them.*

5. The words *en* and *y* follow the above rules, except the third.

J'en parle, j'y pense, *I speak of it, I think of it.*

6. The pronoun used as the indirect object of a verb, answering to the genitive or ablative of the Latin, and to the indirect object which in English is separated from the verb by a preposition other than *to*, is in French always placed after the verb.

Je parle de lui, d'elle, d'eux, *I speak of him, of her, of them.*
 Je reste avec vous et avec eux, *I remain with you and with them.*

7. All pronouns used as objects of verbs must be repeated.

Je les aime, je les respecte, je les honore, *I love them, respect, and honour them.*

RÉSUMÉ OF EXAMPLES.

M'entendez-vous ?	<i>Do you hear [or understand] me ?</i>
Je ne vous entendis pas.	<i>I do not understand [or hear] you.</i>
Les entendez-vous ?	<i>Do you hear them ?</i>
Je les vois et je les entends.	<i>I see them and understand them.</i>
Il nous aime et il nous honore.	<i>He loves and honours us.</i>
Me parlez-vous de votre ami ?	<i>Do you speak to me of your friend ?</i>
Je vous parle de lui. (R. 6.)	<i>I speak to you of him.</i>
Nous parlez-vous de ces dames ?	<i>Do you speak to us about those ladies ?</i>
Je vous parle d'elles.	<i>I speak to you of them.</i>
Ne leur parlez-vous pas ?	<i>Do you not speak to them ?</i>
Je n'ai pas envie de leur parler.	<i>I have no wish to speak to them.</i>
Parlez-lui ; ne lui parlez pas.	<i>Speak to him or her ; do not speak to him or her.</i>
Allez à lui, courez à lui.	<i>Go to him, run to him.</i>
Parlez-leur ; ne leur parlez pas.	<i>Speak to them ; do not speak to them.</i>

VOCABULARY.

Affaire, f., <i>affair.</i>	Compagnon, m., <i>companion.</i>	Pens-er, l, <i>to think.</i>
Arbre, m., <i>tree.</i>	Déjà, <i>already.</i>	Poirier, m., <i>pear-tree.</i>
Avis, m., <i>advice.</i>	Écri-re, 4, ir., <i>to write.</i>	Pommier, m., <i>apple-tree.</i>
Cerisier, m., <i>cherry-tree.</i>	Exemple, m., <i>example.</i>	Respect-er, l, <i>to respect.</i>
Communiqu-er, l, <i>to communicate.</i>	Nouvelle, f., <i>news.</i>	

EXERCISE 47.

1. Allez-vous lui écrire ? 2. Je vais lui écrire et lui communiquer cette nouvelle. 3. Allez-vous lui parler de moi ? 4. Je vais lui parler de vous et de votre compagnon. 5. Leur envoyez-vous de beaux arbres ? 6. Je leur envoie des pommiers, des poiriers et des cerisiers. 7. Ne m'envoyez-vous pas de cerisiers. 8. Je ne vous en envoie pas, vous en avez déjà. 9. Avez-vous raison de leur parler de cette affaire ? 10. Je n'ai pas tort de leur parler de cette affaire. 11. Venez à nous demain matin. 12. Venez nous trouver cette après-midi. 13. Allez-vous les trouver tous les jours ? 14. Je vais les trouver tous les soirs. 15. Leur donnez-vous de bons avis ? 16. Je leur donne de bons avis et de bons exemples. 17. Nous parlez-vous de vos sœurs ? 18. Je vous parle d'elles. 19. Ne nous parlez-vous pas de nos frères ? 20. Je vous parle d'eux. 21. Ne les aimez-vous pas ? 22. Nous les aimons et nous les respectons. 23. Pensez-vous à ce livre, ou n'y pensez-vous pas ? 24. Nous y pensons et nous en parlons. 25. Nous n'y pensons pas.

EXERCISE 48.

1. When are you going to write to your brother ? 2. I am going to write to him to-morrow morning. 3. Do you intend to write to him every Monday ? 4. I intend to write to him every Tuesday. 5. Do you wish to speak to him to-day ? 6. I do wish to speak to him, but he is not here. 7. Where is he ? 8. He is at his house. 9. Do you speak to them ? 10.

* The preposition *to* is understood. *He gives a flower to us.*

* A law term meaning "verbal," in the sense of "not written."

† Pertaining to a fair, or market.

‡ The young student will easily distinguish the personal pronoun used as the direct object of a verb, by the fact that there is in English no preposition between the verb and this pronoun.

Yes, Sir, I speak to them about (*de*) this affair. 11. Do they give you good advice? 12. They give me good advice and good examples. 13. Do you go to your sister every day? 14. I go to her every morning at a quarter before nine. 15. Does she like to see (*voir*) you? 16. She likes to see me, and she receives me well. 17. Do you think of this affair? 18. I think of it the whole day. 19. Do you speak of it with (*avec*) your brother? 20. We speak of it often. 21. Do you send your companion to my house? 22. I send him every day. 23. Are you at home every day? 24. I am there every morning at ten o'clock. 25. Do you like to go to church? 26. I like to go there every Sunday with a companion. 27. Do you speak of your houses? 28. I speak of them (*en*). 29. Does your brother speak of his friends? 30. Yes, Sir, he speaks of them (*d'eux*). 31. Does he think of them? 32. Yes, Sir, he thinks of them (*à eux*). 33. Does he think of this news? 34. Yes, Sir, he thinks of it (*y*). 35. I love and honour them.

SECTION XXVII.—RESPECTIVE PLACE OF THE PRONOUNS.

1. When two pronouns occur, one used as a direct object of the verb (accusative), and the other as the indirect object (dative), the indirect object, if not in the third person singular or plural, must precede the direct object [§ 101 (1)].

Je vous le donne, *I give it to you.*
 Il me le donne, *He gives it to me.*
 Il nous le donne, *He gives it to us.*

2. When the pronoun used as an indirect object [dative, Sect. XXV. 2] is in the third person singular or plural, it must be placed after the direct object [§ 101 (2)].

Nous le lui donnons, *We give it to him.*
 Nous le leur donnons, *We give it to them.*

3. The above rules of precedence apply also to the imperative used negatively:—

Ne nous le donnez pas (R. 1), *Do not give it us.*
 Ne le lui donnez pas (R. 2), *Do not give it to him.*

4. With the imperative used affirmatively, the direct object precedes in all cases the indirect object [§ 101 (5)].

Donnez-le-nous, *Give it to us.*
 Montrez-le-leur, *Show it to them.*

5. En and y always follow the pronouns:—

Je lui en donne, *I give him some.*
 Il nous y envoie, *He sends us thither.*

6. PRESENT OF THE INDICATIVE OF THE IRREGULAR VERBS.

VOIR, to see.	VOULOIR, to be willing.	POUVOIR, to be able.
Je vois, I see, do see, or am seeing.	Je veux, I will, or am willing.	Je puis, or je peux, I can, I may, am able.
Tu vois.	Tu veux.	Tu peux.*
Il voit.	Il veut.	Il peut.
Nous voyons.	Nous voulons.	Nous pouvons.
Vous voyez.	Vous voulez.	Vous pouvez.
Ils voient.	Ils veulent.	Ils peuvent.

7. The above verbs take no preposition before another verb.
 8. The preposition *pour* is used to render the preposition *to*, when the latter means *in order to*.

Je vais chez vous pour parler à votre frère et pour vous voir, *I go to your house to speak to your brother and to see you.*
 J'ai besoin d'argent pour acheter des marchandises, *I want money to (in order to) buy goods.*

RÉSUMÉ OF EXAMPLES.

Voulez-vous nous le donner? *Will you give it to us?*
 Je veux vous le prêter. *I will lend it to you.*
 Pouvez-vous me les donner? *Can you give them to me?*
 Je ne puis vous les donner. *I cannot give them to you.*
 Votre frère peut-il le lui envoyer? *Can your brother send it to him?*
 Il ne veut pas le lui envoyer. *He will not send it to him.*
 Qui veut le leur prêter? *Who will lend it to them?*
 Personne ne veut le leur prêter. *No one will lend it to them.*
 Envoyez-les-nous. *Send them to us.*
 Ne nous les envoyez pas. *Do not send them to us.*
 Donnez-nous-en. *Give us some (of it).*
 Ne leur en envoyez pas. *Do not send them any.*
 Envoyez-le-leur, pour les contenter. *Send it to them (in order), to satisfy them.*
 Je puis vous l'y envoyer. *I can send it to you there.*

* After the verbs *pouvoir*, to be able; *oser*, to dare; *savoir*, to know, the negative *pas* may be omitted.

VOCABULARY.

Commis, m., clerk.	Guère, but little.	Poisson, m., fish.
Connaissance, f., acquaintance.	Marchande de modes, f., milliner.	Pologne, f., Poland.
Croi-re, 4, ir., to believe.	Montr-er, 1, to show.	Prêter, 1, to lend.
Dette, f., debt.	Oubli-er, 1, to forget.	Semaine, f., week.
D-evoir, 3, to owe.	Pay-er, 1, to pay.	Souvent, often.
		Voyage, m., journey.

EXERCISE 49.

1. Voulez-vous donner ce livre à mon frère? 2. Je puis le lui prêter, mais je ne puis le lui donner. 3. Voulez-vous nous les envoyer? 4. La marchande de modes peut vous les envoyer. 5. Les lui montrez-vous? 6. Je les vois et je les lui montre. 7. Avez-vous peur de nous les prêter? 8. Je n'ai pas peur de vous les prêter. 9. Ne pouvez-vous nous envoyer du poisson? 10. Je ne puis vous en envoyer, je n'en ai guère. 11. Voulez-vous leur en parler? 12. Je veux leur en parler, si je ne l'oublie pas. 13. Venez-vous souvent les voir? 14. Je viens les voir tous les matins, et tous les soirs. 15. Ne leur parlez-vous point de votre voyage en Pologne? 16. Je leur en parle, mais il ne veut pas me croire. 17. Est-ce que je vois mes connaissances le Lundi? 18. Vous les voyez tous les jours de la semaine. 19. Vous envoient-elles plus d'argent que le commis de notre marchand. 20. Elles m'en envoient plus que lui. 21. En envoyez-vous au libraire? 22. Je lui en envoie quand je lui en dois. 23. N'avez-vous pas tort de lui en envoyer? 24. Je ne puis avoir tort de payer mes dettes.

EXERCISE 50.

1. Will you send us that letter? 2. I will send it to you, if you will read it. 3. I will read it if (*si*) I can. 4. Can you lend me your pen? 5. I can lend it to you, if you will take care of it. (Sect. XXI. 3.) 6. May I speak to your father? 7. You may speak to him, he is here. 8. Are you afraid of forgetting it? (Sect. XX. 4.) 9. I am not afraid of forgetting it. 10. Will you send them to him? 11. I intend to send them to him, if I have time. 12. Do you speak to him of your journey. 13. I speak to him of my journey. 14. I speak to them of it. 15. Can you communicate it to him? 16. I have a wish to communicate it to him. 17. Do you see your acquaintances every Monday? 18. I see them every Monday and every Thursday. 19. Where do you intend to see them? 20. I intend to see them at your brother's and at your sister's. 21. Can you send him there every day? 22. I can send him there every Monday, if he wishes (*s'il le veut*). 23. Can you give them to me? 24. I can give them to you. 25. Who will lend them books? 26. No one will lend them any. 27. Your bookseller is willing to sell them good books and good paper. 28. Is he at home? 29. He is at his brother's. 30. Are you wrong to pay your debts? 31. I am right to pay them. 32. Will you send it to us? 33. I am willing to send it to you, if you want it. 34. Are you willing to give them to us? 35. We are willing to give them to your acquaintances.

HISTORIC SKETCHES.—VIII.

THE GORDON RIOTS.

"My Lord George, do you really mean to bring your rascally adherents into the House of Commons? If you do, the first man of them that enters I will plunge my sword, not into his body, but into yours." Strong language, certainly, especially for the House of Commons, and yet never was speech spoken more earnestly or significantly than this, and the unusual character of it passed without rebuke from the Speaker. The person addressed was Lord George Gordon, the man who addressed him was his own kinsman, Colonel Murray; the date of the speech was Friday, the 2nd June, 1780, and the occasion on which it was delivered will be set forth in the following sketch.

Soon after the death of Henry VIII., in 1547, the policy or impolicy, the religious zeal or the indelerted spirit—which you will—of the English Government, deemed it necessary that those who lately had been subject to systematic persecution for their religious opinions should change places with their persecutors. Laws of the most stringent kind were passed by the Protestant king, Edward VI., against Papists, as the professors of the Roman Catholic faith were then commonly called, and by them it was made an offence punishable with heavy fine and imprisonment, and in certain cases capitally, for a man to hold the faith in

which he had been educated. Queen Mary, in 1553, repealed these laws, but they were re-enacted with fresh rigours by Elizabeth when she came to the throne in 1558. At the time these laws were made, it was not contemplated that there could be such a thing as dissent from the newly-established Church of England, but when the Puritans arose—the men who fought the battle of religious and political freedom against a Tudor queen, and against all the Stuart kings—fresh laws were framed to check them, and fetters the most oppressive and the most harassing were forged for them as they had been forged for the Roman Catholics. Every one within the realm was ordered to go to church on Sunday, or to be fined twelvepence—a sum in those days equal to more than two days' wages for a labouring man—and those who did not go for a month were fined £20. Subsequently, in the reign of Charles II. (1660-1685), it was ordered that no one should be admitted to office in any corporate town who had not within a year previously taken the Lord's Supper according to the rites of the Church of England, and certain oaths were prescribed to persons elected which no Romanist could take. The Book of Common Prayer was ordered to be used in every place for public worship, and no one was allowed to be a schoolmaster, or to have anything to do with the instruction of youth (dancing, for instance), unless he had signed a declaration of conformity to the Liturgy. Meetings of more than five persons for the purpose of worshipping God otherwise than by using the Prayer Book were liable to be broken up by force, and the preachers fined. The Test Act, passed in the twenty-fifth year of Charles II., required all civil and military officers, and all persons in the service of the Crown, to take the oaths of allegiance and supremacy, to declare their disbelief in the doctrine of transubstantiation, and to receive the sacrament in the Church of England; and another law of the same king forbade any one to sit in Parliament or to vote for a member until he had taken such oaths as no Romanist could possibly take.

William and Mary (1688-1702) assented to a law granting Protestant dissenters the right of meeting for public worship if the place of meeting were duly registered; but the laws which gave this and certain other privileges to Protestants, welded yet closer the rivets of intolerance on the unfortunate Catholics, who were still forbidden to meet, or to celebrate the Mass. Statutes of George I. (1714-1727) and George II. (1727-1760) confirmed the odious Test Act, and extended it. Not only were all officers in the army and navy, and all persons in public posts still compelled to desecrate the sacrament of the Lord's Supper, and to take startling oaths, but all ecclesiastical and collegiate persons, all preachers, teachers, schoolmasters, lawyers, and high constables were compelled, under pain of deprivation, fine, and forfeiture, to take the oaths of supremacy and allegiance, and to abjure the Pope and the Pretender.

In 1779, the year before the words at the beginning of this article were spoken, an Act was passed relieving the Protestant dissenters from almost all their disabilities, those created by the Test Act and Corporation Act excepted. But the people thus enfranchised could not bear that a slight concession made the year before to Romanists, and allowing them to meet for worship under certain restrictions, should remain unrepealed. It was not enough that the Romanist should be shut out from every post of every kind in the public service, that he should be precluded from getting a living by instructing in any branch of knowledge, and that he should be unable to practise at the bar; the lately persecuted felt they could not enjoy their freedom if their fellow-sufferers by the law were also relieved, though only in part.*

A number of organisations, calling themselves Protestant Associations, had been formed in England and Scotland for the purpose of obtaining the removal of disabilities from Protestant dissenters. They chose Lord George Gordon for their chief, and had they searched the whole country over they could not have found a representative more thoroughly unsuited to guide

them to their legitimate aspirations, though it must be confessed there was no fitter incarnation of their weaknesses and their folly. They were indignant at the slight concession given to their fellow-Christians, and they resolved, if possible, to procure the repeal of it, and if that was not to be, then they would do whatever their too ready hands might find to do. At the suggestions of Lord George, petitions were got up and numerous signed, begging the Legislature to deliver the land from the guilt of allowing certain of the inhabitants to pray together! Every means were taken to make the petition from the Protestants of London a "monster petition." Advertisements were issued, speeches were made to inflame the public mind, and personal entreaties were not wanting to induce the people to add their names.

Towards the end of May, 1780, a crowded meeting was held in Coachmakers' Hall, where Lord George spoke at length, addressing the people in a highly inflammatory harangue. He promised to present their petition to the House of Commons, of which he was a member, if they would attend him with not less than 20,000 persons, on the 2nd June. Resolutions were passed pledging the Association to meet with as many friends as they could muster on that day in St. George's Fields; and in order the better to distinguish those of the "true Protestant" party, it was agreed that the petitioners and their friends should wear blue cockades in their hats.

On Friday, the 2nd of June, Lord George Gordon met his followers, some 60,000 strong, in St. George's Fields, and after addressing them in a foolish speech, full of intolerant and strife-stirring words, marched them, six abreast, over London Bridge, up Fleet Street and the Strand to Palace Yard, of which they took riotous possession. The Houses had not yet met when the processionists arrived; there were not any police to keep order, and the troops had not any instructions.

Very soon the disposition of the assemblage was apparent. Thousands had only availed themselves of the Protestants' petition to indulge their natural instincts to commit robbery and violence, and as soon as the members of either House of Parliament began to arrive, these persons commenced to be natural. Earl Mansfield, one of the most upright and able Chief Justices England ever had, had agreed to preside over the House of Lords instead of Lord Chancellor Thurlow, who was ill at Tunbridge. As soon as his carriage came into Palace Yard it was attacked, the windows were broken, the body was much damaged, and the venerable old man with difficulty escaped into the House, with torn robes and disordered wig. The Archbishop of York was subjected to like violence, and the Bishop of Lincoln, whose carriage was literally demolished, was taken fainting into a house, whence he escaped in disguise over the leads. The Duke of Northumberland was pulled out of his carriage and robbed of purse and watch; the Lord President of the Council and other peers were also so roughly handled that they could hardly get into Westminster Hall. The Lords continued to arrive, and business commenced; but little progress had been made when Lord Montfort rushed in to say that Lord Boston was in the hands of the mob, and in imminent danger of his life. One who was present says:—"At this instant it is hardly possible to conceive a more grotesque appearance than the House exhibited. Some of their lordships with their hair about their shoulders; others smudged with dirt; most of them as pale as the ghost in 'Hamlet;' and all of them standing up in their several places, and speaking at the same instant. One lord proposing to send for the Guards, another for the justices or civil magistrates, many crying out, 'Adjourn, adjourn!' while the skies resounded with the huzzas, shoutings, or hootings in Palace Yard."

Lord Boston escaped from the crowd just as the House of Lords were proposing to go out and rescue him; but it being impossible to go on with business, the House adjourned at eight o'clock, and its members managed to get away unperceived by side ways and passages.

Some 200 members of the House of Commons assembled, but the noise of the Protestant rioters almost drowned their voices in debate. Lord George Gordon presented the monster petition, and moved that the House should consider it in committee forthwith. An amendment was moved that it should not be considered till the 6th instant (four days on), but the sense of the House could not be taken, because the rioters had

* It was not till 1829 that the Catholic Emancipation Act allowed Roman Catholics to sit in Parliament, or to vote at elections, nor was it till the present reign that a full measure of freedom was meted out to the professors of all religions, including the Jewish religion, and that the law both in principle and practice ceased to persecute.

possession of the lobbies, whence they kept up a cry of "No Popery!" "Repeal, Repeal!" Lord George constantly went out to encourage the people to persevere, bade them keep up the demonstration, and compel the House to listen to them at once. The uproar was tremendous.

Within the House there was wisdom and dignity, and some anger. One member was for sending Lord George Gordon instantly to Newgate, others were for refusing to consider anything in connection with the petition while the House was under intimidation, and Colonel Murray, when the rioters were actually knocking at the door of the House, addressed to his kinsman the words which appear at the head of this paper. Lord North, however, the Prime Minister, sat serenely in his place, and by his conduct succeeded in infusing a spirit of confidence into the wavering members. Privately he sent for a detachment of the Guards, and these coming about nine o'clock in the evening, the rioters dispersed, the House divided, and rejecting Lord George's motion, adjourned till June the 6th.

With the exception of the burning of the chapels of the Bavarian and Sardinian ministers, which were utterly destroyed, no great damage was done by the rioters in London that night. The magistrates thought the disturbances were over, but on Sunday, June the 4th, the Roman Catholic chapels in Moorfields, and the houses belonging to Romanists in that district, were attacked and gutted. Next day the like fate befel the chapels and houses of the obnoxious religionists in other quarters; and the rioters growing bold at the non-interference of authority, resolved to attack the house of Sir George Savile, who originated the slight measure of toleration which had been granted to the Catholics. Savile House—in Leicester Fields, now Leicester Square—was accordingly besieged, carried by storm, and destroyed with all that was in it.

On June the 6th the House of Commons met under the protection of a body of soldiers, and Lord George Gordon appeared with a blue cockade, the sign of the rioters, in his hat. Colonel Herbert drew the attention of the House to the cockade, and recommended Lord George to remove it, adding that if he did not, he (Colonel Herbert) would step across the House and remove it for him, upon which Lord George put the obnoxious sign into his pocket. While the debate was going on, a mob attacked the official residence of the Prime Minister in Downing Street, but made off at the appearance of some soldiers. During the afternoon a vast multitude assembled before Newgate, and demanded the release of their friends who had been committed a few days before. The demand being refused by the governor, an attack was made on the gaol; fire and levers, pickaxes and crowbars were freely applied, and in the course of a few hours the prison, which had lately been rebuilt at great cost, was a smoking ruin, portions of the stone walls alone being left. The liberated prisoners increased the number and the audacity of the mob, who proceeded to break open the prison at Clerkenwell, and to liberate the prisoners there; and the houses of several obnoxious persons were destroyed in open day. Towards night, however, the mob, drunk with success and with liquor also, grew bolder. At midnight they congregated in front of Lord Mansfield's house, in Bloomsbury Square, and burned it with its contents, including a library of inestimable value, and a priceless collection of materials for history. Lord and Lady Mansfield escaped by a side entrance.

From six-and-thirty different places the fire and smoke went up, promoted by the efforts of incendiaries; but for magnitude, perhaps, the worst fire was that which finally caused the Government to act decisively against the offenders—the fire at the distillery in Holborn. The distillery at the time belonged to Mr. Langdale, a Roman Catholic, and this fact, coupled with the attraction caused by the stores of spirit, was sufficient to draw the attention of the rioters. The place was sacked and then fired. Hundreds of drunken wretches perished in the flames, the gin ran down the gutters in a blaze, and the flames from the burning premises lighted the sky over all London.

There were no police. The officers in command of troops were afraid to fire upon the people, doubts having been raised whether by so doing, even at the bidding of a magistrate, they did not render themselves liable to prosecution for murder. But the danger increased. The king, in council, had the question of military interference debated, and upon the Attorney-General giving it as his opinion that under the circumstances which then existed the soldiers might legally be called upon to

act, the king announced that there was at least one magistrate (meaning himself) in the country who was determined to do his duty. Soldiers were forthwith ordered to take military possession of the town, and the instructions to their officers were that if the people would not disperse on being summoned, they should be fired upon.

Upon these orders the officers acted. Troops marched through the streets, and in some houses they were quartered as garrisons. Unhappily, the march of the soldiers was not unimpeded, though it can scarcely be said to have been resisted. The people would not disperse, the soldiers fired, and the gutters which lately ran gin now ran blood. Two hundred persons were shot dead in the streets, besides those who perished in the flames of the distillery, and 250 more were sent wounded to the hospitals. A few hours served to replace the authorities in possession of London, and "on the morning of Thursday, June the 8th, no trace was to be seen," says Lord Mahon (Earl Stanhope), "of the recent tumults, beyond the smouldering ruins, the spots of blood upon the pavements, and the marks of shot upon the houses."

On Friday, June the 9th, Lord George Gordon was arrested and sent to the Tower, but subsequently escaped trial in consequence of some technical flaw in the legal proceedings. His followers were not so fortunate. Out of a large number condemned to death at the July Assizes, many experienced the king's mercy, but twenty-one were hanged for the part they had had in the Gordon Riots.

SYNOPSIS OF THE LIFE AND REIGN OF GEORGE III.

George III. was the son of Frederick, Prince of Wales, and the Princess Augusta of Saxe-Gotha. His father was the eldest son of George II. He was the thirty-second monarch of Great Britain and Ireland after the Norman Conquest, and the third of the Hanoverian Dynasty, or House of Brunswick. He married the Princess Charlotte of Mecklenburg, by whom he had nine sons and six daughters.

Born in London	June 4, 1738	Partition of Poland	1795
Death of Frederick, Prince of Wales	1751	War with Spain	1796
Began to reign	Oct. 25, 1760	Battle of Cape St. Vincent	1797
Married	Sept. 8, 1761	Feb. 14, 1797	
Stamp Act for American Colonies	1765	Suspension of Cash Payments	Feb. 25, 1797
Tax on Tea Imported into American Colonies enforced by Lord North	1770	Mutiny at the Nore, June, 1797	
Royal Marriage Act passed	1772	Bat. of Camperdown, Oct. 11, 1797	
Riot at Boston. American Colonists meet at Philadelphia	1773	Irish Rebellion commenced	May 4, 1798
Boston Port Bill passed	1774	Battle of the Nile	Aug. 1, 1798
Revolt of the American Colonies	1775	Capture of Seringapatam (India)	May 4, 1799
Bat. Bunker's Hill, June 17, 1775		Legislative Union of Great Britain and Ireland	Jan. 1, 1801
Declaration of Independence by the American Colonies, which are now called the "United States," July 4, 1776		Bombardment of Copenhagen	April 2, 1801
Death of Earl Chatham	May 11, 1778	Peace of Amiens	1802
"No Popery" Riots	1780	Renewal of War with France	1803
Siege of Gibraltar	1782	War with Spain	1804
Independence of the American Colonies acknowledged	Nov. 30, 1782	Bat. of Trafalgar and Death of Nelson	Oct. 21, 1805
Peace of Versailles	1783	Death of William Pitt	Jan. 23, 1806
William Pitt, Prime Minister	1783	The "Delicate Investigation," an Inquiry into charges against the Princess of Wales	May 22, 1806
Warren Hastings impeached for misdemeanour in India	1788	Death of Charles James Fox	Sept. 13, 1806
Temp. Insanity of the King	1788	Abolition of the Slave Trade procured by Wilberforce	1807
Commencement of the French Revolution. Destruction of the Bastille	July 20, 1789	Peninsular War begins	1808
Louis XVI. of France and Marie Antoinette beheaded	1793	Battle of Vimeira	Aug. 21, 1808
Declaration of War against England by the French Republic	1793	Convention of Cintra, Aug. 22, 1808	
Lord Howe's Victory off Ushant	June 1, 1794	Bat. of Corunna and Death of Sir John Moore, Jan. 16, 1809	
		Riots and Arrest of Sir Francis Burdett, April 6, 1809	
		Battle of Talavera	July 27, 1809
		Expedition to Walcheren	Aug. 10, 1809
		Battle of Busaco	Sept. 27, 1809
		Return of the Insanity of the King	Nov. 1809

Regency of the Prince of Wales 1811	Congress of Vienna . Nov. 1814
Battle of Fuentes de Oñore May 6, 1811	Peace with United States . Dec. 24, 1814
Battle of Albuera May 16, 1811	Return of Napoleon from Elba 1815
Capture of Ciudad Rodrigo Jan. 19, 1812	Battles of Ligny, Quatre Bras and Waterloo, June 16-18, 1815
Storming of Badajoz, Apr. 6, 1812	Napoleon sent to St. Helena Aug. 8, 1815
Assassination of Mr. Perceval, then Prime Minister May 11, 1812	Marriage of Princess Charlotte May 2, 1816
Battle of Salamanca, July 22, 1812	Bombardment of Algiers Aug. 27, 1816
Burning of Moscow, Sep. 14, 1812	Resumption of Cash Payments Sept. 22, 1817
War with United States 1812	Death of Princess Charlotte Nov. 6, 1817
Battle of Vittoria June 21, 1813	Death of Queen Charlotte Nov. 17, 1818
Battle of Pyrenees July 24, 1813	Currency Bill introduced 1819
Defeat of Napoleon at Leipzig Oct. 16, 1813	Reform Meeting at Manchester Aug. 16, 1819
Paris in the hands of the Allies Mar. 31, 1814	Sir Francis Burdett committed to the Tower 1819
Abdication of Napoleon, who is banished to Elba April 5, 1814	Death of the King Jan. 29, 1820
Capture of Washington, United States Aug. 24, 1814	

SOVEREIGNS CONTEMPORARY WITH GEORGE III.

Austria, Emperor of.	Netherlands, Kings of.	Charles Emmanuel II. 1796
Francis I. (formerly Francis II. of Germany) 1804	Louis Bonaparte 1805	Victor Emmanuel I. 1802
Bavaria, King of.	Holland United to France 1810	Sardinia merged in the Kingdom of Italy from 1805 to 1814.
Maximilian Joseph I. 1805	William I. 1815	Victor Emmanuel I. (restored) 1814
Denmark, Kings of.	Poland, Kings of.	Spain, Kings of.
Frederick V. 1746	Frederick Augustus II. 1733	Charles III. 1759
Christian VII. 1763	Interregnum 1763	Charles IV. 1788
Frederick VI. 1808	Stanislas II. 1764	Ferdinand VII. 1808
	[This monarch abdicated in 1795, and died in 1798.]	Joseph Bonaparte 1808
France, Rulers of.	Portugal, Kings of.	Ferdinand VII. (restored) 1814
Louis XV. 1715	Joseph Emmanuel 1750	Sweden, Kings of.
Louis XVI. 1774	Maria and Peter III. 1777	Adolphus Frederick 1751
[The son of Louis XVI. under the title of Louis XVII. was King of France de jure from the death of his father, 1793, till 1795, when he died in prison.]	Maria (alone) 1784	Gustavus III. 1771
French Republic declared 1792	John VI. 1816	Gustavus IV. 1792
Napoleon First Consul 1799	[This monarch quitted Portugal in consequence of the invasion of the kingdom by the French, and retired to Brazil, from which he returned in 1821. Owing to his mother's mental derangement, he was Regent of Portugal from 1792 till his accession.]	Charles XIII. 1809
Napoleon I. Emperor 1804	Prussia, Kings of.	Norway annexed to Sweden by the Treaty of Kiel. 1814
Louis XVIII. May 3, 1814	Frederick II. 1740	Charles XIV. (Bernadotte) 1813
Germany, Emperors of.	Frederick William II. 1786	Turkey, Sultans of.
Francis I. 1745	Frederick William III. 1797	Mustapha III. 1757
Joseph II. 1765	Rome, Popes of.	Abdul Ahmed 1774
Leopold II. 1790	Clement XIII. 1758	Selim III. 1789
Francis II. (see Austria) 1792	Clement XIV. 1769	Mustapha IV. 1807
[These Emperors of Germany were also Kings of Hungary.]	Pius VI. 1774	Mañomed VI. 1808
Italy, King of.	Pius VII. 1800	Two Sicilies (Naples and Sicily) Kings of.
Napoleon, from 1805 to 1814	Russia, Emperors of.	Ferdinand IV. 1758
Naples, Kings of.	Elizabeth 1741	This monarch is King of Sicily only from 1806 to 1815, when he again becomes King of the Two Sicilies, under the title of Ferdinand I. 1815
Joseph Bonaparte 1806	Peter III. 1762	United States, Presidents of.
Joachim Murat 1808	Catherine II. 1762	George Washington 1789
Netherlands, Stadtholder of.	Paul 1796	John Adams 1797
William VI. 1751	Alexander I. 1801	Thomas Jefferson 1801
Holland and Belgium merged in French Republic 1795	Sardinia, Kings of.	James Madison 1809
	Charles Emmanuel I. 1730	James Monroe 1817
	Victor Amadeus II. 1773	

LESSONS IN GEOMETRY.—VIII.

PROBLEM XVIII.—To draw a square upon a given straight line.

Let *AB* be the given straight line upon which it is required to draw a square. By Problem III. (page 157), draw the straight line *AX* perpendicular and therefore at right angles to *AB* at its extremity *A*, and set off along *AX* a straight line *AC* equal to *AB*. Then from the point *C* as a centre, with *CA* as radius, draw the arc *AED*, and from the point *B* as a centre, with the radius *BA*, draw the arc *AFD*, cutting the arc *AED* in the point *D*. Join *DB*, *DC*; the figure *ACDB* is a square, and it is described upon the straight line *AB* as required.

ANOTHER WAY.

Draw the straight line *AX* as above, and set off *AC* equal to *AB*. Then with the parallel ruler draw *CD* through the point *C* parallel to *AB*, and *BD* through the point *B* parallel to *AC*. The parallelogram *ABDC* is a square, and it is described upon the given straight line *AB*.

The angles at the four corners of a square are right angles, each containing 90 degrees. The diagonals which intersect each other at right angles in the point *G* bisect the angles at the corners, or divide them into two equal parts. The angles *CAB*, *DAB* into which the right angle *CAB* is divided by the diagonal *AD*, contain each of them 45 degrees. If the learner will carefully construct a square on a large scale, as in Fig. 25, he will find that the angles *CAB*, *DAB* can be also divided into two equal angles by drawing straight lines from the point *A* through *F* and *E*, the points in which the diagonal *CB* is cut by the arcs *AED*, *AED*, and as these angles each contain 45 degrees the angles *CAF*, *FAG*, *GAE*, *EAB*, each contain 22½ degrees. Again, in the triangle *AFE*, which is an isosceles triangle (see Definition 20, page 53) because the side *AF* is equal to the side *AE*, the angle *FAE* contains 45 degrees. Now, as the three interior angles of any triangle are equal to two right angles, or 180 degrees, the two angles *FAE*, *AEF* must together contain 180—45, or 135 degrees, and as these angles are subtended by equal sides, they are equal to one another, or, in other words, each contains $135 \div 2$, or 67½ degrees. From this we learn that if one angle of an isosceles triangle be known, we can easily determine how many degrees are contained by each of the remaining angles.

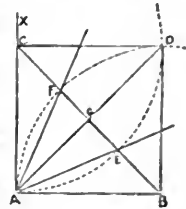


Fig. 25.

Also, if two angles of any triangle be known, the third can be determined by adding together the degrees contained in the known angles, and subtracting them from 180 degrees. For example, in the triangle *ACF* we know that the angle *FAC* contains 22½ degrees, and the angle *ACF* 45 degrees; the angle *AFC* is therefore equal to 180 degrees, less 67½ degrees, the sum of the degrees contained in the angles *FAC*, *ACF*, or 112½ degrees. The value of the angle *AFC* might also have been determined by subtracting the value of the angle *AFE* from 180 degrees, since by Theorem 3 (page 156) the angles *AFC*, *AFE* are equal to two right angles.

To construct a square, whose sides shall be of a given length, all that we have to do is to set off *AB* of the length required, and then proceed to form the square by the method of construction given above.

It will be a useful exercise for the learner to draw straight lines from the point *D* through the points *E* and *F*, cutting the sides *AB*, *AC*, as the lines *AE*, *AF* produced cut the sides *BD*, *CD*; and then determine the value of every angle he can find in the diagram thus formed from the method we have followed in the above remarks.

PROBLEM XIX.—To draw an equilateral triangle of a given altitude.

In Definition 24 (page 53) the learner was taught, that in any triangle a straight line drawn from the vertex of one of its angles, perpendicular to the opposite side or to that side produced, is called the perpendicular of the triangle. This straight line is also called the altitude of the triangle, from the Latin

ERRATUM.—In Lessons in Geometry VII. (page 309), in Problem XIV. line 17, for "the square of the length *a* by the length of *a*," read "the square of the length of *b* by the length of *a*."

altitude, height, because it shows the height of the top or vertex of the triangle from its base. In Fig. 24 (page 209), CE is the altitude of the triangle ABC , and DE the altitude of the triangle ABD . If, then, we have to determine the altitude of an equilateral triangle already drawn, as in the triangle ABC in the same figure, it is manifest that we have only to draw a straight line from the point C perpendicular to the base AB ; or, what is the same thing, bisect the base AB , and join the point of bisection and the point C , which is the top, vertex, or apex of the triangle.

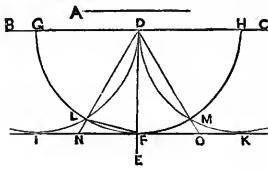


Fig. 26.

But to proceed with the problem under consideration.

Let the straight line AC represent the altitude of the equilateral triangle required. Draw any straight line BC of indefinite length, and from a point D , taken as nearly as possible in the centre of the line, draw DE at right angles to BC . Then, along the straight line DE set off DF equal to A , and from D as a centre with the distance DF , describe the semicircle HFG , cutting the straight line BC in the points G and H . Then from G as centre with the distance GD , describe the arc DI , cutting the semicircle HFG in L , and from H as centre with the distance HD , describe the arc DK , cutting the semicircle HFG in M . Through F draw the straight line IK parallel to BC , or, what is the same thing, touching the arcs DI , DK (see Problem X., page 192), and through the points L and M , draw the straight lines DN , DO , meeting IK in N and O . The triangle DNO is an equilateral triangle, having its altitude DF equal to the given altitude A .

If we join LF , the triangle DLF is an isosceles triangle, having the side DL equal to the side DF . As the sides DL , DF are equal, the angles which they subtend, namely, the angles DLF , DFL , are equal to one another. Now, the third angle, LDL , of the triangle DLF , is an angle of 30 degrees, and each of the angles DLF , DFL is therefore equal to $180 - 30$ divided by 2, or $150 \div 2 = 75$ degrees.

Again, in the triangle LNK , the angle LNK is an angle of 60 degrees; the angle FLN is equal to $180 - 75$, or 105 degrees, since the angles FLN , FLD are together equal to two right angles, and of these the angle FLD has been shown to be an angle of 75 degrees; and the angle NFL is equal to $90 - 75$, or 15 degrees, since the angle NFD is a right angle, and FLD an angle of 75 degrees. Its value can also be found by subtracting the value of the angles FNL , NLF from 180, thus: $180 - (60 + 105) = 180 - 165 = 15$ degrees.

PROBLEM XX.—To draw an angle which shall contain a given number of degrees.

Although it is plain, from the preceding problems, that it is possible to draw many angles containing a given number of degrees without the aid of any instruments, except a pair of compasses and a ruler, it is necessary to resort to the protractor or scale of chords in drawing the great majority of angles when the extent of their opening is stated. The protractor has been described already (page 113). The scale of chords will be found on any "Plane Scale" of boxwood or ivory, sold by mathematical instrument makers, and consists of a line graduated or divided in such a manner as to show the opening of any angle from 1 degree to 90, in degrees only. The method of using the scale of chords is as follows:—

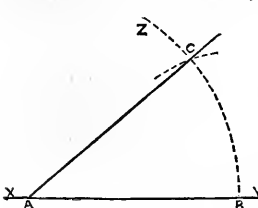


Fig. 27.

On any straight line, XY , set off a portion, AB , equal to the opening of an angle of 60 degrees, as marked on the scale of chords. From the point A as a centre, with AB as radius, draw an arc, cutting the arc BZ in the point C . Join AC ; the angle BAC is an angle of 40 degrees.

To construct a scale of chords, a quadrant of a circle is drawn, and the arc of the quadrant is divided into ninety equal parts,

corresponding to the number of degrees in a right angle. Straight lines are then drawn from one extremity of the arc to each of the points of division, and the length of each line in succession, from that which is drawn to the point nearest to the extremity of the arc from which the lines are drawn, to that which is drawn to the other extremity, is transferred to the scale. The radius of any circle, whether large or small, is the chord of an angle of 60 degrees; but the learner must bear in mind that no chord of an angle of 60 degrees, except that which is marked on his scale, will suffice for the length of the line AB , as the proportions of the chords of the other angles of the scale have been determined by the aid of the quadrant of a circle whose radius is equal to the chord of an angle of 60 degrees of the length laid down on the scale.

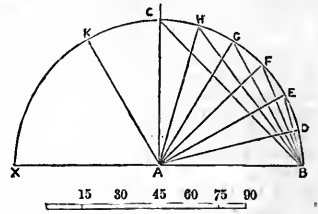


Fig. 28.

To render this perfectly intelligible, in Fig. 28 BAC is a quadrant of a circle, and the angle BAC is an angle of 90 degrees. As it would require an arc of considerable size to divide it clearly into 90 portions of equal size, let us be satisfied with dividing the arc BC into six equal parts in the points D, E, F, G, H . The straight lines drawn from A to each of these points divide the angle BAC into six equal angles of 15 degrees each, and the angles BAD, BAE, BAF, BAG, BAH , are respectively angles of 15, 30, 45, 60, and 75 degrees. Draw the lines BD, BE, BF, BG, BH, BC , from the extremity B of the arc BC through the points D, E, F, G, H, C . These lines represent the chords of the angles BAD, BAE, BAF, BAG, BAH , and BAC respectively, or chords of angles of 15, 30, 45, 60, 75, and 90 degrees, and by setting off the length of each in due order along any straight line, we construct a scale of chords for angles having these openings, based on the quadrant of a circle whose radius is equal in extent to the length of the chord of an angle of 60 degrees, as marked on the scale.

To make an angle greater than 90 degrees by means of the scale of chords, it is only necessary to draw a semicircle instead of a quadrant of a circle, and having set off 90 degrees on the arc, to set off in addition the chord of the number of degrees by which the given angle exceeds 90. Thus, in Fig. 28, to draw an angle of 120 degrees, first draw the semicircle BX , with a radius equal to the chord of an angle of 60 degrees, as marked on the scale. Open the compasses to the whole extent of the scale, and setting one foot on B , with the other draw a small arc, cutting the arc BX in C . Then reduce the opening of the compasses to the extent of the chord of an angle of 30 degrees, and setting one foot on C , with the other cut the arc CX in K . Join AK ; the angle BAC is an angle of 120 degrees, being formed by the angles BAC, CAK , the former of which is an angle of 90 degrees, while the latter is one of 30 degrees.

A scale of chords can be readily constructed without drawing lines from one extremity of the arc of the quadrant to every point of section in succession between the extremity from which the chords are drawn and the other extremity. The method which we are now going to bring under the reader's notice has the advantage of simplicity; but in Fig. 28 the actual chords of the angles from 15 to 90 degrees are shown in succession, and the angles themselves that the chords subtend are also shown by straight lines drawn from the point B to the different points of section of the arc. In Fig. 29, having drawn a quadrant of a circle, A, B, C , as before, join AB , the chord of the right angle A, C, B , and divide the arc AB into nine (or ninety, if it be large enough) equal parts in the points a, b, c, d, e, f, g, h . Then, setting one foot of the compasses at A , draw arcs through the points $a, b, c, etc.$, in succession, cutting the straight line AB in the points numbered 10, 20, 30, etc. The distances along AB intercepted between the extremity A and each arc in succession are respectively chords of angles of 10, 20, 30, 40, 50, 60, 70, 80, and 90 degrees.

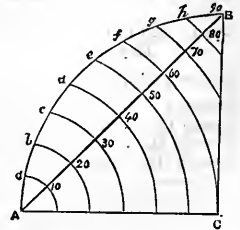


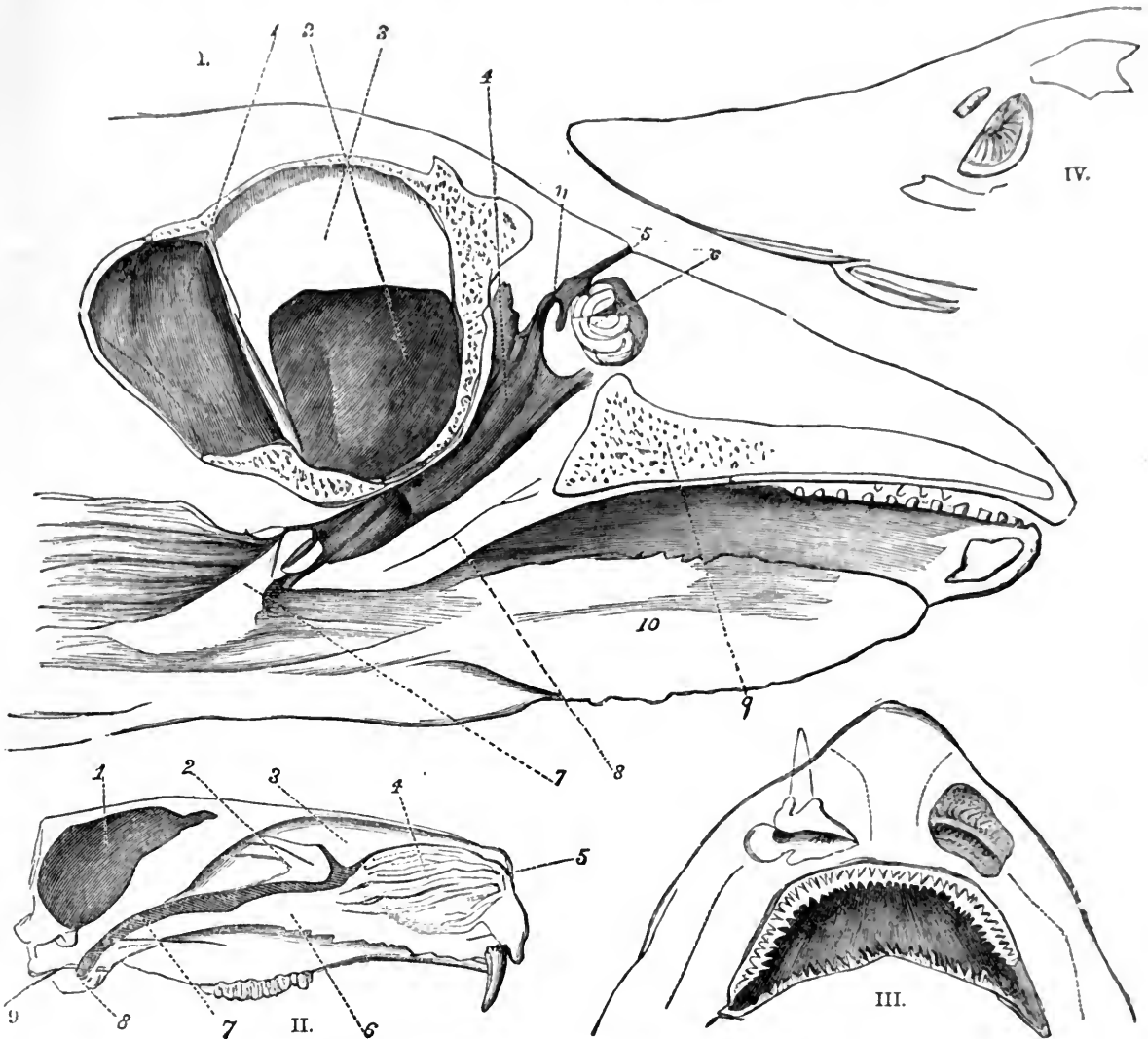
Fig. 29.

ANIMAL PHYSIOLOGY.—VIII.

THE ORGAN OF SMELL—(concluded).

To us the sensations of smell are far less vivid and reliable than those of sight and hearing, or even those of touch and taste. This is shown by the fact, that the ideas which these sensations leave behind them are less distinct: the memory retains them

students in chemistry, will have been struck with the number of men whose sense of smell is imperfect and unreliable; and even those who think they have this sense unimpaired are often misled, from the fact that they are conscious of a sensation, not produced by odour, but which is, in fact, only the general sense of touch, common to the surface of the body, and only more acute in the delicate lining membrane of the nose. Such students can



I. VERTICAL SECTION OF HEAD OF PORPOISE, SHOWING THE NASAL PASSAGE. II. VERTICAL SECTION OF RABBIT'S HEAD, SHOWING OUTER WALL OF THE NASAL CANAL, LEFT SIDE. III. UNDER-SIDE OF HEAD OF SPOTTED DOG-FISH. IV. NASAL SAC OF STURGEON.

Ref. to Nos. in Figs.—I. 1, 2, cavities of the skull; 3, septum between the lobes of the brain; 4, nasal passage; 5, slit-like orifice; 6, folded membrane; 7, upper end of air-passage, grasped by the sides of the nasal canal; 8, soft palate; 9, hard palate; 10, tongue; 11, valve. II. 1, cavity of the brain; 2, 3, ethmo-turbinals; 4, lower turbinal; 5, nostril; 6, palate; 7, nasal canal; 8, bulla of ear; 9, bristle running through Eustachian tube.

for a shorter time, and will not reproduce them at will. Moreover, these sensations furnish but few starting-points for thought, or speculation, or reason to proceed from. We seldom employ the smell in investigation, unless it be upon objects which give no indication whatever to any of the other senses; and when we do so, we are not satisfied until we have other confirmatory evidence as to the nature of those objects. The chemist in the laboratory will make use of this sense, as a rough-and-ready method of detecting gases which cannot be otherwise easily dealt with, but he always confirms their presence by other tests if possible. Any one who has presided over the practical experiments of

detect pungent gases like ammonia and chlorine, but cannot distinguish between them, or between aromatic gases like alcohol and chloroform. On the whole, we make such little use of our organ of smell, its acuteness being as often an inconvenience as an advantage to us, that we endure the loss of this sense with more patience and with less sense of privation than that of any other. The estimate we form from experience of the comparatively small value of this sense, is apt to make us misjudge its importance to the lower animals. But if we imagine that the impressions which this sense brings to animals are as dull, indistinct, and unreliable to their consciousness as to ours, a little

observation of the habits of animals will soon lead us to suspect our error. The sense seems to be the keenest in the carnivora, and man is so sensible of his inferiority to these in the sense of smell, that he supplements his deficiency by their acuteness. The little terrier will inform his master, the rat-catcher, if the rat is at home, by his impatient scratching at the mouth of the hole. The huntsman sees a fox cross an alley in a wood; Reynard has gone he knows not whither, and has left no trace which is available to his dull sense. But a hound comes in sight, and when motioned to the place he sniffs the ground in uncertainty but for a moment, and then flings up his nose towards the sky, and with one long, melancholy howl calls his comrades of the pack, and, in almost less time than it takes to write it, they are all in full cry on the trail, making the echoes ring with their confident music. Who has not observed the pointer, as he stops in the midst of his swift, business-like beat, motionless, as if Medusa's head had turned him to stone? Yet, if you mark him well, his whole frame is instinct with tremulous emotion; his eyes glisten, and seem starting from his head; his nostrils twitch, and his limbs quake with excitement. The game lies hidden in deep cover; it is impossible for him to see it; but as you look at him you feel certain that he is as vividly conscious of its presence, as if his eye saw, or his foot were upon it.

We have seen, in writing of the other senses, that while beasts seem to have these in greater efficiency than men, this is because their attention is not abstracted from their indications, and not because the organ is any more perfect or elaborate in its structure; but in the case of the smell, a corresponding development and complication of structure accompanies a keener sense. The great difference between the skull of man and that of the beast consists in the fact, that in the latter the brain and the brain-case—which it accurately fits—are much smaller; the jaws—and therefore the hollow of the mouth—are much larger and longer. Now, the nasal cavity which lies between these partakes, in the beast, of the elongation of the jaws, and not of the curtailment of the brain. The nose is almost always at the end of the muzzle, and the long chambers of the nose only pass under the brain at the posterior part of their course, where they also begin to descend to enter the throat. Hence, instead of comparing the face to a three-storeyed house, as we did in speaking of the man, it should be compared to a two-storeyed shed, with a lean-to behind for the accommodation of the brain. The turbinated bones are, therefore, not so much one above as one behind the other, the front or inferior one being very much enlarged and contorted, or folded, so as to fill up the large chamber. This bone is very differently shaped in the different animals. In the sheep it arises by a broad plate, which runs inward from the outer wall of the nose, and then divides into two plates, both of which assume the form of scrolls, one curling upwards and the other downwards; and the number of turns of these scrolls is so great, that if a transverse section of the nose be made, the edge of the bone looks like the capital of an Ionic column. In the hare and rabbit the bone has a different form, and consists of a number of plates one above the other, which subdivide into other smaller horizontal plates or ridges, all of which are, so to speak, gathered together into one stem at each end. The seal has a bone of the same structure, but much more subdivided and complicated; and the extraordinary development of the organ in these swimming carnivora, would lead us to suppose that they hunt by scent. It will be seen that the design of all these structures, however different their form may be, is to increase the surface over which the pituitary membrane, as it is called, can be spread. Now, in man, the membrane of the lower scroll-bone is not so specially the seat of the organ of smell as of a refined and acute sense of touch; for the nerve which supplies it is not from the olfactory bulb, but from the fifth pair of nerves. It is this nerve which is excited by the application of snuff: so that the snuff does not act as an odour, but as an irritant, and the pleasure may be compared, by those who do not appreciate it, to the pleasure of scratching in other parts of the body. In beasts, however, the nasal branch from the fifth pair of nerves would seem to be a nerve of special sense; and, besides this, since the turbinated bones are not one above, but one behind the other, the air passes successively over them all, instead of below the ethmo, or upper turbinated bones, as in man.

Perhaps it is not out of place here to remark upon some functions discharged by the nose, which are not olfactory. In

the porpoise the brain has no olfactory lobe, and there are no olfactory nerves; and therefore the nasal passages are made subservient to the supply of the lungs with air. A reference to the engraving will show how the canal from the slit-like opening at the top of the head passes down past a valve, which closes it against the water when the animal is submerged, and then onward to the head of the windpipe, which here does not open on the floor of the oesophagus (or food-throat), but is continued up, and thrust into, the nasal canal, while the muscles of the soft palate and food-throat grasp it firmly. If the animal chooses, however, he can force the water from his mouth past this perforated plug, and make it issue in a stream from the blow-hole. Though the function of smelling seems to be thus entirely sacrificed to other uses, in the nose of the whale and porpoise, it will be seen from the engraving that an orifice leading from the part of the canal external to the valve passes into a chamber, upon whose folded sides a membrane is spread which has branches of the fifth pair of nerves distributed to it. Through this organ, no doubt, the porpoise can test the purity of the water in which it is immersed.

The hog uses his disc-shaped snout to turn up the earth, and the tapir curls his flexible nose round the grass to tear it up; but these slight differences from the usual development of the organ sink into insignificance beside the enormously elongated trunk of the elephant. In this beast, the two narrow tubes into which the nasal chambers are continued forward, run to the very end of the organ, where there is, on the upper side, a finger, which seems to be as serviceable as any of our own. Strong bundles of muscles run along the trunk on all sides, and radiating ones pass between these, so that the beast can move his trunk in any direction he pleases.

In birds the sense of smell is by no means so efficient as in mammals. This we may pronounce with certainty, because not only is the organ, and its accessory apparatus, less developed, but the habits of birds indicate that they are but little guided by the sense of smell. Raptorial birds, like flesh-eating animals, have better-developed olfactory organs than grain-feeding fowls. The main nerve of smell of the vulture is five times the thickness of that of the turkey, although the carrion-feeding bird (first-named) does not exceed the other in weight; but it would seem that this sense in the vulture and condor is only useful to them in selecting while at their meal, and does not guide them to the meal itself. A number of confined condors had some steaks of flesh, wrapped in paper, placed before them, but they gave no sign of being aware of their presence; when, however, the paper was removed, they were seen tumbling over one another in their eagerness to snatch the food.

The general peculiarities of the organ of smell of birds are the following:—The nerve leaves the skull by one hole, and not through many, as in beasts; the membrane to which the nerve of smell goes is confined to the base of the beak, and the outer nostrils are not at the end, but at its sides or base; and though these nostrils are sometimes protected by a scale (as in the pheasant), or a sheath (as in the stormy petrel), or a bunch of stiff feathers (as in the raven), there are never any flexible cartilages moved by muscles. That singular wingless bird, thence called the apteryx, affords the only exception to the above statements, for its nostrils are at the end of its bill, the upper turbinated bones are of very large size, and many nerves pierce the skull, as in the mammalia. These peculiarities indicate greater acuteness in the sense of smell; and this is thought to be associated with its habit of probing among loose earth, to hunt for worms, by scenting them.

In the pelican there are no external nostrils whatever; and this is, no doubt, reasonably accounted for by the fact that this bird fishes under water with its long bill, and detains its prey for inspection in its capacious pouch. While in this position, the contents of the bill send off effluvia to the nose by the back way of the palate; and since the nostrils of the bird, if it had any, would be above the water, and its prey below it, they could be of no service.

In the higher reptiles, the internal organ is very like that of birds; but in some the nostrils are wide apart, and in others, as in all the crocodiles, they are united into one, which in the true crocodile of the Nile is shaped like a half-moon, and closed by a valve from behind; and in the gavial, or slender-snouted crocodile of the Ganges, the skin round the nostril can be raised so as to allow it to be just lifted above the surface, while the

rest of the animal is concealed. In both cases the nostril is placed at the tip of the snout, for reasons which those who have read the lessons on the ear will understand. Space fails to write of the organ in the serpent, the frog, and the siren; but, in passing on to describe it as it occurs in the fish, it should be remarked, that in all the foregoing animals there is a communication between this organ and the air-passage to the lungs.

The position of these hind nostrils, as they are called, are, as we have seen, very various. In some cases, they open just behind the teeth, as in the toad; and in others, far back in the alimentary canal. They are sometimes double, and sometimes single; but they are always present: and consequently these animals all breathe naturally through the nose: and for this reason it has been difficult to discuss the function of smell without trenching on the function of respiration. In fish, on the contrary, there are no lungs; and therefore the hind outlet of the nose is not present, and the organ is solely an organ of smell.

Its usual form is that of a roundish sac, opening on the side of the muzzle by one or two external holes. The sac is either round, in which case a column of cartilage rises in the centre, and radiating folds run from this to the circumference; or elongated, when a bar of cartilage runs across it; and on each side of this plates pass off to the sides; and these secondary plates at their middle portion are elongated into flaps, which float freely in the water of the sac. An example of the first form is seen in the sturgeon, and of the last in the ray and dog-fish. In the drawing of the dog-fish, one sac is represented with a fore-and-aft flap to the nostril, the fore-flap being pulled forward by two threads, so as to disclose the interior; while, on the other side, these flaps have been wholly removed, to expose the organ. These cartilaginous flaps are moved by proper muscles, so that the water in the sacs can be rapidly changed by their action; hence these fish have been said not only to smell, but to scent their prey. In the lamprey, or nine-eyed eel, the nasal sac is single, and in the middle line above the head.

In the nautilus, Professor Owen has detected an organ of smell; and the pretty little organs which are thrust up from the back of the naked sea-slug are considered to be of the same nature. We have already pointed out the organ in the lobster; but where the sense resides in insects is yet unknown.

Notwithstanding these difficulties and uncertainties, it is hoped that it has been shown that there is sufficient evidence of contrivance in the nasal organ in the animal kingdom, to make us exclaim with David, "How wonderful are thy thoughts! how great is the sum of them!"

LESSONS IN GERMAN.—XVI.

SECTION XXIX.—POSITION OF THE VERB, ETC.

WHEN for the sake of emphasis a word (which is not the subject) is placed at the beginning of a principal sentence, or if a subordinate sentence precedes the principal sentence, the subject is placed after the finite verb (a present or imperfect), as:—*Da geht Ihr Freund*, there goes your friend. *Hier steht sein Bruder*, here stands his brother. *Zu lange schon hast Du geschlummert*, too long already hast thou slumbered. *Jetzt muß ich gehen*, now I must go. *Als ich gestern nach Hause kam*, regnete es sehr stark, when I returned home yesterday, it was raining very hard. *Heute kann er nicht sein*, und morgen will er nicht, he cannot read to-day, and to-morrow he will not.

1. *Fahren* is both transitive and intransitive; when transitive, it is conjugated with *haben* (§ 71. 1), and signifies to convey in a vehicle, to drive, as:—*Der Kutscher hat mich schnell gefahren*, the coachman has driven me rapidly. *Der Schiffer hat mich schnell gefahren*, the boatman has rowed me rapidly. When intransitive, it is conjugated with *sein* (§ 71. 1), and signifies to ride in a vehicle, as:—*Ich bin gefahren*, I have ridden (in a carriage, boat, or other vehicle).

2. *Reiten* is also used transitively and intransitively, and signifies to ride, as on horseback, as:—*Der Araber reitet das Pferd* und das Kamel, the Arabian rides the horse and the camel. *Ich habe ein schnelles Pferd geritten*, I have ridden a fleet horse. When used intransitively (§ 71. 1), it is conjugated with *sein*, as:—*Er ist sehr schnell geritten*, he has ridden (on horseback) very rapidly.

VOCABULARY.

<i>Fahren</i> , to drive, to ride (in a vehicle).	<i>Holz-hauer</i> , m. wood-cutter.	<i>Reiten</i> , to ride (on horseback).
<i>Frankfurt</i> , n. Frankfort.	<i>Kalt</i> , cold.	<i>Reit-sattel</i> , n. saddle-horse.
<i>Früh</i> , early.	<i>Leben</i> , to live.	<i>Schlachten</i> , to butcher, kill, or slay.
<i>Gesund</i> , healthy.	<i>Mäßig</i> , temperate, temperately.	<i>Suchen</i> , to seek.
<i>Holz</i> , n. wood, timber of any kind.	<i>Metzger</i> , m. butcher.	<i>Zeit</i> , f. time.
	<i>Ordnentlich</i> , orderly.	

RÉSUMÉ OF EXAMPLES.

<i>Da blühet eine Rose</i> , und hier fällt eine ab.	There a rose blossoms, and here one falls off.
<i>Hier steht der Jüngling</i> , und da der Greis.	Here stands the youth, and there the aged man.
<i>Morgen verläßt das neue Dampfboot</i> den Hafen.	To-morrow the new steamboat leaves the harbour.
<i>Zu lange schon hast du geschlummert</i> , die verlorene Zeit einzuholen.	Too long already hast thou delayed to redeem the lost time.
<i>Jetzt muß ich meinen Brief schließen</i> .	I must now close my letter.
<i>Heute kann er nicht froh sein</i> , und morgen nicht lachen.	To-day he cannot be joyful, and to-morrow not laugh. Adage.

EXERCISE 50.

1. Will der alte Soldat heute in den Wald gehen? 2. Er will hingehen, aber heute kann er nicht, denn er hat viel zu thun. 3. Der Hausnecht ist auf den Markt gegangen, um Fleisch zu holen. 4. Um gesund zu bleiben, muß man ordentlich und mäßig leben. 5. Der Holzhauer ist in den Wald gegangen, um Holz zu hauen. 6. Der Metzger geht von einem Dersje zum andern, um Döfjen zu kaufen. 7. Er geht aus einem Dersje in das andere, kann aber keine Döfjen finden. 8. Was will er mit den Döfjen? 9. Er will sie schlachten; wir müssen ja Fleisch haben. 10. Der Bauer hat zwei Pferde, welche der Brauer kaufen will. 11. Ich gehe in die Stadt, um einen Hut oder eine Mütze zu kaufen. 12. Er hat Bücher zu lesen und eine Aufgabe zu schreiben. 13. Wo will der Freund Ihres Bruders hingehen? 14. Er will nirgends hingehen, er will bei seinem Dheim bleiben. 15. Wollen Sie auf den hohen Berg gehen? 16. Ich will dahin gehen, aber nicht heute. 17. Können Sie morgen auf das Land gehen? 18. Ich kann dahin gehen, aber ich will nicht. 19. Wann will Ihr Vater seine Pferde wieder haben? 20. Er muß sie morgen irad haben, weil er morgen Abend nach Frankfurt fahren will. 21. Warum will er nicht dahin reiten? 22. Weil er kein gutes Reitpferd hat, und das Wetter sehr kalt ist.

EXERCISE 51.

1. It is too cold for him to-day to go over to Frankfort. 2. There runs the hare over the hill. 3. There drives your brother. 4. The confectioner is gone to the bakehouse in order to bake bread. 5. The butcher goes to market in order to buy sheep. 6. Your coachman has driven me rapidly here. 7. Do you see that man upon that horse which we saw yesterday? 8. The soldiers ride on beautiful horses. 9. They say one rides in those carriages comfortably. 10. We have ridden in your coach to pay our visits. 11. Tread not beyond the law! 12. The new steamboat passes down the river to-day for the first time.

SECTION XXX.—COMPARISON OF ADJECTIVES.

German adjectives are compared by suffixing to the simple form of the positive, or for the comparative, and of for the superlative; thus, positive mild (mild), comparative milder (milder), superlative mildest (mildest). (See §§ 1, 2, 3, 4, 5.)

1. When the positive ends in *d*, *n*, or *t*, the *e* of this termination is, in the comparative, omitted, as:—*edel* (noble), *edler* (nobler). It may be here remarked, that adjectives of this class add for the superlative *st* only; thus, *edel*, *edler*, *edelst*. Adjectives, when compared, are commonly contracted when euphony admits.

Adjectives in the comparative and superlative are subject to the same rules of inflection as when in the positive degree. (§ 37. 1.)

* The disposition to contract two concurrent syllables thus a parant in almost every language. Thus, in English, we have entrance for entrance; wondrous for wondrous, etc. So hoped, prayed, etc., words containing each two syllables, are pronounced as though consisting of but one. This is a serious difficulty in the way of foreigners learning our language, but one which in the German, by a conformity of orthography to pronunciation, is entirely avoided.

INFLECTION OF THE ADJECTIVE IN THE COMPARATIVE AFTER THE OLD DECLENSION.

<i>Masc.</i>	<i>Fem.</i>	<i>Neut.</i>	<i>Plural for all genders.</i>
N. Schönerer,	schönerer,	schöneres,	schönerer, finer.
G. Schöneren (§ 35),	schönerer,	schöneren,	schönerer, of the finer.
D. Schönerem,	schönerer,	schönerem,	schöneren, to the finer.
A. Schöneren,	schönerer,	schöneres,	schönerer, finer.

INFLECTION AFTER THE NEW DECLENSION.

<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>
N. Der schönere,	die schönere,	das schönere, the finer.
G. Des schöneren,	der schöneren,	des schöneren, of the finer.
D. Dem schöneren,	der schöneren,	dem schöneren, to the finer.
A. Den schöneren,	die schönere,	das schönere, the finer.

Plural for all genders.

N. Die schöneren, the finer.	D. Den schöneren, to the finer.
G. Der schöneren, of the finer.	A. Die schöneren, the finer.

2. Superlatives of the Old Declension are used only in address, as:—Siebster Bruder, dearest brother. Feuerste Mutter, dearest mother. Siebte Freunde, dearest friends, etc. (§ 37. 2.)

INFLECTION OF THE SUPERLATIVE AFTER THE NEW DECLENSION.

<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>
N. Der schönste,	die schönste,	das schönste, the finest.
G. Des schönsten,	der schönsten,	des schönsten, of the finest.
D. Dem schönsten,	der schönsten,	dem schönsten, to the finest.
A. Den schönsten,	die schönste,	das schönste, the finest.

Plural for all genders.

N. Die schönsten, the finest.	D. Den schönsten, to the finest.
G. Der schönsten, of the finest.	A. Die schönsten, the finest.

3. The Old form of the superlative is rarely used; the article (as in English) always preceding it, as:—Mein Hut ist der schönste, my hat is the finest. Instead of the regular form, the dative of the New Declension, preceded by the particle am, contracted from an tem, is often used, as:—Mein Hut ist am schönsten. (See § 38. 1, etc.)

The adverb mehr, like its English equivalent (more), is likewise employed in the comparison of adjectives, as:—Sie ist mehr liebenswürdig, als schön, she is more amiable than beautiful. (See § 42. 1, etc.)

4. Adjectives of all degrees of comparison may in the simple and absolute form be employed as *adverbs*; but when the superlative is so used, the form produced by the union of am with the dative is adopted, as:—Er schreibt schön, he writes beautifully. Er liest schnell, als ich, he reads more rapidly than I. Sie liest am schnellsten, she reads the most rapidly. (§ 106.)

5. Participles, when used as adjectives, are compared in the like manner, as:—Gelernt (learned), gelehrter (more learned), gelehrtest (most learned); rührend (affecting), rührender (more affecting), rührendst (most affecting).

6. Je-je or je-desto, in phrases like the following, is answered in English by "the-the;" thus, Je mehr, je munterer, the more the merrier. Je mehr, desto besser, the more, the better. Je is sometimes preceded by desto, as:—Ein Werk ist desto nützlicher, je vollkommener es ist, the more perfect a work is, the more useful it is.

7. Desto is likewise used without je, as:—Er lief darauf desto schneller, theouperon he ran the faster. Er hörte nun desto aufmerksamer zu, he listened now the more attentively.

8. The following adjectives are irregular in comparison (see § 39):—

Gut, good;	besser, better;	best or am besten, best.
Hoch, high;	höher, higher;	höchst or am höchsten, highest.
Nähe, near.	näher, nearer.	nächst, or am nächsten, nearest.
Viel, much;	mehr, more;	meist or am meisten, most.
Wenig, little or few;	weniger, minder, less or fewer;	wenigst or minst, least or fewest.

VOCABULARY.

Blume, f. flower.	Ein'formigkeit, f. uniformity.	Gebil'det, educated, cultivated.
Buche, f. beech.	Et'felteit, f. vanity.	Gefal'ten, m. pleasure.
Dick, thick, stout, corpulent.	Entfernt, distant.	Geist, m. spirit, mind.
Eiche, f. oak.	Florenz', n. Florence.	Gewöhnlich, commonly.
Ein'fluß, influence.	Fruchtbar, productive.	

Jungling, m. youth.	Blutern, to prattle.	Unrein, impure.
Klugheit, f. prudence.	Schrift'steller, m. writer, author.	Un'würdig, unworthy.
Lanblust, f. country air.	Sitte, f. manners, custom.	Verän'derung, f. alteration, change.
Luft, f. air, atmosphere.	Stamm, m. stock, trunk.	Verstant, m. understanding.
Muth, m. courage.	Stern, m. star.	Virgil', m. Virgil.
Ovid', m. Ovid.	Um'gehen, to associate.	Wohlthat, f. benefit.
Paris', n. Paris.		Würdig, worthy.
Parma, n. Parma.		Zinn, n. tin.

RÉSUMÉ OF EXAMPLES.

Das Wetter ist heute kälter, als gestern.	The weather is colder to-day than yesterday.
Der reichste Mensch ist nicht immer der glücklichste, und der reichste nicht immer der weiseste.	The noblest man is not always the most fortunate, and the richest not always the wisest.
Der Klügste ist gewöhnlich am bescheidensten, der Dummste am zu'ringlichsten.	The wisest (man) is generally the most modest, the most stupid the most obtrusive.
Ein guter Feldherr muß mehr klug, als tapfer sein.	A good commander-in-chief must be more prudent than valiant.
Dieses Tuch ist besser, als jenes.	This cloth is better than that.
Hunger ist der beste Koch.	(The) hunger is the best cook.
Die Tanne ist der höchste Baum.	The pine is the highest tree.
Weisheit ist mehr zu schätzen, als Reichthum — aber am meisten Tugend und Frömmigkeit.	Wisdom is more to be prized than riches, but virtue and devoutness the most.

EXERCISE 52.

1. Dieser Jäger hat einen schönen Hund, meiner ist schöner, und der eurige ist der schönste von allen. 2. Die Erde ist kleiner, als die Sonne; und die Sterne sind entfernter, als der Mond. 3. Virgil ist ein angesehener Schriftsteller, als Ovid. 4. Die Stadt Canton (§ 123. 6) ist größer, als Paris. 5. Alexander der Große hatte weniger Klugheit, als Muth. 6. Man findet viel mehr Kupfer als Silber, und mehr Eisen als Zinn. 7. Dieses Mädchen plantert mehr, als sie (§ 134. 2) arbeitet. 8. Die Luft in den Städten ist unreiner, als die Lantluft. 9. Frankreich ist nicht so fruchtbar, wie Deutschland. 10. Dieser Jüngling hat nicht so viel Verstand, wie sein Bruder, aber er hat auch nicht so viel Gisttheit. 11. Die Rose ist eine der schönsten Blumen in der Welt. 12. Diejenigen sind gewöhnlich am wenigsten stolz, deren Geist am gebildetsten ist. 13. Die Sitten derjenigen, mit welchen wir umgehen, haben gewöhnlich Einfluß auf uns. 14. Die Wohlthaten, deren wir würdig sind, sind uns angenehmer, als die, deren wir unwürdig sind. 15. Derjenige ist der reichste, dessen Kinder tugendhaft sind. 16. Der Herr hat keinen Gefallen an denjenigen Menschen, die keine Liebe zu ihren Brüdern haben. 17. Der Apfelbaum hat einen dicken Stamm, die Buche hat einen dickern Stamm, und die Eiche hat den dicksten Stamm. 18. Je mehr er hat desto mehr will er. 19. Florenz ist schöner, als Parma.

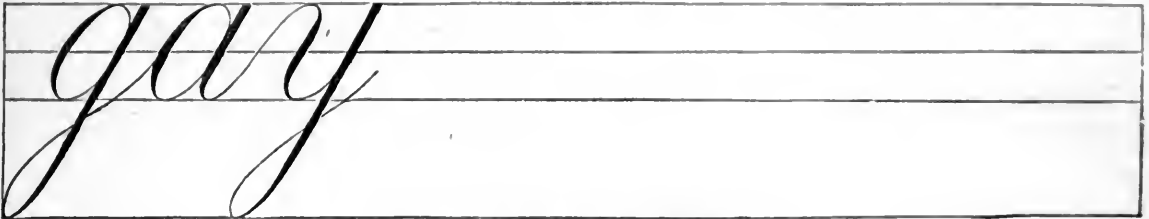
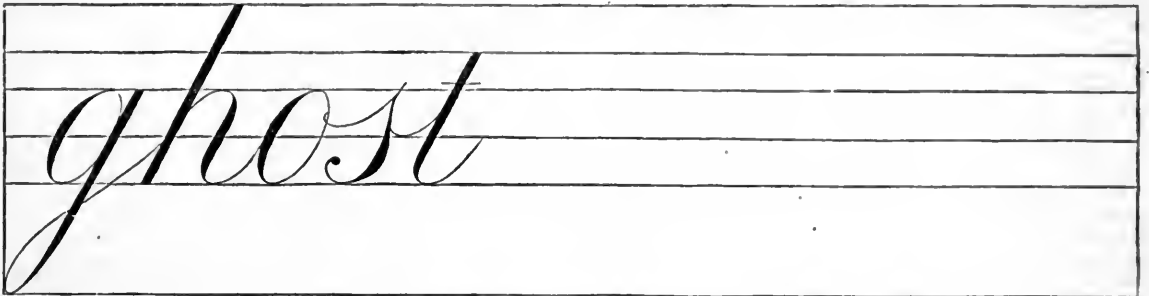
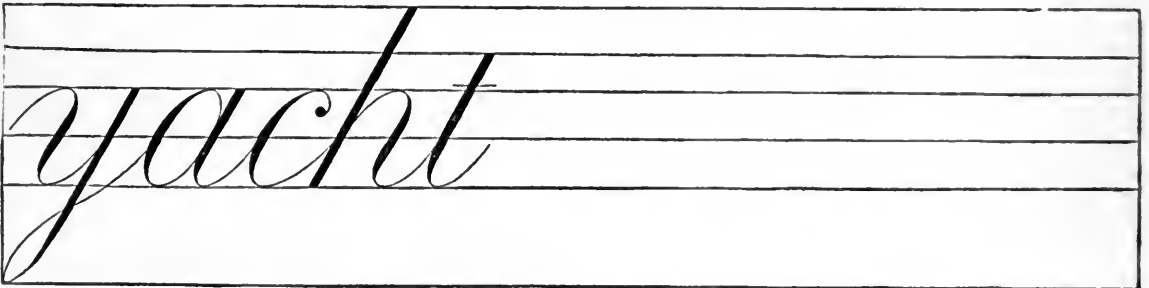
EXERCISE 53.

1. The more frequent our intercourse is with nations, the more our commerce will be extended. 2. Are the palaces of the kings of England as beautiful as those of the German kings? 3. England is not so fertile as Spain or Italy. 4. It is as easy to do good as to do evil. 5. Virtue is the greatest ornament of man. 6. A sage said (used to say), that the more he reflected on the immortality of the soul, the more important it appeared to him. 7. The Rhine presents the most beautiful view. 8. The country air was more beneficial in the recovery of this youth than the treatment of the most efficient doctor. 9. Ovid is a less agreeable writer than Virgil. 10. The spring is more variable than the autumn. 11. This view is beautiful, but the view from that hill is more beautiful. 12. Augustus was not, perhaps, a greater man than Antony, but he was more fortunate than he. 13. Of all flowers the rose is the most beautiful, if the violet is not still more beautiful. 14. The society of that youth is less agreeable than that of his brother. 15. Mont Blanc is a high mountain, but Chimborazo is higher, and Mount Everest the highest. 16. Virtue is more to be prized than riches. 17. The soldiers are going to Vienna. 18. The woodcutter cuts down the highest beech in the forest. 19. Florence is the capital of Italy. 20. The stars in the heaven shine brightly. 21. She is more beautiful than amiable. 22. The louder the man called, the faster the boy ran. 23. The boatman rowed rapidly across the river.

LESSONS IN PENMANSHIP.—XVII.

ANY intelligent self-teacher, who has carefully followed our instructions from the beginning, and has been able to find time to write for at least an hour daily, will now find that he has acquired the proper position of the hand in writing, and the right mode of holding the pen, while he has also gained sufficient control over the muscles of his hand and wrist to be able to make the movements necessary to form the letters that have already been brought under his notice, without the temporary inconvenience which a beginner invariably experiences from an undue tension of the ball of the thumb and the muscles on the opposite side of the palm of the hand, caused by holding the pen too stiffly, and not permitting the fore-finger and thumb to

graved copy-slips, there must still be many of our readers who do, and for their benefit examples for practice are given in Copy-slips Nos. 58, 59, and 60. After furnishing examples of the seven letters of the writing alphabet that yet remain to be mentioned, we shall proceed to give a series of copy-slips in the various kinds of writing generally taught in schools, from which the learner will be able to make himself acquainted with the forms of the capital letters. The instructions already given for tracing out the shapes of the small letters have, of necessity, been copious and ample, and to those of our readers who may be able to write, the explanations of the methods used in forming each letter of the writing alphabet, may have appeared minute and tedious. It must be remembered, however, that these elementary lessons in Penmanship are intended rather

COPY-SLIP NO. 58.—THE WORD *gay*.COPY-SLIP NO. 59.—THE WORD *ghost*.COPY-SLIP NO. 60.—THE WORD *yacht*.

play freely on the joints by which, so to speak, they are hinged together and connected with the wrist and arm. On the contrary, through having gained sufficient confidence in his skill and powers by daily practice, he begins to move the pen freely and rapidly over the paper, while the down-strokes of his letters, which were at first crooked and unevenly formed, are now regularly sloped and sharply and clearly defined at the edges. He begins to find, too, that he no longer requires so many examples for practice in words composed solely of the small letters of the writing alphabet to be placed before him by means of engraved copy-slips, inasmuch as he can select words enough for himself, in writing which he finds a useful exercise in testing his knowledge of the forms of the letters with which he is already acquainted, the way in which each is connected with letters by which they are preceded or followed, and the relative proportion of the parts which extend above and below the lines that contain the body or main part of the letters. But although the majority of our self-taught students may not require en-

for learners who are trying to teach themselves to write, and for those who are endeavouring to improve a faulty style of handwriting, than for those who have had the benefit of being shown how to shape their letters by a writing master; and it is for the guidance of self-teachers, who have no one to show them how each letter should be formed by writing it before them, that our instructions have been made as elaborate and precise as they are.

But even to those who know how to write, these minute directions may be of the greatest importance. Many of our readers, we trust, are engaged in the good work of teaching adults in evening schools. To such as these our lessons will afford assistance in conveying in suitable terms the instructions they are giving, and accompanying that instruction by accurately-formed diagrams on the black-board, which will serve as examples to all the members of a large class, and save the labour and loss of time involved in writing separate copies for each individual of which the class is composed.

LESSONS IN LATIN.—IX.

THE THIRD DECLENSION (continued).

CLASS I.

NOUNS WITH CONSONANTAL STEMS; IMPARISYLLABIC (continued).

2.—With the termination s.

Consonantal stems with the sounds k (c), t, p.

MASCULINES AND FEMININES.

Cases.		
	Singular.	
N. judex, a judge.	comes, a companion.	principes, a chief or prince.
G. judicis, of a judge.	comitis, of a companion.	principis, of a prince.
D. judici, to a judge.	comiti, to a companion.	principi, to a prince.
Ac. judicem, a judge.	comitem, a companion.	principem, a prince.
V. judex, O judge!	comes, O companion!	principes, O prince!
Ab. judice, by a judge.	comite, by a companion.	principe, by a prince.

Cases.		
	Plural.	
N. judices, judges.	comites, companions.	principes, chiefs or princes.
G. judicium, of judges.	comitum, of companions.	principum, of princes.
D. judicibus, to judges.	comitibus, to companions.	principibus, to princes.
Ac. judices, judges.	comites, companions.	principes, chiefs or princes.
V. judices, O judges!	comites, O companions!	principes, O princes!
Ab. judicibus, by judges.	comitibus, by companions.	principibus, by princes.

Cases.		
	Singular.	
N. rex, a king.	lapis, a stone.	urbs (f), a city.
G. regis, of a king.	lapidis, of a stone.	urbis, of a city.
D. regi, to a king.	lapidi, to a stone.	urbi, to a city.
Ac. regem, a king.	lapidem, a stone.	urbem, a city.
V. rex, O king!	lapis, O stone!	urbs, O city!
Ab. rege, by a king.	lapide, by a stone.	urbe, by a city.

Cases.		
	Plural.	
N. reges, kings.	lapides, stones.	urbes, cities.
G. regum, of kings.	lapidum, of stones.	urbium, of cities.
D. regibus, to kings.	lapidibus, to stones.	urbibus, to cities.
Ac. reges, kings.	lapides, stones.	urbes, cities.
V. reges, O kings!	lapides, O stones!	urbes, O cities!
Ab. regibus, by kings.	lapidibus, by stones.	urbibus, by cities.

A few words of explanation may here be desirable. The Latin *c* represents the Greek *g* (gamma), and for the most part was pronounced like our *k*. Thus, the Romans pronounced Cicero, the name of their great orator, *Kíkero*. Now the *x* in *judex* is made up of these letters, thus, *judex*—the *c* and *s* blending together to form *x*; hence, *judex*, *judicis*, *judices*: in the genitive, the laws of pronunciation convert the *e* of the nominative into *i*; as it does in *comes*, *comitis*. From this example you see that the variations which words undergo are not arbitrary. Those variations depend on the nature of the letters that come together, and in their ultimate causes, on the structure of the organs of speech, as these organs are in each nation modified by natural endowments, climate, culture, and a variety of other circumstances.

The *b* in *urbs* may be considered as equivalent to *p*, for *b* and *p* being labials—that is, letters in pronouncing which the lips are chiefly used—are, as letters of the same organ, interchangeable, or may be used the one for the other, under certain conditions.

VOCABULARY.

Ætas, ætatis, f., age.	Grex, grægis, m., a flock.	Plebs, plêbis, f., the people (plebs has no plural).
Artifex, artificis, m., an artist or artificer.	Lex, lëgis, f., a law.	Seges, segëtis, corn-land.
Cælebs, cælbis, m., a bachelor.	Mercēs, mercëdis, f., a reward.	Stirps, stirpis, f., a race, stem.
Cervix, cervicis, f., the neck.	Miles, militis, m., a soldier.	
Eques, equitis, m., a horseman or knight.	Pollex, pollicis, m., the thumb.	

EXERCISE 29.—LATIN-ENGLISH.

1. Artifices debent pueros docere. 2. Pollicem movet rex. 3. Reges custodiunt leges. 4. Leges custodiuntur a regibus. 5. Filius pollicem mordet. 6. Equites vexantur. 7. Artifices ornant urbes. 8. Mercēs artificum nutriunt filios et filias. 9. Cælebs dormit. 10. Plebs defenditur. 11. Stirps artificis laudatur. 12. Estne tibi seges? 13. Cervix militis læditur. 14. Cælebis ætas magna est.

EXERCISE 30.—ENGLISH-LATIN.

1. I defend artists. 2. Artists are defended by me. 3. Has he a reward? 4. He has not a flock. 5. I am pricked in the neck. 6. Artists paint flocks. 7. The laws of the kings are deadly. 8. The corn-land of the horseman is yielded. 9. Why is the bachelor blamed? 10. The people blame bachelors. 11. Soldiers have rewards. 12. Age teaches many things (multa).

CLASS II.

NOUNS WITH VOWEL-STEMS; PARISYLLABIC.

With and without the termination s.

For the most part feminines.

Cases.		Singular.	
N.	avis, a bird.	febris, a fever.	navis, a ship.
G.	avis, of a bird.	febris, of a fever.	navis, of a ship.
D.	avi, to a bird.	febri, to a fever.	navi, to a ship.
Ac.	avem, a bird.	febrem (im), a fever.	navem (im), a ship.
V.	avis, O bird!	febris, O fever!	navis, O ship!
Ab.	ave or avi, by a bird.	febri (e), by a fever.	navi or nave, by a ship.

Cases.		Plural.	
N.	aves, birds.	febres, fevers.	naves, ships.
G.	avium, of birds.	februm, of fevers.	navium, of ships.
D.	avibus, to birds.	febris, to fevers.	navibus, to ships.
Ac.	aves, birds.	febres, fevers.	naves, ships.
V.	aves, O birds!	febres, O fevers!	naves, O ships!
Ab.	avibus, by birds.	febris, by fevers.	navibus, by ships.

Cases.		Singular.	
N.	nubes, a cloud.	mare (neuter), the sea.	rete (neuter), a net.
G.	nubis, of a cloud.	maris, of the sea.	retis, of a net.
D.	nubi, to a cloud.	mari, to the sea.	reti, to a net.
Ac.	nubem, a cloud.	mare, the sea.	rete, a net.
V.	nubes, O cloud!	mare, O sea!	rete, O net!
Ab.	nube, by a cloud.	mari, by the sea.	reti, by a nets.

Cases.		Plural.	
N.	nubes, clouds.	maria, seas.	retia, net.
G.	nubium, of clouds.	marium, of seas.	retium, of nets.
D.	nubibus, to clouds.	maribus, to seas.	retibus, to nets.
Ac.	nubes, clouds.	maria, seas.	retia, nets.
V.	nubes, O clouds!	maria, O seas!	retia, O nets!
Ab.	nubibus, by clouds.	maribus, by seas.	retibus, by nets.

VOCABULARY.

Altäre, altäris, n., an altar.	Ignis, ignis, m., fire.	Rupes, rupis, f., a rock.
Civis, civis, m., a citizen.	Navis, navis, f., a ship.	Securis, securis, f., an axe.
Clades, cladis, f., a slaughter.	Orbis, orbis, m., a globe, the world.	Sedes, sedis, f., a seat.
	Ovile, ovilis, n., a sheepfold.	

EXERCISE 31.—LATIN-ENGLISH.

1. Aves fallant cælibes. 2. Matres occiduntur febris. 3. Valde diligo mare. 4. Mare diligitur a nautis. 5. Agricola colunt segetes. 6. Nautæ sunt in navibus. 7. In orbe est ignis. 8. In ignibus sunt fratres. 9. Altaria sunt deabus. 10. Nonne diis sunt altaria? 11. Securi defendunt agricolæ ovilia.

EXERCISE 32.—ENGLISH-LATIN.

1. Sailors defend ships with (their) bodies. 2. Birds are on the rocks. 3. Are rocks loved by sailors? 4. Slaughter injures the people. 5. Birds strike the clouds. 6. Axes defend the ships. 7. The birds of the citizens are injured. 8. The seat of the prince is praised. 9. We conquer the companions of the princes.

General view of nouns of the third declension, according to their stems:—

Class I.

Nouns with consonantal stems, or imparisyllabic.

1st division: Nouns without the termination s.

1st subdivision: Nouns in which the nominative and the stem are the same; the stems end in *r* and *l*.

2nd subdivision: Nouns in which the nominative and the stem are different; the stems end in *n* and *r*.

2nd division: Nouns with the termination s, with the sounds *k*, *t*, *p*.

Class II.

Nouns with the vowel-stems, or parisyllabic.

With and without the termination s.

Some peculiarities belonging to this declension must be briefly indicated. The termination of the accusative singular is properly *m*, which is connected with the consonantal stem by the interposition of *e*. In the vowel-stems no interposing vowel is required, because there is a vowel in the stem. That vowel is *i*. Vowel-stems, therefore, end in *im* in the accusative, and in *i* in the ablative singular; for the most part, however, they in usage have *e* in both. However, in *sitis*, *thirst*, *tussis*, *a cough*, and *vis*, *strength*, *i* only is used. *Vis* is a defective noun, and is thus declined: singular, *vis*, *vim*, *vi*; plural, *vires*, *virum*, *viribus*, *vires*, *vires*, *viribus*, the plural being complete and regular. In these nouns,—namely, *febris*, *a fever*; *securis*, *an axe*; *pelvis*, *a basin*; *turris*, *a tower*; and *retis*, *a cord*, *im* is more usual than *em*; but less usual than *em* is it in classis,

a fleet; messis, a crop of corn; clavis, a key; navis, a ship. The ablative singular has for the most part *i* (perhaps from *ie*) instead of *e* in parissyllabics with the vowel-stem in *i*. In imparissyllabics with consonantal stems, *e* is the usual ablative termination, but *i* is sometimes found, derived from the usage in the vowel-stems.

Nouns which make the ablative singular in *i*, make the genitive plural in *um* instead of *um*; and nouns neuter, which in the ablative singular end in *i*, in the nominative, accusative, and vocative plural end in *ia*.

Adjectives of the third declension, in general, follow the declension laws of the nouns, only that in the ablative singular they prefer *i*. Adjectives of the third declension are of two sorts: first, those that have three terminations, as, *alacer, m., alacris, f., alacere, n., lively, active*; second, those that have two terminations, as the comparative, *vilior, m. and f., vilius, n. meaner*; under this second class may stand such as *ferox, fierce*, which in the nominative singular is *m., f., and n. (accusative, ferocem)*, but in the plural has for the neuter a separate form in *ia, as ferocia*.

DECLENSION OF AN ADJECTIVE OF THREE TERMINATIONS.

EXAMPLE.—*Acer, acris, acre, sharp, acute, pungent, energetic.*

Singular.			Plural.				
Cases.	M.	F.	Cases.	M.	F.	N.	
N.	acer.	acris.	acre.	N.	acres.	acres.	acria.
G.	acris.	acris.	acris.	G.	acrium.	acrium.	acrium.
D.	acri.	acri.	acri.	D.	acribus.	acribus.	acribus.
Ac.	acrem.	acrem.	acrem.	Ac.	acres.	acres.	acria.
V.	acer.	acris.	acrem.	V.	acres.	acres.	acres.
Ab.	acri.	acri.	acri.	Ab.	acribus.	acribus.	acribus.

DECLENSION OF AN ADJECTIVE OF TWO TERMINATIONS.

EXAMPLE.—*Suavis, m. and f.; suave, n., sweet.*

Singular.			Plural.		
Cases.	M. and F.	N.	Cases.	M. and F.	N.
N.	suavis.	suave.	N.	suaves.	suavia.
G.	suavis.	suavis.	G.	suavium.	suavium.
D.	suavi.	suavi.	D.	suavibus.	suavibus.
Ac.	suavem.	suave.	Ac.	suaves.	suavia.
V.	suavis.	suavo.	V.	suaves.	suavia.
Ab.	suavi.	suavi.	Ab.	suavibus.	suavibus.

OTHER FORMS OF ADJECTIVES OF TWO TERMINATIONS.

EXAMPLES.—*Major, m. and f.; majus, n., greater; andax, m., f. and n. (audacem in acc.); audacia, n. plural, bold.*

Singular.			Plural.				
Cases.	M.	F.	N.	Cases.	M.	F.	N.
N.	major.	major.	majus.	majores.	majores.	majora.	majora.
G.	majoris.	majoris.	majoris.	majorum.	majorum.	majorum.	majorum.
D.	majori.	majori.	majori.	majoribus.	majoribus.	majoribus.	majoribus.
Ac.	majorem.	majorem.	majus.	majores.	majores.	majora.	majora.
V.	major.	major.	majus.	majores.	majores.	majora.	majora.
Ab.	majore.	majore.	majore.	majoribus.	majoribus.	majoribus.	majoribus.

Andax, m. and f.; audacia, n., bold.

Singular.			Plural.		
Cases.	M. and F.	N.	Cases.	M. and F.	N.
N.	audax.	audax.	N.	audaces.	audacia.
G.	audacis.	audacis.	G.	audacium.	audacium.
D.	audaci.	audaci.	D.	audacibus.	audacibus.
Ac.	audacem.	audax.	Ac.	audaces.	audacia.
V.	audax.	audax.	V.	audaces.	audacia.
Ab.	audaci.	audaci.	Ab.	audacibus.	audacibus.

KEY TO EXERCISES IN LESSONS IN LATIN.—VIII.

EXERCISE 25.—LATIN-ENGLISH.

1. I have great grief. 2. Hast thou not great grief? 3. Mothers have great griefs. 4. The colour of the cushion is beautiful. 5. Is the colour of the cushion beautiful? 6. He has (is under) a deadly error. 7. Why has father (is under) deadly errors? 8. I have a brother. 9. Brothers have great griefs. 10. Lightning frightens animals. 11. Does not lightning frighten mothers? 12. Lightning frightens sparrows.

EXERCISE 26.—ENGLISH-LATIN.

1. Est mihi calcar. 2. Estne tibi anser? 3. Illis sunt anseres. 4. Estne tibi agger? 5. Fulguris odor in pulvinari est. 6. Veotigilla non dilige. 7. Molesti sunt rumores. 8. Pulvinar est ne illis? 9. Non est illis anser. 10. Tibi sunt pater, frater, et mater? 11. Illis sunt dolores. 12. Tibi est magnum pulvinar.

EXERCISE 27.—LATIN-ENGLISH.

1. I fear charcoal. 2. The boy strikes the peacocks. 3. The regions are beautiful. 4. Thou hast an opportunity. 5. We move the ashes.

6. The hinge is moved. 7. The becomingness of order delights mothers. 8. There is a great dust of the ashes. 9. Peacocks are on the shore. 10. We have not songs. 11. There is a wound in (his) breast. 12. The light of the region is great. 13. He has a great name. 14. Pledges are not praised.

EXERCISE 28.—ENGLISH-LATIN.

1. Timesne carbonem? 2. Cur puerum ferit mater? 3. Decus non est illis. 4. Vulnus est tibi. 5. Tuis patribus sunt vulnera. 6. Vulnera terrent matres. 7. In regione florent poemata. 8. Tili est nomen magnum. 9. Mihi non est pignus. 10. Illis est occasio. 11. Viro magna est occasio.

LESSONS IN DRAWING.—IX.

THE aim of all instruction in drawing ought to be, first, to convey in as clear and simple a manner as possible the best means of judging of the relative proportions of objects, not only with regard to their individual component parts, but also with reference to the proportions these objects bear to one another; and, secondly, to place before the pupil the most ready methods of representing these objects, subject as they are to an endless variety both of form and position. How is it that when standing upon the side of a hill, and looking over a large extent of country, if we raise the hand and hold it parallel to our eyes at arm's length, it will cover or prevent our seeing probably many miles of landscape, including houses and villages? Or, if we select a closer object—for instance, the house on the opposite side of the street—and place the hand as before, we find the result to be the same? Simply because as objects retire, or are further from the eye, they occupy less space upon the vision than when nearer. Here, then, we have practical evidence that to represent these objects correctly we must inquire for some means which will enable us to accomplish our task, and satisfy our minds that we have given these objects their right proportions as they retire, and that each object, and each part of an object, occupies its proper space upon the paper as it does in the eye; in short, giving them their true scale of representation according to their distances from ourselves and from one another. The science of perspective enables us to accomplish this end, and although we do not attempt, in these lessons upon free-hand drawing, to go very deeply into geometrical perspective, yet we find it absolutely necessary to make some use of it in order to render our explanations clearer; for by the assistance of rules, difficulties are lessened, especially when we can classify many objects and the circumstances in which they are placed under the same principles.

We said in a previous lesson that there were rules in perspective for regulating the retiring horizontal distances of objects, as well as their heights; and we now propose to give such of these rules as are absolutely necessary for the pupil's guidance in free-hand drawing. We must first remind the pupil of what has been already said respecting the theory of planes or surfaces. A horizontal plane is a plane parallel with the earth; a perpendicular plane is one perpendicular to the earth. The top of a table and the ceiling of a room are horizontal planes; the walls of the room are perpendicular planes. These are *visible planes*. We are sometimes, in practical perspective, compelled to use *imaginary planes*. These more properly belong to the *practice* of geometrical perspective. It will be very necessary for the pupil, if he wishes thoroughly to understand the principles of drawing objects at a given distance from him, especially buildings, to go very attentively through future lessons on geometrical perspective, given in the pages of the *POPULAR EDUCATOR*, for this reason: no one ought to be satisfied with the result of his work, even if it be correct, unless he knows the whole of the *why* and the *wherefore* which have brought out the result. It is, unfortunately, a very common practice in some books of instruction upon drawing, when the subject is a building, to mark a *copy* with letters—*a, b, c, d*, etc.—and carry the instructions no further, but merely tell the pupil to draw from *a* to *b*, and from *c* to *d*, and to observe that *d* is a little higher or a little lower than *c*, as the case may be, without any mention whatever as to why *d* should be higher or lower. Now in this, and all similar cases, a little knowledge of perspective would make the practice simpler and the result certain. The pupil may make an exact imitation of his *drawn copy*, but that is not enough; he must be able to do the same from the object; and how is this to be done correctly by such a system as that which only enables a pupil, parrot-like, to reproduce a *copy* and

nothing more? But we hope that very few of our readers will like to stop there. To draw from *nature* and the *real thing*, we trust, is the ambition of every one who makes up his mind to go through these lessons, that he may make the art of drawing a useful and valuable auxiliary to his occupation as a means of expressing himself, as well as a pleasing recreation for leisure hours. Another reason why we recommend the pupil to study our lessons in geometrical perspective is, as we have said before, when treating upon drawing a simple outline from the *flat* (a term used by draughtsmen when copying from a drawing), that the practice of geometrical perspective assists the eye to under-

standing barns, stables, strawyards, etc. etc.—that we must first make a measured plan of the whole, and go through the drawing geometrically, before we can hope to make a truthful picture. It would be as ridiculous to suppose that when we write a letter or an essay, we ought to repeat all the rules of syntax, so that the grammatical construction of the sentences may be correct. Every educated man knows that the right words flow naturally into their places in proper agreement and sequence. The phrases harmonise without any effort on his part, simply because he knows the rules, and experience makes them easy to apply.

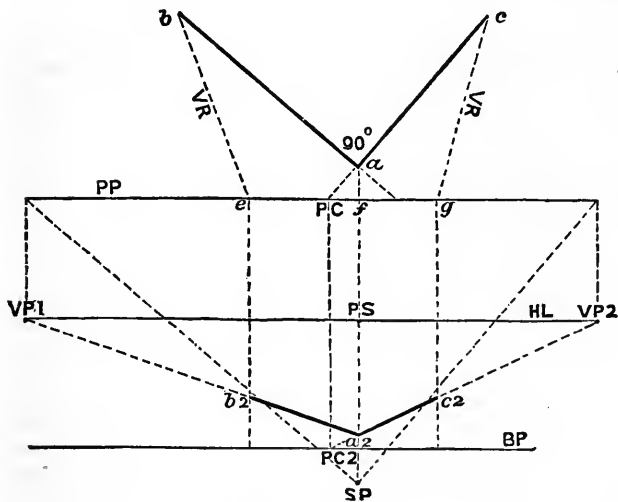


Fig. 65.

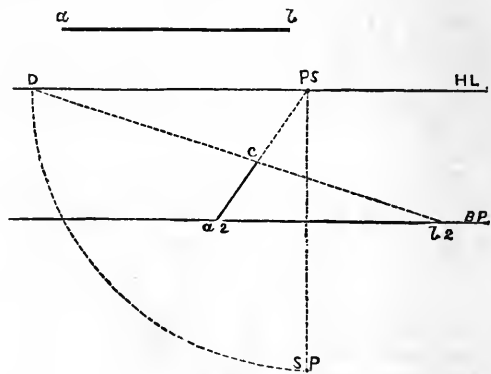


Fig. 67.

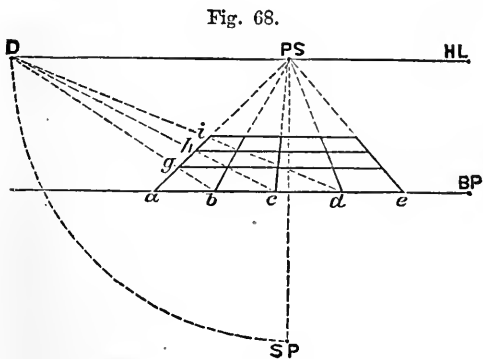


Fig. 68.

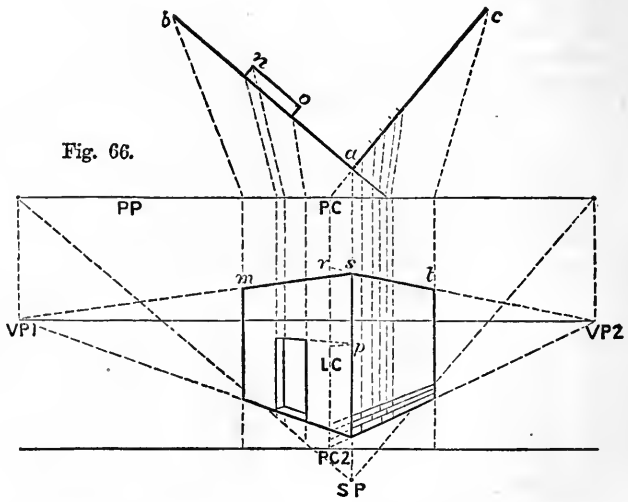


Fig. 66.

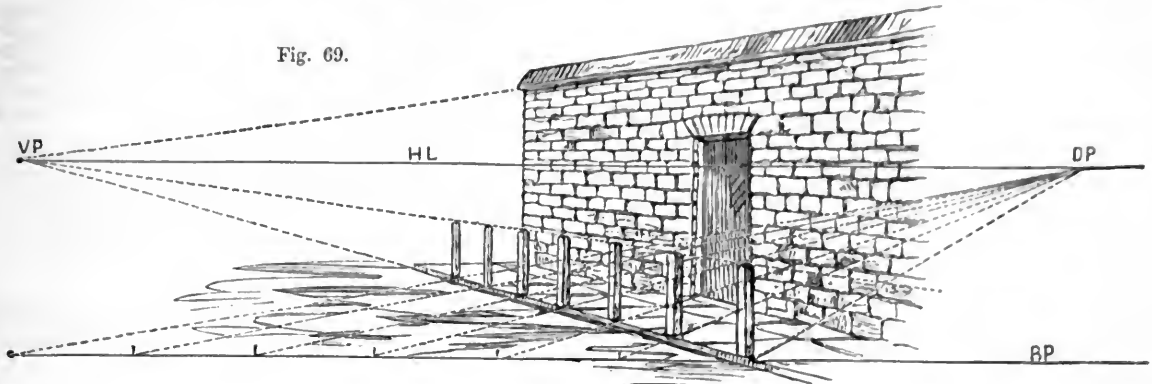
stand and calculate more readily the proportions of retiring lines and planes. As a practical illustration of this principle, we meet with it repeatedly in the readiness with which an experienced carpenter will tell you the length of a board without taking the trouble to measure it. His eye is so accustomed to the foot-rule, and the space a repeated number of measurements will cover, that to him it is no difficulty to say within a very close approximation how long the board is. It is the repeated practice of geometrical perspective that enables a draughtsman to decide upon the proportional length of a line or plane as it retires, and to draw either correctly on his paper. If we did not consider it in this way with regard to free-hand drawing, it would be of very little use in the practice of drawing from nature. It would be absurd to expect, when we are seated before a subject—say a picturesque farmhouse, with the accom-

We will now give a geometric method of representing two walls meeting at an angle, as an illustration of what we have stated. Let two lines, *ab*, *ac* (Fig. 65), forming an angle of 90 degrees, represent the plan of two walls meeting at the point *a*, of which *ba* forms an angle of 40 degrees with the picture plane. *PP* is the picture plane, *HL* the line of sight, *BP* base of the picture, *SP* the station point, and *VP1* and *VP2* are the vanishing points for the corresponding numbered lines of the plan. First draw the picture plane, and then the line *ba*, placing it at an angle of 40 degrees with the *PP*; then from *a* draw *ac* at an angle of 90 degrees—that is, a right angle—with *ab*; this will be the plan of the walls as they are placed before our vision. Then mark *SP* to represent the supposed distance we are from the angle of the walls. Find the vanishing points for the two lines of the plan. We have already given the rule

for finding the vanishing point (see page 137): $v p 2$ is the vanishing point of $a c$, and $v p 1$ is the vanishing point of $a b$; $v r$ and $v r$ are visual rays—that is, they are *imaginary direct lines*—passing from the extremities of the object through the $r p$ to the eye. These lines will indicate where the points a , b , and c would be depicted on the picture plane—viz., at e , f , and g .

extremities of each wall come closer together on the plane of representation—that is, the picture plane—and therefore we do not see the whole extent of the wall as we should do if we stood parallel to it. We will carry out the subject, and show the walls as they would naturally appear. To do this we must make a fresh diagram, because, to prevent confusion, we do not wish to

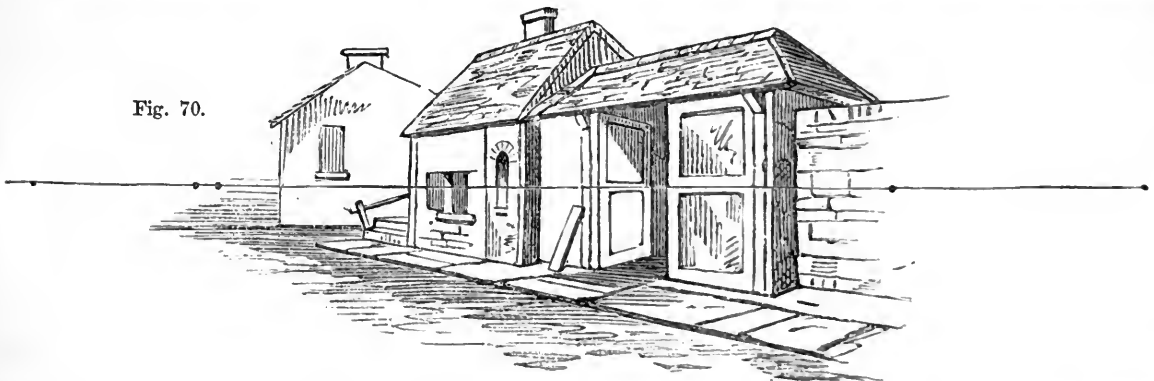
Fig. 69.



These visual rays must always be drawn from the extremities of lines, or any especial point which is to be represented in the picture, in the direction of the *station point*, or *eye*, but *stopping* at the picture plane (see Fig. 65); afterwards, from e , f , and g , they are drawn perpendicularly. For the reason why they are drawn perpendicularly, we refer the pupil to future lessons on geometrical perspective. Then produce or draw out one of the lines of the plan, say $a c$, to meet the picture plane. The point of meeting is called the point of contact, $p c$. Draw a perpendicular line from the $p c$ to the base of the picture. We will call that $p c 2$, meaning the point of contact brought down. Join the $p c 2$ to $v p 2$, and somewhere on this last line will be the picture of the object $a c$ represented in the plan. This is determined by the visual rays being perpendicularly drawn to a^2 and c^2 , therefore between a^2 and c^2 is the picture of the line $a c$; so, for the other line $a b$, draw a line from a^2 to $v p 1$, and the visual rays, as before, brought down, will determine the perspective length of $a b$ —viz., $a^2 b^2$. Perhaps some

add any more lines to that already given. We recommend the pupil to repeat the perspective view of the plan in Fig. 65, as given in Fig. 66. In this figure $p c$ and $p c 2$ represent the points of contact of the line $a c$ —that is, supposing the line were brought to the picture—in other words, to *touch it*. Then, in this case, it would be represented in the picture its natural size, therefore we call the perpendicular line drawn from $p c$ to $p c 2$ the *line of contact*, marked $l c$. Upon this line we always measure and set off heights of objects. Suppose, then, the height of the wall to be marked at r , draw a line from r to $v p 2$: $s t$ will be the top of the wall $a c$; draw a line from s to $v p 1$; $s m$ will be the top of the wall $a b$. Now if we wish to draw the courses of the bricks, we must set them off also upon the line of contact as we did to represent the top of the walls, and draw them to their respective vanishing points; also, the perpendicular joints of the bricks must be marked in the plan, and brought down by visual rays in the same way as the ends of the walls were found. We have represented a few of the bricks, leaving the

Fig. 70.



reader may ask why we do not draw the line from $p c 2$ to $v p 1$, instead of $v p 2$. Our answer is, because $p c$ is the point of contact for $a c$ and not $a b$; if $a b$ had been produced to the $r p$ for a point of contact, then it would have been right to draw a line from $p c 2$ in the direction of $v p 1$.

All that we have now done in this perspective diagram is, that we have shown the horizontal retiring length of the base of the wall each way—viz., $a^2 c^2$ on one side, and $a^2 b^2$ on the other. To have drawn these lines equal to the length of the walls themselves—that is, those of the plan—would have been a very great mistake, because as they retire the further

pupil to complete the drawing: the plan of the door is shown at $n o$, its height at p . (We will observe, by way of parenthesis, that all heights of objects are marked or set off on the *line of contact*; all horizontal lengths and breadths are shown in the ground-plan, and brought down by visual rays.) We will give one other method of showing the horizontal perspective length of a line or plane, and then leave the pupil to think over and practise all that we have been trying to teach him. Let $a b$ (Fig. 67) represent the length of a line to be shown in perspective at a given angle with our position or with the picture plane. Let $r s$ represent the point of sight, $s r$ the station point, $h l$ the

horizontal line or height of the eye, BP base of picture. Let a^2 be the point where the line commences, and from which it retires; and, to simplify the matter, let PS also be the VP . (The pupil will remember that all retiring lines vanishing at the point of sight, are lines going off at a right angle with our position, or with the picture plane. We advise him to turn to page 72, and read the perspective rules and axioms again.) Make the distance from PS to D equal to $PSSP$. Draw a line from a^2 to PS , and on BP make the distance $a^2 b^2$ equal to the given line ab ; draw a line from b^2 to D , which will cut off the given space $a^2 c$; $a^2 c$ is then the perspective length of ab . The lengths of the retiring sides of planes are determined by the same rule. Let it be required to draw a series of retiring square slabs (Fig. 68). On the base of the picture BP , beginning at a , set off any required number of divisions to represent the length of the side of each slab; from these points, a, b, c , etc., draw lines to PS . Find the distance point, D , as in the last case; draw lines from b, c, d , etc., to D , cutting aPS in ghi . From g, h, i draw lines parallel to the base of the picture, which will complete the squares required; for as ab of the first square is parallel with our position, and touching the picture plane, its true length is therefore shown, whilst ag is its retiring or perspective length.

Having now shown, as we promised, how the retiring horizontal distances of objects may be faithfully represented on paper, we will give some examples as subjects for exercises. Fig. 69 is an example of a retiring row of posts, their distances being purposely shown by the geometric method of the last two problems. It is almost needless to direct the attention of the pupil to the diminishing retiring spaces between the posts; however, he will see, as we have previously endeavoured to make clear to him, that those retiring distances can be satisfactorily proved. Fig. 70 is given as an exercise, including many of the principles we have before explained—viz., angular perspective; horizontal retiring lines, inclined lines of the roofs, and horizontal retiring distances, all of which the pupil, we trust, will now be able to arrange for himself, and to find his vanishing points.

LESSONS IN ARITHMETIC.—XVII.

DECIMALS (continued).

24. To reduce a given Circulating Decimal to a Vulgar Fraction.

Take the decimal $\cdot 345\dot{6}7$.

Denote the true value of the equivalent fraction by f . Then $f = \cdot 34567567567 \dots$, the period 567 being supposed continued *ad infinitum*.

If we multiply f by 100000, and also the decimal by 100000, the results will still be equal.

Hence $100000f = 34567\cdot 567567567 \dots$

The decimal place being moved five places to the right, and the period 567 being still continued *ad infinitum* on the right of the decimal point as before.

Similarly, $100f = 34\cdot 567567567 \dots$

Now the difference of $100000f$ and $100f$ —i.e., $99900f$ —must be equal to the difference of the decimals to which they are respectively equal. Now this difference is $34567 - 34$, because the infinite recurrence of the period $\cdot 567$ on the right of the decimal point is the same in each decimal, and therefore vanishes when the subtraction is performed.

Hence $99900f = 34567 - 34$;
and f , the fraction required, $= \frac{34567 - 34}{99900} = \frac{34533}{99900}$.

Now observe carefully how each part of this fraction has arisen. The numerator is obtained by writing down the figures of the decimal as far as the end of the first period without the decimal point, and then subtracting from the number so obtained the figures which occur before the period, or, as we may call it, the *non-recurring* part. The denominator 99900 arises from subtracting 100 (i.e., 10 raised to the same power as the number of figures in the *non-recurring* part) from 100000 (i.e., 10 raised to the same power as there are figures in the *non-recurring* part and period together).

This subtraction will necessarily produce a number 99900, containing, that is to say, as many nines as there are figures in

the period, and as many ciphers as there are figures in the *non-recurring* part.

25. It will be seen from the above detailed explanation of the method by which the equivalent vulgar fraction may be determined, that an analogous method would apply to any circulating decimal whatsoever.

Hence we get the following

Rule for reducing a Circulating Decimal to a Vulgar Fraction.

Subtract the number formed by the figures of the *non-recurring* part from the number formed by the figures taken to the end of the first period, and set down this difference as a numerator. Take as many nines as there are figures in the period, and, annexing to them as many ciphers as there are figures in the *non-recurring* part, set down the number so formed as a denominator.

26. We have proved the rule in the case of a mixed circulating decimal. The case of a pure circulating decimal is included in it; for in a pure circulating decimal there is no *non-recurring* part, and therefore nothing to be subtracted, and the denominator will consist wholly of nines, their number being equal to the number of figures in the period.

Thus $\dot{6}7 = \frac{67}{99}$, $\dot{0}53 = \frac{53}{999}$.

27. For the sake of clearness, however, we will perform the process for a pure circulating decimal. Take $\cdot \dot{6}7$, for instance.

Let, as before, $f = \cdot 676767 \dots$;

Then, $100f = 67\cdot 676767 \dots$,

and therefore subtracting, as in the previous case,

$99f = 67$,

Or, $f = \frac{67}{99}$;

and it is evident, from the way in which they arise, that the number of nines in the denominator is equal to the number of figures in the period.

28. Of course, if there is an integral part in the original decimal, that will remain unaltered, and the required answer will be a mixed number, which may be reduced to an improper fraction if necessary.

EXAMPLE.— $3\cdot 14\dot{1}5$.

Taking the decimal part separately, $\cdot 1415 = \frac{1415 - 14}{9900} = \frac{1401}{9900}$.

Hence $3\cdot 1415 = 3\frac{1401}{9900} = \frac{31401}{9900}$ expressed as an improper fraction. Or it may be expressed as an improper fraction at once:—

$3\cdot 1415 = \frac{31415 - 314}{9900} = \frac{31101}{9900}$.

The truth of this latter method may be established exactly in the same way as the two cases we have already explained.

29. The learner is recommended at first, in reducing circulating decimals to vulgar fractions, to perform the operation in the way we have indicated in the examples already given—i.e., by multiplying by the requisite powers of 10, subtracting, etc. He will thus better appreciate the truth of the rule which he will afterwards employ. It is evident that the equivalent fractions found by the rule will often not be in their lowest terms.

EXERCISE 35.

Reduce to their equivalent vulgar fractions the following decimals:—

- | | | | |
|------------------------|------------------------------|------------------------------|-------------------------------|
| 1. $\cdot \dot{3}$. | 5. $\cdot 234\dot{9}$. | 9. $27\cdot 523\dot{8}$. | 13. $\cdot 05210\dot{0}$. |
| 2. $\cdot 0\dot{3}$. | 6. $\cdot 4262\dot{3}$. | 10. $21\cdot 00000\dot{8}$. | 14. $181\cdot 03241\dot{6}$. |
| 3. $\cdot 0\dot{3}2$. | 7. $\cdot 314\dot{1}6$. | 11. $52\cdot 31415\dot{9}$. | 15. $\cdot 000054\dot{9}$. |
| 4. $\cdot 52\dot{3}$. | 8. $357\cdot 00312\dot{9}$. | 12. $3\cdot 01010\dot{3}$. | 16. $6125\cdot 1252\dot{7}$. |

30. Approximation. Decimals correct to a given number of places, etc.

We have already remarked, that if we take only a limited number of the figures of a decimal, we approach nearer and nearer to the true result as we continue to take in more figures.

We give an example, taken from De Morgan's "Arithmetic," which shows this clearly.

$\frac{1}{3} = \cdot 142857$ a circulating decimal.

Now taking successively one, two, three, etc., figures of the decimal, we have—

$\frac{1}{3}$	is less than $\frac{1}{3}$ by $\frac{1}{30}$	which is less than $\frac{1}{3}$.
$\frac{1}{100}$	" $\frac{1}{3}$ " $\frac{1}{300}$	" " $\frac{1}{300}$.
$\frac{14}{1000}$	" $\frac{1}{3}$ " $\frac{1}{3000}$	" " $\frac{1}{3000}$.
$\frac{142}{10000}$	" $\frac{1}{3}$ " $\frac{1}{30000}$	" " $\frac{1}{30000}$.
$\frac{1428}{100000}$	" $\frac{1}{3}$ " $\frac{1}{300000}$	" " $\frac{1}{300000}$.
$\frac{14285}{1000000}$	" $\frac{1}{3}$ " $\frac{1}{3000000}$	" " $\frac{1}{3000000}$.
$\frac{142857}{10000000}$	" $\frac{1}{3}$ " $\frac{1}{30000000}$	" " $\frac{1}{30000000}$.
etc.	" $\frac{1}{3}$ " etc.	" " etc.

We thus see that the difference between the decimal and the true value of the fraction continually diminishes. In the case of a terminating decimal this difference becomes zero when we have taken all the figures in. In the case of a circulating decimal, it never actually becomes zero, but we can make it as small as we please by taking a sufficient number of decimal places.

31. When a result is required correct only to a certain number of decimal places, it is better, as we have already explained (Art. 14), to find one figure more of the result than is actually required, so as to ascertain whether this figure is greater or less than 5. If it is greater, we increase the figure in the last place which is required in the result by 1.

The following is an example of a decimal continually approximated to in this way, by taking successive figures, and increasing, where necessary, the last figure by unity:—

Let 4.89169 be the decimal. The successive approximations would be—
5, 4.9, 4.89, 4.892, 4.8917, 4.89169.

Here 5 is nearer to the true value than 4 would be.

4.9	"	"	"	4.8	"
4.892	"	"	"	4.891	"
4.8917	"	"	"	4.8916	"

32. Operations in which circulating decimals occur are better conducted by reducing the circulating decimals to their equivalent vulgar fractions, if absolute accuracy is required. If an approximate result is desired true to a certain number of decimal places, then, in additions and subtractions, it will be sufficient to take in two or three figures of the period beyond the number of places required, and then add or subtract. For instance, in adding .4567 to .3124689 correctly to 9 decimal places, we should write the decimals as follows:—

$$\begin{array}{r} .45675675675 \\ .31246894689 \\ \hline .769225703 \end{array}$$

In all cases, however, where circulating decimals are involved as multipliers or divisors, it will be best to reduce them to their equivalent vulgar fractions before performing the multiplications or divisions, and then afterwards to reduce the resulting fractions to decimals.

EXERCISE 36.

1. Write down the decimals containing respectively one, two, three, four, five, and six decimal places which are the nearest approximation to the decimals .67819473, .203781947.

2. Find the value correctly to seven decimal places of the following expressions:—

- | | |
|--------------------------------------|--|
| 1. $2.0127 + 89.3897 + .003704$ | 4. $7.23705 - .378 + 10.34567$ |
| 2. $15.379 + 2.13459 + 18 + 70.2178$ | 5. $85.6 + 7.5$ |
| $+ 5.34567$ | 6. $\frac{2\frac{1}{2} + 5.123 - 2.345}{3\frac{1}{2} - 2.39 + 3.23}$ |
| 3. $27.459 - 3.876439$ | |

EXERCISE 37.

1. Reduce the following decimals to vulgar fractions:—

- | | | | |
|---------|-------------|--------------|----------------|
| 1. .3 | 6. .72 | 11. .16 | 16. .583 |
| 2. .6 | 7. .09 | 12. .8567923 | 17. .0227 |
| 3. .18 | 8. .045 | 13. .138 | 18. .4745 |
| 4. .123 | 9. .142857 | 14. .53 | 19. .5925 |
| 5. .297 | 10. .076923 | 15. .5925 | 20. .008497133 |

2. Change the following sets of decimals to similar and convenient periods:—

- | | |
|---|--------------------------|
| 1. 6.814, 3.26, and .083 | 3. .27, .3, and .045 |
| 2. 46.162, 5.26, 73.423, .486, and 12.5 | 4. 4.321, 6.4263, and .6 |

3. Add together the following sets of decimals:—

- $24.132 + 2.23 + 85.24 + 67.6$
- $328.126 + 81.23 + 5.624 + 61.6$
- $31.62 + 7.824 + 8.392 + .027$
- $462.31 + 60.52 + 71.164 + .35$
- $60.25 + .34 + 6.435 + .45 + 45.24$
- $9.814 + 1.5 + 87.26 + 0.83 + 124.09$
- $3.6 + 78.3476 + 735.3 + 375 + .27 + 137.4$
- $5391.357 + 72.33 + 187.21 + 4.2965 + 217.8496 + 42.176 + .523$
58.30048
- $.162 + 134.09 + 2.93 + 97.23 + 3.769230 + 99.083 + 1.5 + .314$

4. Subtract the greater from the less in the following sets of decimals:—

- | | | |
|-----------------------|---------------------|--------------------------|
| 1. $85.62 - 13.76432$ | 4. $46.125 - 41.2$ | 7. $1419.6 - 1200.9$ |
| 2. $476.32 - 84.7697$ | 5. $801.6 - 400.75$ | 8. $.624352 - .021$ |
| 3. $3.8564 - .0382$ | 6. $4.7824 - .87$ | 9. $8482.421 - 6031.035$ |

5. Multiply together the following decimals:—

- | | | |
|-----------------------|-------------------------|-----------------------------|
| 1. $37.23 \times .26$ | 4. 24.6×15.7 | 7. $3.973 \times .8$ |
| 2. $.123 \times .6$ | 5. 48.23×16.13 | 8. $49640.54 \times .70503$ |
| 3. $.245 \times 7.3$ | 6. 8574.3×87.5 | 9. $7.72 \times .297$ |

6. Work the following examples in division of recurring decimals:—

- | | | |
|------------------------------|----------------------------|---------------------------|
| 1. $319.28007112 \div 764.5$ | 5. $750730.518 \div 87.5$ | 8. $24.081 \div .386$ |
| 2. $18.56 \div .3$ | 6. $54 \div .15$ | 9. $.36 \div .25$ |
| 3. $.6 \div .123$ | 7. $10.5169533 \div 4.297$ | 10. $923.4375 \div 26.87$ |
| 4. $2.297 \div .297$ | | 11. $4376.32 \div .032$ |
| | | 12. $15.379 \div 7.36705$ |

LESSONS IN ENGLISH.—IX.

DERIVATION: PREFIXES (continued).

BEFORE proceeding further with these prefixes, we may now expose a common error. It is generally thought that words have several disconnected significations. Several significations many words have, but these significations are all allied one with another, and they are allied one with another in such a way that a genealogical connection runs through them all. I mean that the second ensues from the first, and conducts to the third. The meanings of words flow from a common source, like the waters of a brook. That common source, or parent-signification, is, in all cases, one that denotes some object of sense, for objects of sense were named before other objects. Our first duty, then, is to ascertain the primary meaning of a word. From that meaning the other meanings flow, as by natural derivation. Those secondary or derivative significations, then, can scarcely be termed meanings; they are not so much meanings as modifications of the primary import of the root. Certainly they are not independent significations. Thus viewed, words have not two or more senses, but in the several cases the one sense is varied and modified. Even in instances in which opposite meanings are connected with the same word, the filiation may be traced, as both Jacob and Esau sprang from the same stock. I will take an example in the word *prevent*. *Prevent* means both to *guide* and to *hinder*, to lead to, and to debar from. The opposition is sufficiently decided. Yet these two opposed meanings are only modifications of the root-sense of the word. First I will exhibit the diversity, and then explain it.

Prevent, signifying to *guide, aid forward*:—

"Prevent us, O Lord, by thy grace."—*Book of Common Prayer.*

"— Love celestial, whose prevent aid
Forbids approaching ill."—*Mallet.*

Prevent, signifying to *hinder, obstruct*:—

"Where our prevention ends, danger begins."—*Carew.*

"Which, though it be a natural preventive to some evils, yet without either stop or moderation, must needs exhaust his spirits."—*Reliq. Wottoniana.*

"Physick is either curative or preventive; preventive we call that which preventeth sickness in the healthy."—*Brown, "Vulgar Errors."*

"Prevent us, O Lord, by thy grace," means "aid us forward." "Preventive of sickness," signifies that which causes sickness not to come. There is the contrariety. Now for the explanation. *Prevent* is made up of two Latin words, namely—*præ*, before, and *venio*, I come or go. Now, you may go before a person for two opposite purposes. You may go before him in order to guide, aid, and conduct him onward; or you may go before him to bar up his way, to hold him back, to prevent his advance. And as either of these two purposes is prominent in the mind of the speaker, so the word is used by him to signify to *guide* or to *hinder*. The proper meaning, then, of *prevent* is, to come before: hence, 1, to guide, or, as a natural consequence, 2, to aid; or again, 1, to obstruct, and, as a natural consequence, 2, to stop, etc. And how the moral and spiritual imports come

out of the physical, is also seen in the diverse application of the word; for, as we have just read of *preventive* medicine, so in divinity you may read of "*preventive* grace."

These remarks, illustrations of which occur in what has just preceded, and will occur in what is about to follow, may serve to show you that language must be studied genealogically. Indeed, every word has a history; and in the dictionaries, every account given of a word ought to be a complete history of the word; a history of its origin, uses, and application, the one traced from the other logically, or according to the laws of thought, and philologically, or agreeably to the laws of language. Very different, and very inferior, is the character of most dictionaries. But to return to the subject of English prefixes.

E, of Latin, or rather Greek origin, in the forms *e*, *ef*, *ex*, denotes *out of*, as in *egress* (*e* and *gradior*, Lat. *I walk*), a *walking out*; *excess* (*ex* and *cedo*, Lat. *I go*), a *going beyond*—that is, too far; *effect* (*ef* and *facio*, Lat. *I do*), a *thing made out, produced; a result*.

E. "All occasions must be taken of sending forth pious heavenly ejaculations to God."—*Bishop Hall*.

Ex. "The ecclesiastical courts possessed the power of pronouncing excommunication; and that sentence, besides the spiritual consequences supposed to follow from it, was attended with immediate effects of the most important nature. The person excommunicated was shunned by every one as profane and impious; and his whole estate, during his lifetime, and all his movables, for ever were forfeited to the crown."—*Hume*, "*History of England*."

Ef. "Two white sparry incrustations, with efflorescences in form of shrubs, formed by the trickling of water."—*Woodward*, "*On Fossils*."

En is a prefix found in the English, the French, and the Greek languages. Into the English it appears to have come from the Latin, through the French. Many words of Latin origin have passed through the French into the English. *En* is the form in Greek. In Latin, *en* becomes *in*. In French, both *en* and *in* are used. The same is the case with the English. Though *en* and *in* are the same particle, it may be advisable to handle them separately, in order that their respective usages may become apparent.

En is found in the forms *en*, *em*. The prefix signifies *in* or *into*, e.g. :—

"He (Samson) rises and carries away the gates wherein they thought to have encaged him."—*Bishop Hall*.

So in *encamp*, *encase*, *enchain*, *enchant*, *enclose* (or *inclose*), *endemic* (*en* and *demos*, Gr. a *people*), *peculiar to a district*. *En* sometimes has an intensive or augmentive effect on the verb of which it forms a part; as in *encourage*, *enfeeble*, *enkindle* (candle), *encrease* (increase), *encumber* (incumber, from the French *encombtre*, Lat. *cumulus*, a *heap*).

"Encumbered soon with many a painful wound,

Tardy and stiff he treads the hostile round;

Gloomy and fierce his eyes the crowd survey,

Mark where to fix and single out the prey."

Roué, "*Pharsalia*."

En has also, though seldom, the force of a negative; as in *enemy*. *Enemy* is from the Latin *inimicus*, where the English *en* represents the Latin *in*. *Inimicus* is made up of *in*, *not*; and *amicus*, a *friend*.

En, for the sake of euphony, becomes *em* before *b* and *p*; *em-bitter*, *emblem*, *embosom*, *embroil*, *emprison* (imprison), *employ*, *empoverish* (impoverish).

"At eve within yon studious nook,

I ope my brass-embossed book,

Portrayed with many a holy deed,

Of martyrs crowned with heavenly meed."—*Warton*.

There is a tendency to substitute *i* for *e* in many words. This tendency deserves encouragement, if only for the sake of uniformity.

Enter, coming from the Latin (*intra*, *within*) through the French (*entre*, *between*, *among*), is found in *enterprise* (*enter* and *Fr. prendre*, Lat. *prehendere*, to *take*, to *take hold of*), *undertaking*; also in *entertainment* (*in* and *terra*, Lat. *the earth*), now more common as *interment*. It is found also in *entertain* (*Fr. entretenir*, Lat. *inter* and *tenere*, to *hold*).

"His office was to give entertainment

And lodging unto all that came and went,

Not unto such as could him feast againe,

And double quite for that he on them spent;

But such as want of harbour did constraine,

Those, for God's sake, his dewty was to entertaine."

Spenser, "*Faerie Queene*."

Epi, a prefix of Greek origin, from *επι* (*ep'i*), signifying *upon*, as *epidemic*, upon or over (widely spread over) a people. *Endemic* declares that a disease is in-born, native to the soil; *epidemic* that it is very prevalent. *Epi* is found in *epigram* (*epi* and the Greek *γραμμα*, pronounced *gram'ma*, a *writing*, from the verb *γραφω* [*graph'ō*], *I write*), *epilepsy* (*epi* and *ληψια*, pronounced *leap'si-a*, a *taking*), *epiphany* (*epi* and Greek *φαινω*, pronounced *phai'no* or *fi'no*, *I appear*), *epistle* (*epi* and *στέλλω*, pronounced *stel'lo*, to *send*), etc. etc.

"He that would write an *epitaph* for thee,

And do it well, must first begin to be

Such as thou wert; for none can truly know

Thy worth, thy life, but he that hath lived so."—*Donne*.

Equi, of Latin origin (*æquus*, *equal*), denoting equality, forms part of several words, as *equipoise* (*equi* and *peser*, *Fr. to weigh*); *pendère*, Lat. to *hang*), *equity*; *equivocal* (*equi* and *vox*, Lat. a *voice*).

"Faith! here's an *equivocator* that could swear in both the scales against either scale; who committed treason enough in God's sake, yet could not equivocate to heaven; oh, come in, *equivocator*."—*Shakespeare*, "*Macbeth*."

Es, of French origin (Lat. *e*, *ex*), is in English found in words borrowed from the French, as in *escalade* (*es* and *scala*, Lat. a *ladder*), a *scaling* (of a city), *escape* (*Fr. échapper*, to *get away*), *escheat* (old *Fr. escheoir*, to *fall due*), a *forfeit*, *eschew* (old *Fr. eschever*, to *shun*), *escutcheon* (*es* and *scutum*, Lat. a *shield*).

"Hence without blushing (say what'er we can)

We more regard the escutcheon than the man;

Yet, true to nature and her instincts, prize

The hound or spaniel as his talent lies."—*Cawthorn*.

Eu, of Greek origin (*ευ*, pronounced *you*), signifying *well*, occurs in *euphony* (*eu* and the Greek *φωνη*, pronounced *pho'ne*, a *sound*), *euthanasia* (*eu* and the Greek *θανατος*, pronounced *than'a-tos*, *death*), a *happy death*; the *eu* in *eunuch* is a part of the word; *eunuch* being from the Greek *ευνη*, pronounced *n'ne*, a *bed*, and *εχω*, *ek'o*, to *have*, or *have charge of*; *eunuchs* were *chamberlains*. Men were made *eunuchs* by the jealousy of Eastern despots. They were also made so in order to give them a contralto voice. The latter fact is well alluded to in this quotation :—

"Our present writers, for the most part, seem to lay the whole stress in their endeavours upon the harmony of words; but then, like *eunuchs*, they sacrifice their manhood for a voice, and reduce our poetry to be like echo, nothing but a sound."—*Lansdown*, "*Peteus and Thetis*."

Ever, of Saxon origin, signifying *always*, is seen in *everlasting*, *evermore*; *evermore* appears in the older writers as *evermo*.

"I shall readily grant that the words for ever and *ever-lasting* do not always, in Scripture, signify an endless duration."—*Barrow*, "*Sermons*."

Extra, of Latin origin, with the meaning *out of*, appears in *extraneous*, *out of* (not belonging to) the subject; *extraordinary* (*extra* and *ordo*, Lat. *order*), *out of the usual order*.

"Some lands, either because they were in the hands of irreligious and careless owners, or were situate in forests and desert places, or for other now unsearchable reasons, were never united to any parish, and therefore continue to this day *extra-parochial*."—*Blackstone*, "*Commentaries*."

For, of Saxon origin, whose original is probably found in the German *ver*, which denies and reverses the action expressed in the verb, occurs in *forbid* (not to bid; that is, to bid not).

"Rather how hast thou yielded to transgress,

The strict forbiddance, how to violate

The sacred fruit forbid'd n."—*Milton*, "*Paradise Lost*."

For is found also in *forbear*, *not to bear* or *take*; *to abstain*.

"Phidias, when he had made the statue of Minerva, could not forbear to engrave his own name, as author of the piece."—*Dryden*.

Fore, a different word from the preceding, of Saxon origin (*vor*,

Germ., *in advance*; vorwärts, Germ., *forwards*), appears in foretell, forecast, forefathers, forehead.

"The foreknower is not the cause of all that are foreknown."—Hammond.

In *forgive* (Germ. *vergeben*), the idea seems to be that of giving away, giving without a return, giving freely, and hence to pardon (Fr. *pardonner*, in low Lat. *perdonare*).

"Not soon provoked, however stung and teased,
And if perhaps made angry, soon appeased;
She rather waves, than will dispute her right,
And injured makes forgiveness her delight."—Cowper.

Hept, of Greek origin (*επτα*, pronounced *hep'-ta*, *seven*), forms the first syllable of *heptagon* (Greek *γωνια*, pronounced *gon'-i-a*, an angle), that which has seven angles, and consequently seven sides; and *heptarchy* (Greek *αρχη*, pronounced *ar'ko*, government), a sevenfold government.

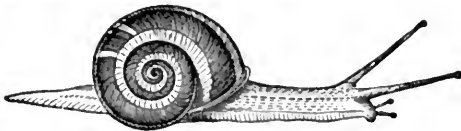
"Seven independent thrones, the Saxon *heptarchy*, were founded by the conquerors."—Gibbon.

RECREATIVE NATURAL HISTORY.—I.

THE SNAIL.

It is to be feared that there are not many among us who are disposed to regard the little animals that may be classed among the "common objects" of our fields, gardens, and even houses, with the same attention and curiosity as we examine the form and inquire into the habits of a lion, elephant, or gorilla, fresh from the deserts of Africa or the jungles of Asia, or a walrus lately brought from northern climes. And yet the beasts that find a hiding-place in our woods and thickets, the birds that fill the air with melody at the approach of spring, and the insects that often destroy our best and choicest fruits and blossoms, are as "fearfully and wonderfully made" as the larger animals of foreign lands—ay, even as ourselves, for whose use, or pleasure, or perchance correction, they were created. Each has been called into being for some wise end by the Maker of us all, even though our limited knowledge may fail to discover its utility, and the purpose which it serves in the economy of Nature. The structure and habits of each beast or bird or insect, however small, however unattractive in appearance, claim our consideration as much as the graceful figure of the antelope or giraffe, or the instinct and docility of the horse or dog; and as a lesson may be learnt from each and all, more potent in its teaching than the precepts of the best of all books save one, we invite the attention of our readers to our studies in Natural History, which may be termed *recreative* in two senses—first, as they will do much to relieve the strain that our lessons in languages, mathematics, and science may exert on the mind of the student; and secondly, in the first and truest meaning of the word, as by a thoughtful inspection of some of God's lesser works, we may *renew* from time to time and *build up again* what we may have lost of our reverential love of Him without whom not even a sparrow falls to the ground unnoticed or uncared for.

In such a spirit, then, we introduce to the notice of our readers the snail, an animal that finds small favour, generally speaking, with those who love their gardens.



THE SNAIL.

We will imagine that while strolling round your garden or in the fields you have just picked up a snail. Hold him tenderly, and not long in your hand, or you may make him very wretched. How so? Remember his body is cold, your hand is hot, almost like a furnace to him, and the temperature must be enough to make him faint. In truth, while on a human hand the snail must feel about as comfortable as St. Lawrence on his gridiron. Besides, St. Lawrence gained honour and applause for his suffering, but no such reward awaits the snail; so, out of a kindly feeling, do not keep him long in the hot hand.

Then how shall we observe our friend and study his comfort also? Get a piece of clean window-glass, and place the snail upon it. He will hold firmly to the glass with his broad, expanded, sucker-like foot. Then, by looking at the gentleman through the glass, as he moves along, the reader will be able to note the mode in which such animals walk, mark the wave-like motions of the foot on the glass, and remember that all soft-bodied animals with a foot like the snail's, are named *Gastropods*, a word which means "having the feet and belly joined," and which is derived from the Greek *γαστηρ* (*gas-teer'*), the belly, and *πους* (*pous*), a foot.

Having noticed the sucker-like foot, and tested the force with which it clings to the glass, let us look at the head of our snail. The first noticeable objects are what children call the horns or feelers. Look closely at them. What is that black shining speck on the top of each feeler? The eye of the snail, according to the judgment of most naturalists. Strange sort of eye, which can thus be lifted up above the body, when its owner wants to take a survey of the world. If we want to obtain a wider view, we get on an elevation; the snail manages matters in another manner, he lifts up the eye itself. As the snail contemplates one of us through those black specks, the question rises, is he not terribly frightened at a being having an eye as large as his whole body? However, unfortunately, in the present state of snail education, it is impossible to impart his views to us, so we will let that topic pass.

Touch the tip of his feeler; see how ingeniously he tucks the whole machine into its case, just as the top of the finger of a glove is turned in sometimes, when the glove is drawn off. Now wait awhile; see, the tube is pushed out again, and the eye is slowly rolled out from its remarkable hiding-place. Have you a pair of scissors in your hand? Would you like to cut off those feelers, eyes and all? No, some will say, respect even a snail's feelings. Others may answer yes, cut them off, if we shall get any knowledge by so doing; we do not believe such creatures feel pain. Well, you cannot prove they do not feel when thus treated, that's certain; and it shows a better heart to believe they suffer when injured. Those who believe in Shakespeare will probably take this view. They will remember his remark that a worm when crushed feels as much pain as when a giant dies. However, we will dare to be rather cruel for once only; we will do violence to our tender feelings, and earnestly begging the snail's pardon, we cut off both feelers at one snip of the scissors. Now we have killed the snail, have we not? At least we have blinded him for life? Indignant the snail is certainly; see how he goes back into the innermost part of his house. He may well retire from a world which treats him thus. Now what will be the result? If the snail be in good health, and the operation be not performed too late in the year, that poor despicable-looking creature will begin to form a new pair of eyes and feelers in about twenty-five days. This operation was often performed on a great number of snails by Spallanzani, a celebrated Italian naturalist of the last century. Such a reproduction of organs proves the possession of singular vital powers in so lowly a creature. But Spallanzani and others have gone beyond this. They repeatedly cut off the heads of snails, and those heads, with all their organs, have been in a few months reproduced! That is a power which some men might have envied. Even the little finger of a human being when cut off is gone for life; no power of making a fresh one grow on the old place belongs to the greatest philosopher on the earth. Yet here we have a poor despised creature often able to recover its lost head, eyes, feelers, and mouth. The snail beats us all on such a work, beyond doubt.

Let us not forget the *mouth* of the snail. It is an instrument capable of doing no light work, as those know to whose gardens the animal pays its unwelcome visits. The two lips are formed of a horny substance, which acts in the manner of a file on vegetables. The tough leaves of the white lily are often rasped off in a few nights by this cutting machine. If any one should be desirous of examining minutely the structure of the snail's mouth, he will find some fine specimens in the Physiological Gallery of the Hunterian Museum in the College of Surgeons, Lincoln's Inn Fields.

Of the snail's brain we may just make this remark, that the complete nervous system of the creature's first cousin, the slug, is to be seen in the same museum, and Professor Owen has given a learned description of the whole. Both snails and

slugs may therefore know, as well as human beings, what it is to suffer from nervous attacks.

Would any one like to see the heart of a snail? The keeper of the above-mentioned museum will gratify the wish. It is a hard matter to look into the human heart, but readers may there inspect the inner part of a snail's heart, which is generally placed near the middle of the animal's back.

The snail must, of course, breathe. How does the air enter his system? The snail's nose, if we may use the expression, is on the back, or right side of the neck—that is, the hole through which the air enters is there placed. Can the snail smell? Philosophers are not agreed upon the point. There is not, however, the least doubt that they soon find out vegetables for which they have a liking, as many an indignant gardener will admit.

Snails exhibit in spring and early summer a strange peculiarity. Their bodies are then covered with little spikes or darts of a horny substance, about a quarter of an inch long. Some of the older books have engravings representing these darts flying as if shot off from the bodies of the snails. They are, however, a puzzle to the snail philosophers up to the present time.

Let us now look at the shell. In what light shall we regard this? Is it the snail's house, or the snail's skeleton? Either notion may be held. If we deem it the house, then we may well envy the animal for his power, not only of making his own house, but of repairing damages which may happen to walls or roofs. He is not only his own mason, builder, and architect, but provides his own quarry. We need not say, perhaps, that the lime of the shell is produced from the pores of the animal's body. When he grows too large for his first house he enlarges it, and thus inhabitant and mansion are always accommodated each to the other. As his family never live with him, he has but his own good-will and pleasure to consult in the building. Two things deserve special notice. Readers must have observed great differences in the coloured markings of snails' shells. Now each snail has his own colour manufactory. A series of glands, like so many chemical workshops, produce the colours which give the various tints to the shell. It is a singular fact that even the baby snail begins its work of builder before it is hatched. Even when yet in the egg, the little creatures are found to have formed a thin shell. This is something like infant precocity. One thing, however, seems beyond these babies; they cannot form the colouring matter of the shell, the house is built first and ornamented after.

We must now call attention to the snail's winter house. When food begins to fail, and the autumn nights get cool, the creature becomes drowsy, and makes up his mind to a long sleep. Some bury themselves in the ground, others crowd into sheltered corners. But note the preparation for the winter. Some species retire deeply into the shell, building up four or five thin walls of lime at the entrance, so that the animal is completely blocked up and separated from the outside world. Having performed this building feat, the snail bids good-bye to all care and sorrow, dropping into a comfortable sleep for the whole winter. Some of these are indeed rudely roused from slumber by hungry birds, which, discovering the shells, drive their beaks through the thin walls, and tearing out the luckless snail, devour him before he has time to awake.

Are snails of any use at all? Readers who wish for variety of food may make wholesome soup of their bodies. Start not at the proposal; one species of snail was eaten in England in the time of Elizabeth, and "a snail feast" is said to be still celebrated on special days by some trades in the North of England. A modern cookery book describes no less than twelve modes of preparing the animals for food. Is any reader anxious to try a dish? Then take our recipe: Get a sufficient quantity, according to appetite, of the edible snail (*Helix pomatia* is the learned name), boil them in spring water, then strew pepper and salt over—and dine. The Emperor Nero is said to have preferred them fried; any reader who pleases can, of course, try them that way.

Our friends will bear in mind that we purposely avoid in these articles technical descriptions of species and genera, deep physiological discussion, and anatomical details. Our main object is to call attention to the richly varied facts which are to be seen in every field and garden throughout the year. There is much to excite wonder, and remind us of our infinite Creator in the meanest creatures of the waters, land, or air.

LESSONS IN FRENCH.—XVII.

SECTION I.—FRENCH PRONUNCIATION (*continued*).

VIII. LIQUIDS.

80. **L** and **LL**.—Whenever *l* and *ll* are preceded by *ai*, *ei*, *oui*, and sometimes by *i* only, they receive a sound very different from that which they have when *initial*. In the former case, they become *liquid*, and are so called from their peculiar sound. Yet it is a sound with which foreigners are well acquainted. The only difficulty is, in expressing or illustrating the sound by means of English analogous sounds.

It is the same sound which is given to the letters *ll* in the correct pronunciation of the English words *collier*, *billiard*, *brilliant*, and *William*. If you pronounce any one of these words very carefully, observing at the same time the peculiar sound of the letters *ll*, you will have the correct liquid sound which is illustrated by the peculiar sound of *gl* in the word *seraglio*.

In French words containing liquid sounds, observe the following general rules, namely:—

Rule 1.—Pronounce the letter *a* before *il* and *ill* as *a* in the English word *ah*.

Rule 2.—Pronounce the letter *e* before *il* and *ill* as *a* in the English word *day*.

In the illustrated pronunciation of the following examples of liquid sounds, the last syllable *ye* of many of them is scarcely sounded. Let it be but the mere faint echo of the voice.

Name, *gl*; sound, like *gl* in the English word *seraglio*.

FRENCH.	PRONUNCIATION.	ENGLISH.
Accueil	Ak-uhyl	Reception.
Briller	Breel-yay	To brighten.
Castille	Kas-teeyl	Contention.
Dépouille	Day-pooyl	Spoil.
Emorgueillir	Ahm-or-guhll-yeer	To be proud of.
Famille	Fam-eeyl	Family.
Feuille	Fuhyl	Paper, or a sheet of paper.
Fille	Feeyl	Daughter.
Mouiller	Mool-yay	To wet.
Oreille	Or-ayl	Ear.
Paille	Pahyl	Straw.
Pouiller	Pool-yay	To abuse.
Réveil	Ray-vayl	Alarm-clock.
Sillon	Seel-yonh	Furrow.
Soleil	Sol-ayl	Sun.
Tailleur	Tie-yuhr	Tailor.
Tourbillon	Toor-beel-yonh	Whirlwind.
Travail	Trav-i-y	Labour.

But there is another very different and common method of pronouncing the liquid sound illustrated in the preceding examples. Its chief merit is, the ease with which it may be acquired. It cannot be stigmatised as absolutely vicious, though it be, at least in our opinion, inelegant.

The following examples will be used to illustrate the kind of pronunciation just spoken of, viz:—

FRENCH.	PRONUNCIATION.	ENGLISH.
Aiguille	A-guee-y'	Needle.
Bouilli	Booee-y'	Boiled Beef.
Bouteille	Boo-tay-y'	Bottle.
Cuiller	Knee-year	Spoon.
Fauteuil	Fo-tuh-y'	Arm-chair.
Groseille	Gro-zay-y'	Currant.
Muraille	Mu-rah-y'	Wall.

Speaking of these different methods of pronouncing the liquids, the following opinion is taken from Bolmar's "Levizac's French Grammar," namely:—

"This last pronunciation being the easiest of the two, has been adopted by so many people in France, that it is no longer considered a fault, except by grammarians. However, I recommend the former, not only on account of its correctness, but also on account of its being a sound very common to the Spanish, Italian, and Portuguese languages, in which languages this sound does not admit of any variation. It is represented in the Spanish by *ll*, in the Italian by *gli*, and in the Portuguese by *lh*."

81. **GN**.—This liquid is much used in the French language. Its correct sound is peculiar, and by no means difficult to attain. It is the sound of the letters *gn* in the English words *bagnio*, *mignonette*, and *vignette*.

Pronounce the word *mignonette* correctly and carefully, observing, at the same time, the peculiar sound of the letters *gn*, which will be the correct sound of this liquid.

FRENCH.	PRONUNCIATION.	ENGLISH.
Baigne	Bagn	Galley.
Baigné	Bay-gnay	Bathed.
Bignone	Boe-gyon-nee	Trumpet-flower.
Digne	Deegu	Worthy.
Dignitaire	Dee-gnee-tair	Dignitary.
Dignité	Dee-gnee-tay	Dignity.
Épargne	Ay-pargn	Economy.
Gagner	Gag-nay	To earn.
Peigne	Paygn	Comb.
Régnant	Ray-gnanh	Reigning.
Signe	Seegn	Sign.
Soligner	S'wah-gnyay	To attend to.
Vignerou	Veegn'-rouh	Vine-dresser.

The exceptions to this method of pronouncing the letters *gn* occur only in these words, in which they belong to different syllables; that is to say, in dividing those words into syllables, it would be found that *g* belonged to one syllable, and *n* belonged to the next succeeding syllable, viz. :—

FRENCH.	PRONUNCIATION.	ENGLISH.
Igname	Ig-namm	Indian potato.
Igné	Ig-nay	Igneous.
Ignicole	Ig-nee-kol	Fire-vorshipper.
Ignition	Ig-nee-seonh	Ignition.
Ignivome	Ig-nee-vom	Fire-romiting.
Ignivore	Ig-nee-vor	Fire-eating.
Magnificat	Mag-nee-fee-kat	Name of a sacred hymn.
Regnicole	Raig-nee-kol	A native.
Stagnant	Stag-nanh	Stagnant.
Stagnation	Stag-nah-seonh	Stagnation.

To the above may be added a few proper names.

SECTION XXVIII.—USE OF THE ARTICLE [§ 77].

1. The article *le, la, les*, as already stated, is used in French before nouns taken in a general sense.

Les jardins sont les ornements des villages et des campagnes, *Gardens are the ornaments of villages and of rural districts.*

2. The article is also used in French, as in English, before nouns taken in a particular sense.

Les jardins de ce village sont superbes, *The gardens of this village are superb.*

3. It is also used before abstract nouns, before verbs and adjectives used substantively.

La paresse est odieuse, *Idleness is odious.*

La jeunesse n'est pas toujours docile, *Youth is not always tractable.*

Le boire et le manger sont nécessaires à la vie, *Eating and drinking are necessary to life.*

4. The article is used before the names of countries, provinces, rivers, winds, and mountains [§ 77 (3) (4)].

La France est plus grande que l'Italie, *France is larger than Italy.*

La Normandie est très-fertile, *Normandy is very fertile.*

5. The article is used before titles.

Le Général Cavaignac, *General Cavaignac.*
Le Maréchal Ney, *Marshal Ney.*

6. In respectful address or discourse, the words *Monsieur, Madame, Mademoiselle* are placed before titles and designations of relationship.

Monsieur le Président, *(Mr.) President.*
Madame la Comtesse, *(Madam) Countess.*
Mademoiselle votre sœur, *(Miss) your sister.*

7. The plural of *Monsieur, Madame, and Mademoiselle*, is *Messieurs, Mesdames, and Mesdemoiselles*.

8. The student should be careful to distinguish a noun taken in a general or in a particular sense from one taken in a partitive sense [§ 78].

GENERAL OR PARTICULAR SENSE.	PARTITIVE SENSE.
Nous aimons les livres, <i>We like books.</i>	Nous avons des livres, <i>We have books, i.e., some books.</i>
Nous avons les livres, <i>We have the books.</i>	Vous avez écrit des lettres, <i>You have written letters, i.e., some letters.</i>

RÉSUMÉ OF EXAMPLES.

La modestie est aimable, *Modesty is amiable.*
Le courage est indispensable au général, *Courage is indispensable to the general.*

Les fleurs sont l'ornement des jardins, *Flowers are the ornament of gardens.*
Les fleurs des jardins de ce château, *The flowers of the gardens of this villa.*
Avez-vous l'intention de visiter la France? *Do you intend visiting France?*
J'ai l'intention de visiter l'Italie, *I intend visiting Italy.*
Le Capitaine Dumont est-il ici? *Is Captain Dumont here?*
Le Major Guillaume est chez lui, *Major William is at home.*
Voyez-vous Madame votre mère? *Do you see your mother?*
Je vois Monsieur votre frère, *I see your brother.*
Mon frère n'aime pas les louanges, *My brother is not fond of praises.*

VOCABULARY.

Aim-er, 1, to be fond of, to like.	Cerise, f., cherry.	Framboise, f., raspberry.
Apport-er, 1, to bring.	Demeur-er, 1, to dwell, live.	Légume, m., vegetable.
Bois, m., wood, forest.	Étud-er, 1, to study.	Loin, far.
Capitaine, m., captain.	Fleur, f., flower.	Lundi, m., Monday.
Caporal, m., corporal.	Fraise, f., strawberry.	Pêche, f., peach.
		Prune, f., plum.

EXERCISE 51.

1. Aimez-vous le pain ou la viande? 2. J'aime le pain, la viande et le fruit. 3. Avons-nous des pêches dans notre jardin? 4. Nous y avons des pêches, des fraises, des framboises et des cerises. 5. Monsieur votre frère aime-t-il les cerises? 6. Il n'aime guère les cerises, il préfère les prunes. 7. Avez-vous des légumes? 8. Je n'aime point les légumes. 9. Nous n'avons ni légumes ni fruits. (Sect. VI. 3, 4.) 10. Nous n'avons ni les légumes ni les fruits. 11. Allez-vous tous les jours dans le bois de Monsieur votre frère? 12. Je n'y vais pas tous les jours. 13. Votre sœur apporte-t-elle des fleurs? 14. Elle les apporte. 15. Madame votre mère apporte-t-elle des fleurs? 16. Elle en apporte tous les Lundis. 17. Voyez-vous le Général Bertrand? 18. Je ne le vois pas, je vois le Caporal Duchêne. 19. Mesdemoiselles vos sœurs sont-elles fatiguées? 20. Mes sœurs sont fatiguées d'étudier.

EXERCISE 52.

1. Does your sister like flowers? 2. My sister likes flowers, and my brother is fond of books. 3. Is he wrong to like books? 4. No, Sir, he is right to like books and flowers. 5. Have you many flowers in your garden? 6. We have many flowers and much fruit. 7. Is your cousin fond of raspberries? 8. My cousin is fond of raspberries and* strawberries. 9. Is the captain fond of praises? 10. He is not fond of praises. 11. Has the gardener brought you vegetables? 12. He has brought me vegetables and fruit.* 13. Is he ashamed to bring you vegetables? 14. He is neither ashamed nor afraid to sell vegetables. 15. Is your mother tired? 16. My mother is not tired? 17. Is your brother at Colonel D.'s? 18. He lives at Colonel D.'s, but he is not at home at present (*à présent*). 19. How many peaches have you? 20. I have not many peaches, but I have many plums. 21. Does Captain B. like peaches? 22. He likes peaches,* plums, raspberries, and strawberries. 23. Are you going into (*dans*) your brother's wood? 24. I go there every morning. 25. Is General L. here? 26. No, Sir, he is not here, he is at your cousin's.

LESSONS IN GEOGRAPHY.—IX.

DISCOVERIES OF THE NINETEENTH CENTURY.

THE Russian Admiral Krusenstern, in 1804-5, made an exploratory voyage in Oceania, which enlarged our hydrographical knowledge of the Pacific Ocean. In 1819, Bellinghausen re-visited a part of Polynesia, and made additions to some of the groups. About the same period, Freycinet discovered Ross Island, and solved some interesting questions relating to those distant seas. In 1823 and 1824, Captain Duperré made some additional discoveries in Polynesia, and re-explored the Papuan group and New Zealand. Captain Lütke, of the Imperial Russian Marine, who navigated the seas of Oceania, discovered some new islands in the Carolino group, and Olimarau, between them and the Ladrone Islands. In 1831-32, Captain Laplace, of the French sloop of war *La Favorite*, visited the coasts of Arabia and other countries washed by the Indian Ocean and China Sea; while about the same time Captain Du Petit-Thouars, of the *Venus*, made surveys along the shores of Kamchatka, California, and Australia. The Russian Admiral, Krusenstern, also

* The student must not forget that the article is repeated before every noun.

made additions to the geography of the Kurile Isles, the coasts of Japan, and the Sea of Okhotsk. Captain Maxwell, of the suite of Lord Amherst, our ambassador to China, extended our knowledge of these Asiatic regions. The squadron under his command made several important discoveries in the Yellow Sea, particularly Sir James Hall's Islands. This expedition ascertained that the western coast of the peninsula of Corea had been placed on our maps greatly to the westward of its true position; and made known to the world a vast archipelago which no European had previously visited. Captain Maxwell also visited the Loo-Choo Islands, where he was only welcomed by feigning shipwreck, and seeking the assistance of the inhabitants.

The northern coasts of Asia having been previously imperfectly known, M. Gedenchtrom was commissioned to explore them in 1808; but his efforts were limited. Lieutenant (afterwards Admiral) Wrangell was charged to complete the exploration of these coasts, and to fill up the blanks which then existed in the maps of Siberia, by re-visiting the most northern latitudes of these dreary regions. The object of this expedition was to examine the whole of the coast from Cape Chelagask to Cape North, discovered by Cook to the west of Behring Strait, and to determine whether there existed in the vicinity of these capes an isthmus uniting Asia and America. This dangerous expedition occupied from 1820 to 1824. Beyond Cape Chelagask, he discovered Cape Baranoff, and surveyed the coast from this cape to the mouth of the river Kolyma. He discovered that the hypothesis of the existence of land in this vicinity was unfounded; and he rectified and completed the geography of this part of the continent of Asia. In 1843, M. Middendorff successfully explored, in the midst of innumerable dangers, the coasts of the Frozen Ocean between Turukansk, the sources of the Khatounga, and Cape Taimoura. Traversing Siberia from north-west to south-west, he visited the coasts of the Sea of Okhotsk, and part of Tartary.

In the quarter of a century that has elapsed since this time, our knowledge of Central Asia has been greatly extended, by the advance of the outposts of the Russian empire towards the south into the heart of Independent Tartary, and to the north bank of the River Amur, or Amoor, in the east, which now forms the greater part of the northern frontier of Manchouria, that part of Central Asia, nominally tributary to China, which lies to the east of the great sandy desert of Gobi. Commencing at the Caspian Sea, on the western side of the continent, the acquisition by Russia of the Kirghiz Steppes, and the great plains round the Sea of Aral, that are traversed by the Syr Daria or Jaxartes, and the Amoo Daria or Oxus, has led to the thorough exploration of these regions, of which comparatively little or nothing was previously known with any degree of certainty. In 1825 an expedition was sent to the Sea of Aral by the Russian Government, under the command of General, now Count de Berg, who was commissioned to make an accurate exploration of the Russian frontier; and in 1848 an eminent Russian sailor, Admiral Alexis Boutakoff, cut out and fitted together ships at Orenburg, and carried them in pieces across the steppes to the shores of the Sea of Aral, where they were built and launched. These ships were the pioneers of the establishment of regular steam navigation on the Sea of Aral, and up the great rivers Oxus and Jaxartes, which discharge their waters into it on the south and west, establishing along the coast of the last-named stream a line of water communication through the centre of Turkistan, by which an active commerce is and will be carried on between the Celestial Empire and Russia. For this achievement, the Founder's Gold Medal of the Royal Geographical Society was awarded to Admiral Boutakoff in 1867. Our knowledge of the scenery and the manners and customs of the inhabitants of Khiva, Bokhara, Thibet, and other parts of West Central Asia, has been increased by M. Arminius Vámbéry, an enterprising Hungarian, who has travelled through these regions, visiting many places hitherto unseen by Europeans, in the disguise of a dervish, at the risk of his life and liberty.

Passing eastward along the line of the Jaxartes, through the sandy wastes of the desert of Gobi, down the wooded slopes of the mountains that divide Manchouria from Mongolia, and over the rich plains that are watered by the Songari and its tributaries, we stand at last on the shores of the Japan Sea, and make our way across its waters to the crescent-formed chain of

islands, stretching from the island of Saghalien on the north to the south-eastern extremity of the peninsula of Corea, that form the Empire of Japan. Of this island empire, the most reliable account that we possessed, until Lieutenant Silver's recently published work, was one written by Engelbert Kämpfer, in 1690. Several attempts have been made by the Portuguese and Dutch, since the commencement of the sixteenth century, to establish commercial relations with Japan; but trade with this country has always been attended with great difficulty and danger, owing to the repugnance of the inhabitants to hold intercourse with foreigners. In 1853, however, the Japanese government entered into a commercial treaty with the United States, and in the following year another was concluded with Great Britain. Since that time several ports have been opened to British commerce, while embassies have been sent from Japan to visit Europe and America, the Japanese showing a disposition to abandon many of the customs, and even the costume to which they have adhered without change for many hundreds of years, according to their own account, and to adopt in a great measure the usages of the most civilised portions of the world. Much of an efficient and thorough survey of the Japanese waters has recently (1865-8) been carried out by Commander Bullock, of the Royal navy.

Expeditions into the interior of Asia have, from time to time, thrown great light on the geography of this part of the Old World. We owe much of our knowledge of China to the Jesuit missionaries who laboured in that country; of the northern frontiers of this empire, to Klapproth, Timkowsky, De Humboldt, and Pierre de Tóhatcheff; of Thibet, to Turner; of the Himalaya chain of mountains and the adjacent countries, to Lieutenant Webb, Captain Raper, Moorcraft, Colonel Crawford, M. Frazer, Victor Jacquemont, and Major Rennell. Sir H. Pottinger made us acquainted with Beloochistan and Scinde; Elphinstone and Burnes with Afghanistan; Burnes with Bokhara; and Mouraviev with Turcomania and Khiva. Persia has, at different periods, been visited by a number of able travellers, to whom we owe a knowledge of this country; as, Tavernier, Chardin, A. Jubert, Moorcraft, Morier, Frazer, Kerr Porter, Alexander, and Messrs. Coste and Flaudin. Of Arabia, we have gained information from Niebuhr, Burckhardt, and Ruppel; but of late years a great deal of additional light has been thrown on the western districts of this enormous peninsula, and the condition of its inhabitants, by Captain Richard F. Burton, who visited Mecca and Medina in 1853, and travelled through that part of the country which borders on the Red Sea, by a route hitherto untrodden by Europeans. A considerable part of Captain Burton's adventurous journey was performed in the disguise of a pilgrim to the cities sacred to Mahometans as the birth-place and burial-place of Mahomet, the founder of their religion, as it would be impossible for a European to pass through that country in quest of information, otherwise than in the garb of the inhabitants of some Mahometan country. Captain Burton's researches were further supplemented and augmented by Mr. William Gifford Palgrave, who travelled from the Dead Sea to the Persian Gulf, through Central and Eastern Arabia, in 1862-3. This gentleman also made his way through the country in disguise, and found, contrary to his own expectation and the general belief, that the interior of Arabia, instead of being a trackless waste, resembling the Sahara in its character, and peopled only by a few wandering Bedouin Arabs, is inhabited by tribes who live in towns and villages, under sheikhs and native princes, actively engaged in trading with each other and the countries bordering on the coast. Mr. Palgrave's discoveries, indeed, were of so important a nature, as to give quite a new character to the map of Arabia, the interior of which, previous to his visit, has been represented as being little better than a sterile uninhabited desert.

Of recent discoveries in Asia little remains to be said, but that the acquisition of territory recently made by the French in the south of Cambodia and Cochin China, has led to an extended knowledge of this part of India beyond the Ganges, or the Indo-Chinese Peninsula; while our wars with China, and the spirit of enterprise shown by such men as the "English Tai-ping," and other adventurers in the service of the Imperialists, and the so-called Tai-pings who are seeking to overthrow the present dynasty in that country, have secured a more elaborate survey of the Chinese coast, and much information respecting the interior of that wonderful country.

LESSONS IN MUSIC.—V.

The learner must be careful not to let his thoughts be confused by the different uses of the word "time" in ordinary musical language. You will meet with the phrases "common time," "triple time," etc. The word "time," then, refers to the orderly recurrence of accents—the *measure*. In the phrases "quick time," "slow time," etc., it means *rate of movement*, the speed with which the accents recur. And when we are requested to "keep the time," it is commonly meant that (though we may have been correct in the rate of movement, and accurate in the recurrence of accents) we have *not given the exact proportionate length of each note*. It is known that the swings of the same pendulum are of equal length in time, whether they are long or short in respect of the distance traversed; and that the longer the pendulum, the slower its movement; and the shorter the pendulum, the quicker its movement. This gives us the means of regulating the "rate of movement" in music as well as in clockwork. There is an instrument called a "metronome" or *measure-ruler*, the pendulum of which can be lengthened or shortened according to a graduated scale, so as to swing any required number of times in a minute. Let each swing of the metronome correspond with an aliquot or "pulse" of the measure, or in the quick senary measure, with the loud and medium accents. Then, if the number at which the weight is set, on the graduated scale of the metronome, be given in the signature or title of the tune, it will indicate to others the rate at which that tune should be sung. Thus, "M. 66," placed at the head of a tune, signifies that, while this tune is sung, the metronome should swing at the rate of sixty-six swings a minute; and that each aliquot of the measure should keep pace with a swing of the metronome. The larger metronome, which is kept in motion by clockwork and "ticks" to every accent of the measure, costs thirty shillings and upward—that which strikes a bell on the recurrence of each stronger accent being much more expensive. The smaller metronomes, which simply oscillate without noise, are sold at four shillings and upward, and there are even cheaper instruments than these which are sold at sixpence or eightpence. Each teacher, however, and scholar too may make his *string pendulum*, which will answer the end very fairly. For this purpose fasten a penny or some such weight at the end of a piece of string. Then, at four inches and five-eighths from the weight, tie a double knot. Hold the string by this knot, and the weight will swing at the rate of 160 swings a minute, and make your pendulum correspond with M. 160. At 6½ inches tie a single knot, and that length of pendulum will correspond with M. 138. The double knots may mark the distances most used, and the single knots those used occasionally between them. The rest of the pendulum may be constructed to the following table—S. standing for single, and D. for double knot.

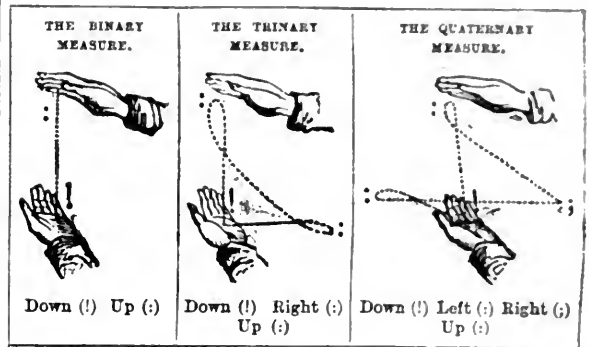
1st D. at 4¼ inches from weight	=	M. 160.
1st S. at 6½ in.	=	M. 138.
2nd D. at 9½ in.	=	M. 112.
2nd S. at 1 foot 1¼ in.	=	M. 96.
3rd D. at 1 foot 7½ in.	=	M. 80.
3rd S. at 2 feet 6½ in.	=	M. 66.
4th D. at 3 feet 10½ in.	=	M. 50.

A silk tape with the metronome figures marked at the proper distances would be preferable to the string. A lath of wood might be graduated in a similar manner, with holes punctured for the points of suspension, but it would require different distances according to its own weight.

The "string pendulum" which is here recommended for its convenience of measurement by a common carpenter's rule, is slightly inaccurate, though quite near enough to the truth for all practical purposes. Some such instrument should be used by every pupil. Though it need not be always used for the exercises, it should be constantly referred to as a standard, and strict attention should be given to it in the earlier lessons. When you have learnt to sing the notes of a tune correctly, then set your metronome swinging, and practise singing the tune at the proper rate, or "in the right time." After considerable practice has taught you to keep the accents at regular and equal distances, you will only need your pendulum to give you a correct idea of the "rate of movement," before you commence singing a tune. An accomplished solo singer, or instrumentalist, need not confine himself to strict clock-time, but should vary the rate of movement according to the emotional

expression. You, however, are a long way from that position, and should carefully practise yourself with this instrument until you have established in your mind and ear a *sense of time*.

It is not an easy thing for an unpractised singer to keep an equal rate of movement throughout a tune without aid, but he must learn to do it, and we are persuaded that a careful and frequent use of the pendulum is the best means hitherto proposed for the attainment of this power; but it is customary to recommend the practice of "beating time." To those who may wish to adopt this plan, the diagrams below—explaining the method of "beating time" for the different measures—may be of use. But to many persons this is only a hindrance. Let us keep in mind that the object to be gained is—first a *mental perception* of equal movement, or the regular recurrence of the pulses; and secondly, a *mental command*, by which the muscles of the larynx are made to obey the conceptions of the mind. Both these may be gained by careful practice, discipline, and effort on the part of the pupil. If a regular movement of the muscles of the arm is easier to him than a regular movement of the muscles of the larynx, then let him use the first as a guide to the second—not otherwise. It is, however, frequently necessary, when many sing together, that the leader of the band should beat time, either with a wand, or by the movement of his own hands. The *senary* measure may be beaten in the same way as the *binary*.



"To enable a number of performers," says Dr. Bryce, "to keep time, it is usual for a leader to guide them by a preconcerted movement of his hand. This is called *beating time*. . . Though it is most essential that every learner should be made to *keep time*—that is, *follow his leader*—it is by no means necessary that he should at first be able to *beat time*, that is, *act as leader*. It may be said that he requires to keep time when singing alone. This is true. But if his mental conception of time cannot guide him to a correct and regular movement of the muscles of the larynx, neither will it guide him to a correct and regular movement of the muscles of the arm. On the contrary, by making him first to regulate the motion of the arm by his mental feeling of time, and then to regulate the motions of his organ of sound by that of his arm, we give him two things to do instead of one, and therefore double the chance of going wrong by the very measures we take to keep him right. There can, therefore, be no greater practical blunder in teaching than the premature attempt to teach the *beating* of time to those who are yet struggling with the difficulties of the scale; and, instead of being any assistance to them in *keeping time*, it is the most effective hindrance." Dr. Burney, in his "Dissertation on the Music of the Ancients," prefixed to his "General History of Music," seems to have proved satisfactorily that one of the greatest improvements of modern music is, that we have learned to keep time with less external flourishing and hammering than was necessary in ruder ages, whose music was little more than an exaggerated way of marking the feet of the poetry to which it was sung. He concludes his account of the operations of the ancient Coryphæus, or leader of a choir, in the following words:—"It was not only with the feet that the ancients beat the time, but with all the fingers of the right hand upon the hollow of the left; and he who marked the time or rhythm in this manner was called 'Manu-ductor.' For this purpose they used oyster-shells and the shells of other fish, as well as the bones of animals, in beating time, as we do castanets, labors, etc. Both Hezychius and the Scholiast of Aristophanes furnish passages

to confirm this assertion. What a noisy and barbarous music; all rhythm and no sound! . . . It would afford us no very favourable idea of the abilities of modern musicians if they required so much parade and noise in keeping together. 'The more time is *beaten*,' says M. Rousseau, 'the less it is kept.'" Rousseau's opinion is, perhaps, too strongly expressed; but we think no person of good taste can doubt that it is, in the main, well founded. The practice of making a whole class beat time while they sing, is a return to barbarism. The proper mode of teaching this part of practical music would be to make the members of the class act as leaders in turn; or, if the class be large, one or two at once might be taken out, placed in front of the others, and employed to beat the time—first with the assistance of the teacher, and afterwards by themselves. See Dr. Bryce's "Rational Introduction to Music."

The peculiarities of the old notation on the staff of five lines will be explained as we come to them, and at the proper period of his course our pupil will be more systematically introduced to them. He is already acquainted with most of the points relating to our "interpreting notation." They are, however, repeated below for the sake of distinctness. Observe that the notation of "slurs, repeats, and expression," applies alike to both notations.

NOTATION OF THE RELATIVE LENGTH OF NOTES.—As the accents recur at equal intervals of time throughout a tune, marking aliquot parts of the measure, the relative length of notes can be clearly indicated by showing what proportion of the measure each note occupies. This is done by first placing the accent marks at equal distances along the page, thus—

Or thus :—
 : : : : :
 Or thus :—
 : : : : : etc.

And then observing the following rules :—
 a. A note placed alone immediately after an accent mark is supposed to occupy the time from that accent to the next.

Thus :—
 | d : d : d | d : d : d | d
 Or thus :—

b. A stroke — indicates the continuance of the previous note through another aliquot (or pulse), thus :—
 | d : d | d : —
 Or thus :—

: d | d : d : d | d : — : — | d : — : d | d : —

c. A dot divides an aliquot into equal parts, and shows that the note before it fills half the time from one accent to the next, leaving only half an aliquot to the note or notes which follow, thus :—

| d : d.d | d : d | d : d.d | d : —
 Or :—
 | d : m.r | d : s₁ | d : m.r | d : — | l₁ : d
 | s₁ : m | m.r : d.t₁ | d : —

d. The dot after a mark of continuance shows that the previous note is to be continued through half that aliquot, thus :—
 | d.r : m.f | m : d | d : -f | m : d

e. A comma signifies that the note before it fills a quarter of the time from one accent to the next. The last note in an aliquot does not require a mark after it, as the proportion left to it is sufficiently evident. Thus :—
 | d : d : d.d | d : d

Or,
 | d : t₁.d.r | d : d

f. The dot and comma together show that the note before them fills three-quarters of the time from one accent to the next, thus :—
 | d.r : m.₁f | m.₁r : d

g. This mark , indicates that the note before it fills one-third of the time from one accent to the next, thus :—
 : d | s : l.s.f | m : r | d

k. An aliquot or any part of an aliquot left unfilled indicates a pause of the voice, thus :—
 | d : r : | m : | : t₁ | d : d | r : r | m : —
 hark! hark! hark! while infant voices sing.

Or thus :—
 | d : -f | m : d | d : f | m : d.

NOTATION OF SLURS, REPEATS, AND EXPRESSION.

a. When two or more notes are sung to the same syllable, they are said to be slurred. The slur is indicated by a stroke beneath the notes.

b. In some tunes it is required to repeat certain parts of the strain. The manner in which this is done is indicated by the following signs :—

- d. c. abbreviated from the Italian *Da Capo*, means "Return to the beginning."
- d. s. abbreviated from *Dal Segno*, means "Return, and sing from the sign."
- s. is used for the sign, and
- f. abbreviated from *Fine*, shows where such repetitions end.
- r. placed over a note shows that a repetition of words commences there.

c. Greater "expression" is sometimes given to music by regulating the degree of force with which certain parts of the strain are to be delivered. This is done by means of the following signs placed over the notes :—

- f. abbreviated from *forte*, signifies loud.
- p. from *piano*, signifies soft.
- ff. very loud.
- pp. very soft.

d. Sometimes it is needful to indicate the manner in which that force is to be thrown in. For this purpose the following marks are used :—

- <> denotes a *swell*, the voice commencing softly, becoming louder, and then closing softly.
- < denotes increasing force.
- > denotes diminishing force.
- | or ' over a note shows that it should be sung abruptly and with accent.

e. The same piece of music often requires to be sung with different expression, according to the different words with which it may be used. In that case the marks of expression should be placed on the words. It is proposed that—

CAPITAL LETTERS, in printing, or double lines under the word in writing, should distinguish words to be sung louder than others; that

Italic letters, in printing, or a single line under the word in writing, should indicate softness; that

The acute accent ' should denote special abruptness and decision of voice; that

A stroke above the words, in printing, a succession of little strokes over or a stroke through the word in writing, should show a heavy movement; the accents being dragged along, and the lighter ones little distinguished from the stronger; and that

The grave accent ' placed on the words which fall to the strong accent of the music, should indicate a spirited movement, with marked attention to accent.

A slower or quicker movement may be expressed by the words slowly or quickly. The "heavy movement" mentioned above necessarily tends to slacken, as the "spirited movement" does to quicken the pace of the singer.

An analysis of the markings used in the Tonic Sol-fa System has elicited the following principles, which may be of use to the student :—Passages should be marked to be sung softly in which (1) any peculiarly solemn or awe-inspiring thought is expressed; (2) a change from praise to reflection, or (3) from reflection to prayer. Passages should be marked to be sung loudly which express (1) joyful praise, (2) strong desire, (3) ardent gratitude, (4) high resolve, or (5) some inspiring thought. For a much fuller development of this subject of expression (verbal and musical) see the "Standard Course" of Tonic "Sol-fa Lessons," and the "Tonic Sol-fa Reporter," Vol. VIII.

THE STANDARD SCALE.—A certain note "about midway between the highest and the lowest that can be perceived by the ear" is fixed on by musicians as the standard of FITCH, and the notes arranged upon it, according to the order of the "common mode" or scale already described, are called the standard scale. This note is called c. The second note of the

scale is called **D**, the third **E**, the fourth **F**, the fifth **G**, the sixth **A**, the seventh **B**, and the replicate or octava **C** again. A note something less than half a tone higher than any one of these notes is said to be that note *sharpened*, as "a sharp." A note something less than half a tone lower than any one of these notes is said to be that note *flattened*, as "B flat."

M. Fetis (a well-known French writer) truly observes that "a sound cannot be altered or substituted for another without ceasing to exist. **DOH** (or **C**) sharp is no longer **DOH** (or **C**). It is a mere error so to call it, and it is one of those errors which have tended to render music obscure." But so it is called, and we must be content with this warning against the dangers of obscurity. The particular pitch assigned to this note **C**, and consequently to the other notes of its scale, is called "concert pitch." The moderns generally fix the sound of **C** as that which would be produced by 256 vibrations of a sonorous body.

The accepted "concert pitch" has been gradually rising even beyond this standard within the last few years, so that Handel's music (unless we lower the key) is sung nearly a tone higher than he meant it to be.

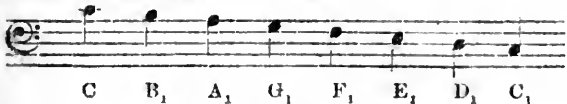
The pitch of the key-note may be given in the heading or title of a tune, thus "key A," "key G," "key B flat," etc. In "pitching a tune" it is usual to take the upper **C** of the standard scale from the tuning-fork or the pitch-pipe to descend to the pitch-note required, and then give its sound to the syllable **DOH**. **DOH**, thus fixed, establishes the relative position of all the other notes of a tune. Suppose the "pitch-note" required is **D**. Then you would take **C** from the tuning-fork, and run down till you come to **D**, which you would "swell out" a little, and then sing the same sound to **DOH**, taking the "chord" afterwards. Thus:—

| C¹ : — | B : A | G : F | E : D | — : — | DOH : — |
DOH : ME | SOH : —

If you find any difficulty in singing your **A B C** backwards, remember that after sounding the **C** you have only to spell the words **BAG** and **FED**. To pitch **B** flat, sing the **C** to the syllable **SOH**, and striking **FAH**, which will be **B** flat, call it **DOH**. The upper **C** is used in pitching because the higher sounds are found to be more distinctly and correctly appreciable by the ear. Tuning-forks can now be obtained for a shilling or eighteenpence. The wholesale price is ten shillings a dozen. We mention this to stimulate our friends to the purchase of these useful instruments. With a small-sized one in his pocket the good sol-faist is ready to take up a tune-book, and make out a tune without the need of any other instrument. After a time he will become, with a little practice to that end, quite independent even of the tuning-fork. He will soon learn to recall the pitch note **C** at will. Those who are studying the old notation will like to see the standard scale represented on the staff. It stands thus:—



But a man's voice, taking the **C** from the tuning fork, would sing the scale an octave lower, thus:—



LESSONS IN FRENCH.—XVIII.

SECTION I.—FRENCH PRONUNCIATION (concluded).

GENERAL RULES FOR PRONOUNCING AND READING FRENCH.

82. The preceding portions of this section on French pronunciation have been devoted exclusively to the illustration of every known French sound, whether occurring singly, or the result of combinations of vowels, consonants, compound vowels, &c.

nasals, and liquids. Analogous English sounds have constituted the agents of the foregoing illustrations of French sounds. Generally, this has had reference to separate words only. But let it be remembered that, to give the correct sound of a French word as it stands alone, is a very different thing from giving that same French word its correct sound when it is used with other words in the formation of a sentence in reading, or a phrase in conversation.

In this respect, the French language is like our own, as used in common conversation. The system of word-connections, in sentences and phrases in both languages, is nearly identical. For the purpose of illustration we will begin by giving specimens of word-connections in the English language, viz. :—

My hat was on the table, is pronounced as if printed *my hat-was-on the table*.

I jumped upon the ground, is pronounced as if printed *I jump-tup-pon the ground*.

Not at all, is pronounced as if printed *not-tat-tall*.

I assert a dogma, another denies it, is pronounced as if printed *I assert-ta dogma, another denies-it*, etc.

These and similar word-connections occur in almost every sentence and phrase in the English language, where the continuity of sound is not broken by punctuation marks, without our being sensible of it. It is unavoidable. We are, and have been, so constantly used to it, that we notice it only when attention is called to it. It will be observed that the foregoing word-connections in the English language occur when a word ending with a consonant is immediately followed by another word commencing with a vowel. And the same exists when, in common conversation, the word following the one with a final consonant begins with a silent *h*, viz. :—

I was out about an hour, is pronounced as if printed *I was-out-tabout-tan-hour*, etc.

Word-connections in the French language also occur under circumstances exactly similar; i.e., when a word ending with a consonant immediately precedes another word commencing with a vowel or silent *h*.

This feature, therefore, of the pronunciation of French, both in ordinary reading and common conversation, will present no great difficulty to the student. The following rules, thoroughly understood and committed to memory, will place the student beyond doubt and hesitation concerning these word-connections, and other matters pertaining to the correct, intelligible use of the French language, both in reading and conversation.

- I.—Pay no attention whatever to the apostrophe.
- II.—Pronounce the pronoun *elle* like the English *it*.
- III.—The final letters *ent* of verbs, with which the pronouns *ils* and *elles* do or can agree, are always silent.
- IV.—In reading poetry, *ia, ie, ie, io, ion, ier*, and sometimes *ien*, are pronounced as two syllables.
- V.—The letters *es* final are pronounced like the letters *ay* in the English word *day*, except when *s* forms the plural of words ending in *c*, in which latter case *es* are not pronounced.
- VI.—Pronounce *eur, e, œu*, like *c* mute or unaccented.
- VII.—Pronounce *ch* and *sch*, generally, like the letters *sh* in the English word *fish*, except the letters *ch* in the word *yacht*.
- VIII.—The letters *st* final, in the words *Christ* and *antichrist*, are sounded, but they are silent in *Jésus Christ*.
- IX.—All final consonants after *r* are silent, except in the words *Mars* and *ours*, a bear.
- X.—In the word *Messieurs*, the final letters *rs* are only sounded when preceding a word beginning with a vowel.
- XI.—Whenever a word ending with a consonant immediately precedes a word beginning with a vowel or silent *h*, the sound of the final consonant of the former word is carried to the first syllable of the latter, or to the word itself, if it be a monosyllable, just as if the latter word commenced with that consonant. This is most particularly the case if the two words are intimately connected in sense.

The above rule owes its existence entirely to *euphony*, to subserve which almost everything else is sacrificed in the French language. Still the student must not observe it too rigidly, except in poetry. Neither in prose nor conversation does this rule hold good in the following cases, viz. :—

1. When a *harsh sound* would be the consequence.
2. Whenever any punctuation mark is placed between the two words in question.
- III. The letter *h*, in the words *et* (a conjunction meaning

and) and cent (meaning a hundred) is never carried to the following word in pronunciation.

XIII.—The letter *a* in the word *Août* , the month August (pronounced *oo*, and not *ah-oo*), is not sounded.

XIV.—In the compound word *est-il*, and a few others, the *t* is carried to the second syllable in pronunciation.

XV.—Whenever a word ending with a silent *e* is immediately followed by another word beginning with a vowel or *h* mute, the consonant preceding the silent *e* of the first word is carried to the next word in pronunciation; as:—

La France entière, as if printed *la Fran-centièrre*, and pronounced *lah franh-sanh-teair*.

Honnête homme, as if printed *honné-tomme*, and pronounced *on-nay-ton*.

XVI.—With the words *ah, eh, oh, ouest* (one of the points of the compass), *ouf, oui, onze, onzième, pho, vuidème, yacht, yatagan, yole, and yucca*, no final consonant of a preceding word is connected in pronunciation. Neither is any elision of the article made before any of these words.

XVII.—In the phrase *vers les une heure*, the *s* final of the second word, *les*, is not carried to the following word, *une*, in pronunciation.

XVIII.—The word *cing* is pronounced *sanh* whenever it comes before a consonant or an aspirated *h*. But before a vowel or *h* mute it is pronounced *sanhk*.

XIX.—The letters *ue* have the sound of *u*, when they are not silent, after *g* and *q*.

XX.—The word *dix*, ten, before a consonant, is pronounced *dee*; before a vowel or *h* mute, *deez*; and at the end of a clause, *as deess*.

XXI.—The word *six*, six, before a consonant, is pronounced *see*; before a vowel or *h* mute, *seez*; and at the end of a clause, *as sees*.

XXII.—The word *huit*, eight, before a consonant, is pronounced *wee*, or nearly *wee*; before a vowel or *h* mute, as *ueet*, or nearly *weet*.

XXIII.—The letters *er* final are usually pronounced like the letters *ay* in the English word *day*. The following words, however, constitute an exception to the above rule. In them the letters *er* are pronounced like *air* in English.

Alger	Cher	Fier	Hier	Magister	Sadder
Amer	Cuiller	Frater	Hiver	Mer	Stathouder
Belvédér	Enfer	Gaster	Jupiter	Niger	and
Cancor	Fer	Gessner	Lucifer	Pater	Ver.

XXIV.—Divide each word *naturally* into syllables, as you would in the English language.

SECTION XXIX.—USE OF THE ARTICLE (continued).

1. Adjectives of nationality will, according to Rule 4 of the last lesson, be preceded by the article.

Il apprend le français, l'anglais, He learns French, English, German, l'allemand et l'italien, and Italian.

2. After the verb *parler*, the article may be omitted before an adjective of nationality, taken substantively.

Votre frère parle espagnol et portugais. Your brother speaks Spanish and Portuguese.

3. The article is not used in French before the number which follows the name of a sovereign. This number (unless it be first and second), must be the cardinal, and not the ordinal (§ 26 (3)).

Vous avez l'histoire de Henri Quatre. You have the history of Henry the Fourth.

4. A noun placed in apposition with a noun or pronoun is not in French preceded by *un, une, a* or *an*, unless it be qualified by an adjective or determined by the following part of the sentence.

Votre ami est médecin, Your friend is a physician.
 Notre frère est avocat, Our brother is a barrister.
 Votre ami est un bon médecin, Your friend is a good physician.
 Notre frère est un avocat célèbre, Our brother is a celebrated advocate.

5. PRESENT OF THE INDICATIVE OF THE IRREGULAR VERBS.

APPRENDRE, to learn.	CONNAÎTRE, to know.	SAVOIR, to know.
J'apprends, I learn, do learn, or am learning.	Je connais, I know, or do know.	Je sais, I know, or do know.
Tu apprends.	Tu connais.	Tu sais.
Il apprend.	Il connaît.	Il sait.
Nous apprenons.	Nous connaissons.	Nous savons.
Vous apprenez.	Vous connaissez.	Vous savez.
Ils apprennent.	Ils connaissent.	Ils savent.

6. *Connaitre* means to be acquainted with; *savoir*, to know, is said only of things.

Connaissez-vous ce Français, cet Anglais, cet Allemand, et cet Espagnol? Do you know that Frenchman, that Englishman, that German, and that Spaniard?
 Savez-vous le français, l'anglais, l'allemand et l'espagnol? Do you know French, English, German, and Spanish?

RÉSUMÉ OF EXAMPLES.

Le Capitaine G. sait-il le français? Does Captain G. know French?
 Il ne le sait pas, mais il l'apprend. He does not know it, but he is learning it.
 Connaissez-vous le Docteur L.? Do you know Dr. L.?
 Je ne le connais pas, mais je sais où il demeure. I am not acquainted with him, but I know where he lives.
 Ce monsieur est-il peintre? Is that gentleman a painter?
 Non, il est architecte. No, he is an architect.
 Ce monsieur est un architecte distingué. That gentleman is a distinguished architect.
 Ce Français parle grec et arabe. That Frenchman speaks Greek and Arabic.
 Il parle le grec, l'arabe et l'italien. He speaks the Greek, Arabic, and Italian languages.
 Avez-vous vu Charles Dix, frère de Louis Dix-huit? Have you seen Charles the Tenth, brother of Louis the Eighteenth?

VOCABULARY.

Allemand, -e, German.	Grec, -que, Greek.	Quatorze, fourteen.
Ancien, -ne, ancient.	Hongrois, -c, Hungarian.	Quatre, four.
Anglais, -e, English.	Polonais, -e, Polish.	Russe, Russian.
Bibliothèque, f., book-case, library.	Polonois, -e, Polish.	Suédois, -e, Swedish.
Chinois, -e, Chinese.	Polonois, -e, Polish.	Tapissier, m., upholsterer.
Danois, -e, Danish, Dane.	Polonois, -e, Polish.	

EXERCISE 53.

1. Connaissez-vous ce monsieur? 2. Oui, Madame, je le connais fort bien. 3. Savez-vous de quel pays il est? 4. Il est hongrois. 5. Parle-t-il allemand? 6. Il parle allemand, polonois, russe, suédois et danois. 7. N'est-il pas médecin? 8. Non, Monsieur, avant la révolution il était capitaine. 9. Avez-vous envie d'apprendre le russe? 10. J'ai envie d'apprendre le russe et le grec moderne. 11. Connaissez-vous les messieurs qui parlent à votre sœur? 12. Je ne les connais pas. 13. Savez-vous où ils demeurent? 14. Ils demeurent chez le tapissier de votre frère. 15. N'avez-vous pas l'histoire de Louis Quatorze dans votre bibliothèque? 16. Je n'ai ni celle de Louis Quatorze, ni celle de Henri Quatre. 17. Avez-vous tort d'apprendre le chinois? 18. Je n'ai pas tort d'apprendre le chinois. 19. Vos compagnons apprennent-ils les langues anciennes? 20. Ils savent plusieurs langues anciennes et modernes. 21. Parlez-vous anglais? 22. Je sais l'anglais et je le parle. 23. Connaissez-vous l'Anglais que nous voyons? 24. Je ne le connais pas. 25. Il ne me connaît pas et je ne le connais pas.

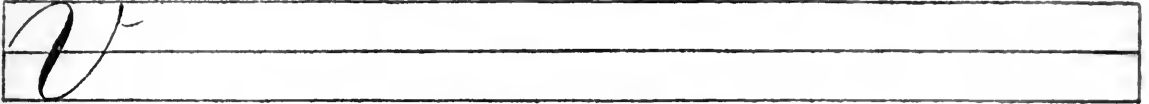
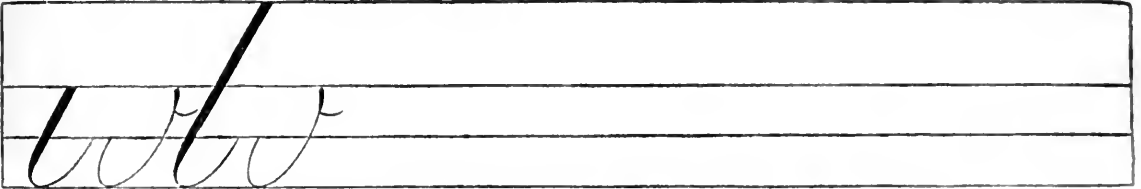
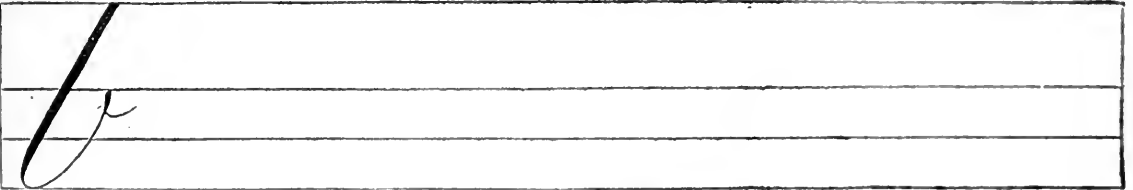
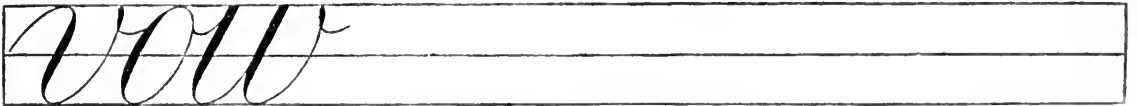
EXERCISE 54.

1. Does our physician know French? 2. He knows French, English, and German. 3. Does he know the French physician? 4. He knows him very well. 5. Are you acquainted with that lady? 6. I am not acquainted with her. 7. Is she a German or a Swede? 8. She is neither a German nor a Swede, she is a Russian. 9. Do you intend to speak to her? 10. I intend to speak to her in (en) English. 11. Does she know English? 12. She knows several languages; she speaks English, Danish, Swedish, and Hungarian. 13. Is your brother a colonel? 14. No, Sir, he is a captain. 15. Is your upholsterer a Dane? 16. He is not a Dane, he is a Swede. 17. Are you a Frenchman? 18. No, Sir, I am a Hungarian. 19. Do you know Chinese? 20. I know Chinese, Russian, and modern Greek. 21. Are you wrong to learn languages? 22. I am not wrong to learn languages. 23. Do you know the Englishman who lives at your brother's? 24. I am acquainted with him. 25. I am not acquainted with him. 26. Do you like books? 27. I am fond of books. 28. Have you a desire to learn Russian? 29. I have no desire to learn Russian. 30. Have you no time? 31. I have but little time. 32. What do you learn? 33. We learn Latin, Greek, French, and German. 34. Do you not learn Spanish? 35. We do not learn it. 36. Have you fine flowers in your garden? 37. We have very fine flowers; we are fond of flowers. 38. Do you give them to him? 39. I give them to you. 40. Give us some. 41. Do not give us any.

LESSONS IN PENMANSHIP.—XVIII.

In the copy-slips that are given on this page, a new elementary form is brought under the reader's notice—the first of the four elementary strokes entering into the composition of the seven letters of the writing alphabet that yet remain to be considered. This stroke, which is shown separately in Copy-slips Nos. 61 and 63, enters into the formation of *v*, *w*, and *b*. When exhibited by itself, it may be described as a fine bottom-turn or hooked-stroke, consisting of a hair-line commenced at the line

the looped form of termination is useful when the next letter happens to be *e*, as by making the finishing-turn larger, we are the better able to carry it into the fine up-stroke commencing at *c c*, which forms the loop of this letter. In Copy-slip No. 61, as our readers will perceive, the stroke that we have been describing is given with the top-and-bottom turn, to which elementary stroke it is added in order to form the letter *v*, the simplest of the three letters into whose composition it enters. In Copy-slip No. 63, the bottom-turn is given, to which, twice repeated, this new elementary form is added to form the letter *w*, while with

COPY-SLIP NO. 61.—ELEMENTARY STROKES FORMING THE LETTER *v*.COPY-SLIP NO. 62.—THE LETTER *v*.COPY-SLIP NO. 63.—ELEMENTARY STROKES FORMING THE LETTERS *w* AND *b*.COPY-SLIP NO. 64.—THE LETTER *w*.COPY-SLIP NO. 65.—THE LETTER *b*.COPY-SLIP NO. 66.—THE WORD *vow*.

c c, and brought downwards, like the lower half of the ordinary bottom-turn, as far as the line *b b*, where it is turned to the right and carried upwards, with a slight inclination to the left after it has crossed the line *c c*, until it reaches the line *a a*. The pen is then brought down the line again to a point about midway between *a a* and *c c*, to thicken it, and then turned abruptly to the right, making a small curved stroke, which completes the elementary form. The short thickened stroke which is made by the downward course of the pen along the hair-line already carried up to the line *a a*, must have its broadest part at this line, and taper gradually downwards until the point is reached at which the curved line completing the stroke is turned to the right. Sometimes this stroke is finished with a small loop at the top resembling the loop of the letter *e*. The method, however, adopted in our copy-slips is neater and more compact, although

the modification of the bottom-turn, known as the letter *l*, which stands third in order in Copy-slip No. 63, it forms the letter *b*. The three letters *v*, *w*, and *b* are given separately in Copy-slips Nos. 62, 64, and 65. It will be noticed that although in exhibiting the stroke by itself it has been commenced at the line *c c*, and carried downwards and then upwards with a bottom-turn, practically it is nothing more than the extension of the fine up-stroke of the bottom-turn as far as the line *a a*, where it is finished in the manner already described. It should be remarked that the letter *w* is frequently made by adding this termination to the fine up-stroke of the bottom-turn of the letter *n*. The form, however, that we would recommend our readers to adopt is given in Copy-slips Nos. 64 and 66, where *w* is formed by the addition of this termination to the fine up-stroke of the second bottom-turn of the letter *n*.

HISTORIC SKETCHES.—IX.

THE BLOODY ASSIZE.

There are some historical events of which we gladly cherish the memory, because of the lustre they spread around our national character, or because of the intrinsic worth of the events themselves. Such are the great victories of the nation, abroad and at home, the enforcers of our foreign and colonial policy against external foes, the winners of steps onward in the path of constitutional freedom, in opposition to the tactics of absolutists and tyrants. Other events there are over which we would gladly draw a veil, if it were permitted us to do so, events so sad and disgraceful, not only to our national character, but to humanity itself, that we would fain not look at them. But we cannot afford to lose sight of them, much as the contemplation may disgust us; we are bound in our own interests, and in the interests of those who are to come after us, not to "let oblivion damn" the record in which these ugly histories are written. There is, seemingly, a natural tendency in politics to repeat themselves, and in principles to re-assert themselves: and if, according to this rule, we may look for a re-appearance of past glories, so we must look also for a fresh advent of past evils. They may not come in the same shape—indeed, the chances are strongly against their doing so—but come they will, and it behoves us to watch very diligently against the evils lest they take us by surprise, and furnish for posterity a chapter of horrors, a counterpart of those old chapters which we are bound freshly to remember. To use the emphatic language of Lord Erskine, with reference to some irregular proceedings in the law courts, presided over by the subject of this sketch (Judge Jeffreys), which were taken off the file and burnt, "to the intent that the same might no longer be visible to after ages:"—"It was a sin against posterity; it was a treason against society; for, instead of being burnt, they should have been directed to be blazoned in large letters upon the walls of our courts of justice, that, like the characters deciphered by the prophet of God to the Eastern tyrant, they might enlarge and blacken in your sight to terrify you from acts of injustice."

It is a sketch of one of those subjects which, for the above reason, should never be forgotten, that it is proposed now to bring under the notice of our readers.

The Duke of Monmouth, the illegitimate son of Charles II. and Lucy Waters, having been engaged in many intrigues to procure his own elevation to the throne instead of the Duke of York (James II.), had got into trouble during his father's lifetime; but when Charles died in 1685, and his brother, James II., succeeded him, the Duke of Monmouth renewed more energetically his intrigues, and succeeded in fastening to his cause a very considerable following. There were said to exist proofs of Charles II. having been married to Lucy Waters, and though they did not actually exist, many believed they did, and on that ground alone, apart from their dislike to James, regarded him as their lawful king. Finding his party, as he fancied, sufficiently strong, he determined, in the spring of 1685, a few weeks after the king's accession, to try his hand at an invasion. With a slender force he landed on the 11th of June, at Lyme, in Dorsetshire, where many of the country people joined him. Shortly afterwards he proclaimed himself king, denounced James as a usurper, and all his adherents as traitors. In a lengthy declaration, Monmouth asserted the reasons why James ought to be deposed, and stated the measures which he intended to introduce if the people would put him in possession of the throne.

Four days after landing he left Lyme at the head of over 3,000 men, raw levies for the most part, badly officered, and without the countenance or help of any of the country gentlemen. At Taunton, where the Duke was received with open arms, some addition was made to the number, but hardly to the quality of his army. At Bridport, where a detachment of his men first came in contact with the royal forces, he experienced a check, and nowhere did he gain anything by force of arms. Wells, Bridgewater, and Exeter received him; but Bath and Bristol shut their gates on him, and refused him supplies. At Sedgewood, about five miles to the south-east of Bridgewater, in Somersetshire, he was compelled to fight on the 6th of July, by the king's general, Lord Feversham; and after a combat of some hours' duration, in which the royal troops lost about 300 men, and the rebels 800, besides three times that number of prisoners, he was completely defeated. The duke, with two companions,

fled before the fight was done, and galloped off in hope of ultimately reaching the Hampshire coast, but after skulking about for several days in various disguises, they were captured, and Monmouth, who had been already condemned by Act of Parliament, was brought to London and executed.

Perhaps it cannot be said, on a calm review of the facts, that the Duke of Monmouth received anything but what he deserved. He was "the head and front of the offending," and in his person it might be said that the law fairly claimed its due. Not much could have been said on the score of strict justice if the other leaders in the rebellion had shared his fate, but the proceedings of Judge Jeffreys on the circuit, well called the "Bloody Assize," were of such a kind as to make one doubt whether even the guilty were not unwarrantably condemned. Immediately after the battle of Sedgewood thirteen of the prisoners were hanged without trial, by order of Colonel Kirk, a brutal commander of brutal soldiers, who were called by the satirical nickname of "Kirk's Lambs." Further military executions would, no doubt, have taken place; but the king decided to have the rebels tried according to the law of the land, a decision which would have been recorded to his advantage, had he not chosen the man he did choose to put the law in motion.

The prisons in the western counties, except Cornwall, which had remained loyal, were crowded with prisoners. On account of the disturbed state of the country there had not been any summer assize on the western circuit, so that the ordinary prisoners remained for trial, but the people who crowded the gaols to overflowing were the captives taken at and after Sedgewood. For the trial of these a special commission was issued, with Jeffreys, Lord Chief Justice of England, at its head. A second commission was given to Jeffreys alone, appointing him temporarily commander-in-chief of the troops in the west, with the rank of lieutenant-general.

Now Jeffreys was a man who had risen at the bar by brute force exhibited through his mind. Was there any dirty, disgusting case to be taken in hand, any utter scoundrel to be defended, any honest man to be hunted down, Jeffreys was the counsel employed. His knowledge of law was small, but the amount of his brazen hardihood was enormous, and by dint of this questionable quality he acquired a large practice of the baser sort. When the Crown, during the life of Charles II., wanted such talents for the purpose of prosecuting its enemies to death, Jeffreys came forthwith to the front. He was rapidly promoted to the highest official dignity at the bar, and when Lord William Russell and Colonel Algernon Sydney were to be tried for complicity in the Rye House Plot—a plot to waylay and assassinate the king and Duke of York on their return from Newmarket—with which neither of the accused had any real connection, it was recognised as a necessity that Jeffreys should be promoted to the office of their judge. The selection was thoroughly justified by the result. In defiance of the rules of evidence, even such as they were in those days, with brutal browbeating and cross-examining of witnesses from the bench, the prisoners all the while being undefended by counsel, Jeffreys, the judge, helped the Crown lawyers to procure a verdict of guilty; and having succeeded, he had the indecency to mock the prisoners after having sentenced them to death.

The public of that day, not over-squeamish, were scandalised at his proceedings, and many about the court made no secret of their disgust for him; but the man was necessary to such a government as then existed, and the king distinguished him with favour. When James II. succeeded his brother, the chief justice found favour in the sight of the new king, to whom he was as necessary as he had been to Charles. When Monmouth's rebellion had filled the West-country gaols with prisoners, there was no fitter man than Jeffreys to clear them in the only way the Crown meant them to be cleared.

With an escort of soldiers Jeffreys opened his commission at Winchester, when the only trial connected with Monmouth's rebellion was that of Alice, Lady Lisle, the widow of one of the judges of Charles I. This lady had given shelter to two refugees from the rebel army after the battle of Sedgewood, and had denied them, when Colonel Penruddock, one of the king's officers, came to search her house. The men were found concealed on the premises (the event furnishes a subject for one of the beautiful frescoes on the walls of the entrance to the House of Commons); she was arrested for having harboured known traitors, and was indicted as a participator in their guilt. Her case was, that she

did not know the men had been concerned in the rebellion; that she understood one of them, a minister, was merely persecuted for non-conformity; and she made this capital point herself—for no legal assistance was in those days allowed to prisoners on trial for treason—that it was unreasonable to try her for complicity in treason, when the person implicated as the traitor had not been proved one, seeing that he had not been tried at all, and that “peradventure he might afterwards be acquitted as innocent after she had been condemned for harbouring him.” This very reasonable objection was overruled by the judge, who himself examined adversely to the prisoner the witnesses for the prosecution, and then summed up in violent language against her. Some accounts, written at the time, report that the jury three times refused to find a verdict, and that it was only in consequence of the threats of the judge that they at length found her guilty. It is but right to say that the account given in the State Trials says nothing about this, though it gives enough to show the disgraceful bias of the judge against the prisoner, and the judicial part, and that a violent one, which he played. He expressed the greatest surprise that the jury should have hesitated so long about their verdict, adding, “If I had been among you, and she had been my own mother, I should have found her guilty.” He then passed sentence, the sentence of the law be it observed, not of the judge, “That you be conveyed hence to the place from whence you came, and from thence you are to be drawn on a hurdle to the place of execution, *where your body is to be burnt alive till you be dead.* And the Lord have mercy on your soul.”

This horrible sentence to death by fire was changed by the royal clemency—save the mark—to death by beheading, the utmost King James could be induced to grant to a woman. When James himself was sent into exile, an Act of Parliament reversed the attainder of Lady Lisle, on the ground that “the verdict was injuriously extorted by the menaces and violence, and other illegal practices of George, Lord Jeffreys, Baron of Wem, the Lord Chief Justice of the King’s Bench.”

At Salisbury, the next town on the circuit, various punishments, including flogging and imprisonment, were passed on rebel sympathisers who had wished “the cause” good speed; but there were not any actual rebels for trial till the judge came to Dorchester, where the real campaign began. He charged the grand jury to the effect, that he would punish with the extreme rigour of the law, not only principals, but all aiders and abettors, all who had encouraged traitors, whether by word or deed, and all who had helped any of them to escape. Several hundreds of “true bills” were found, when the meshes of the net were declared to be so ample, and Jeffreys, alarmed for his own convenience if so many prisoners were tried singly, announced that those who would plead guilty “should find him to be a merciful judge; but that those who put themselves on their trial, if found guilty, would have very little time to live; and, therefore, that such as were conscious they had no defence, had better spare him the trouble of trying them.” To show that he was in earnest, he ordered thirteen out of twenty-nine of those first convicted to be hanged in thirty-six hours after sentence, and the remainder the next morning. To one man who objected to the competency of a witness, he exclaimed, “Villain! rebel! methinks I see thee already with a halter about thy neck;” and this poor man he ordered specially to be hanged first. Two hundred and ninety-two were condemned to death at this town, and seventy-four of them were actually hanged; the others were sold as slaves, and sent to the plantations in the West Indies. Cruel floggings took place, in addition to these severities, on those who had taken smaller part in the rebellion; one poor wretch was sentenced to be whipped through every market town in the county for seven years, that is to say, once a fortnight for seven years.

At Exeter, the first man convicted was sent to instant execution. Thirty-seven more suffered death at the same place, and 206 were condemned to whipping, slavery in the West Indies, or imprisonment. At Taunton 500 prisoners awaited their trial, and Jeffreys observed, in his address to the grand jury, that “it would not be his fault if he did not purify the place.” One hundred and forty-three were ordered for execution, 284 were to be sent to the plantations, and, in order that the rebellious county might be duly warned for the future, Jeffreys ordered some of the condemned men to be executed in the surrounding villages. At Wells, the scenes enacted at Taunton were repeated with

sickening iteration, and then Jeffreys went on to Bristol, where, however, he had but three victims. Two men of the same family having been convicted in Somersetshire, one of them was condemned to death, and the other procured a pardon; but before his release, the other man escaping, Jeffreys ordered execution to be done on the pardoned one, because “his family owed a life!”

A large sum of money was made by the judge in the sale of pardons, notwithstanding the quantity of blood actually shed. As much as £15,000 was given in one case, £3,000 was refused in another, and by the time the circuit was over, Lord Jeffreys found himself rich enough to support the dignity of lord-chancellor, a post which was the reward of his zealous services in the west.

Neither king nor judge profited in the end. The former lost his throne, which has been ever since barred against the return of any of his dynasty, and the spirits disembodied on the Bloody Assize sat heavily on the soul of the judge, and pressed it down to death. As soon as it was found that King James had fled on the approach of the Prince of Orange, in 1688, the people demanded with loud voices that his ill advisers should not escape. The chief one for whose punishment they thirsted was Jeffreys, and search was made high and low for him. Almost he escaped. Steps to ensure his departure from England had been “secretly taken, and, disguised as a seaman, his eyebrows shaven off, the better to conceal his features, he had arrived on board the collier which was to take him to Hamburg, when he took it into his head to go on shore. At an alehouse in Wapping he was recognised by one to whom he had, as judge, behaved brutally; a mob surrounded the house, and would have torn the fugitive to pieces, had not some soldiers rescued him and taken him to the Lord Mayor. By order of the temporary Government he was sent to the Tower, where he died miserably, before he could be brought to trial on a charge of high treason.

In the West of England the man’s memory is still preserved as that of an incarnate fiend, the true representative of perfect injustice, the fit sign of brutal cruelty and oppression. Probably some inventions to his disadvantage have been made by the fertile brains of angry foes, and possibly some traits of goodness may have been forgotten amidst the universal execration which has been his historical epitaph; but there are few even now-a-days who think the epithet “bloody,” which is usually prefixed to Jeffreys’ name, too strong for the man who presided over the special commission after Monmouth’s rebellion, and who, in his capacity of judge, “played such fantastic tricks before high Heaven, as made the angels weep.”

SYNOPSIS OF THE LIFE AND REIGN OF JAMES II.

James II. was the third son of Charles I. by his Queen, Henrietta Maria of France. He was the twenty-seventh sovereign of England after the Norman Conquest, and the fourth of the Stuart dynasty.

Born at St. James’s, Oct. 14, 1633	Test Act Suspended . . . 1696
Began to reign . . . Feb. 6, 1685	The King goes to Mass . . . 1695
Rising in Scotland in favour of the Duke of Monmouth, 1685	The Universities compelled to admit Papists . . . 1687
Monmouth lands at Lyme, June 11, 1685	Trial of the Seven Bishops, June 29, 1683
Battle of Sedgemoor, July 6, 1685	Birth of the “Old Pretender” . . . June 10, 1688
Execution of Monmouth, July 15, 1685	William of Orange lands at Torbay . . . Nov. 5, 1688
The “Bloody Assize” . . . 1685	Abdication of James, Dec. 11, 1688
Revocation of the Edict of Nantes, in France, Oct. 12, 1685	Died at St. Germain, Aug. 6, 1701

SOVEREIGNS CONTEMPORARY WITH JAMES II.

Denmark, King of.	Portugal, King of.	Turkey, Sultans of.
Christian V. . . 1670	Peter II. (previously Regent) . . . 1683	Mahomet IV. . . 1649
France, King of.	Rome, Pope of.	Solyman III. . . 1687
Louis XIV. . . 1643	Innocent XI. . . 1676	United Provinces of the Netherlands, Sied: holders of.
Germany, Emperor of.	Russia, Cæsar of.	William Henry (afterwards William III. of England) . . . 1672
Leopold I. . . 1658	Ivan IV. and Peter I. (the Great) conjointly . . . 1682	[This prince married Mary, the daughter of James II.]
Poland, King of.	Spain, King of.	
John Sobieski . . . 1674 [This monarch was the last independent king of Poland. He defeated the Turks in many battles, and compelled them to raise the siege of Vienna, in 1683.]	Charles II. . . 1665	
	Sweden, King of.	
	Charles VI. . . 1680	

LESSONS IN BOTANY.—IX.

SECTION XVII.—ON THE COROLLA, ITS PARTS AND MODIFICATIONS.

As the calyx may be made up of one sepal, in which case it is termed monosepalous, or of many sepals, in which case it is termed polysepalous, so the corolla may be made up of one or many parts called petals. In the former case a *monopetalous*, in the latter a *polypetalous*, flower results. Even the most casual observer of flowers must have noticed some of the various modifications of form and arrangement to which petals are subject.

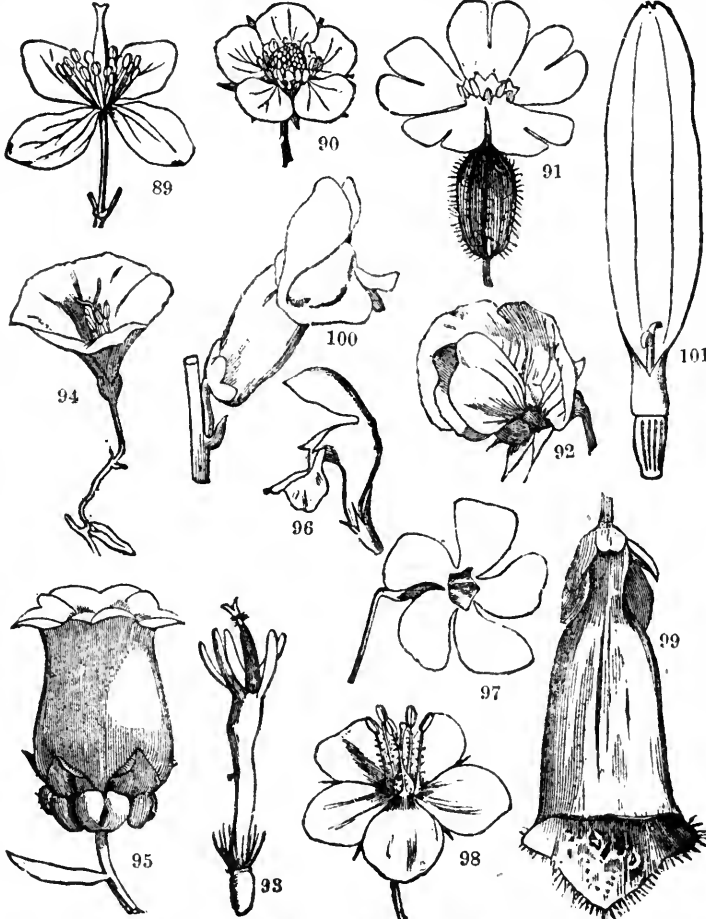
Hence have arisen various botanical designations, some of which we shall now proceed to explain. In the disposition and arrangement of petals, those which assume the cross form are very conspicuous. Vegetables of the cabbage tribe, indeed, including turnips, watercresses, and many others, have had the botanical designation *cruciform* or *cruciferous* (Latin *crux*, *crucis*, a cross, and *fero*, I bear) given to them from this very circumstance (Fig. 89). The *rosaceous* disposition of petals is also very well marked, not only being observable in the wild roses, but being shared by numerous other vegetables. The strawberry flower, for example, is rosaceous in the disposition of its petals (Fig. 90). The long tapering claw which certain petals have is also highly characteristic, and gives rise to corollæ which are said to be *caryophyllate*, from resembling that of the pink *Dianthus caryophyllus*. Of this the lychnis (Fig. 91) furnishes us with an example. The papilionaceous (Latin, *papilio*, a butterfly) corolla constitutes an exceedingly well-marked natural division, the name being acquired from the circumstance that they resemble a butterfly in general appearance. No person, we are sure, who has ever seen a pea-flower—and who has not?—can have failed to be struck with the marked resemblance in question. Hence the technical name *papilionaceæ* has been applied by botanists to plants bearing such flowers. Our diagram (Fig. 92) represents the flower of a common garden pea.

Such are amongst the chief of the modes in which the petals of polypetalous flowers are arranged. Monopetalous corollæ evidently do not admit of these variations, since they only consist of one organ; nevertheless, so numerous are the forms which these one-petaled corollæ assume, that many distinctions may be drawn between them. Thus, for example, we have *tubular*, from the Latin *tubulus*, the diminutive of *tubus*, a pipe (Fig. 93); *infundibuliform* (Latin, *infundibulum*, a funnel), or funnel-shaped (Fig. 94); *hypocrateriform* (Greek, *ὑποκράτης* [*hu-po-cra-tees*],

a saucer, from *ὑπο* under, and *κράτης* a cup), or saucer-shaped (Fig. 97); *campanulate* (Italian, *campana*, a bell), or bell-shaped (Fig. 95); *rotate* (Latin, *rota*, a wheel), or wheel-shaped (Fig. 98); *labiate* (Lat., *labium*, a lip), or lip-shaped (Fig. 96); *personate* (Lat., *persona*, a mask), or mask-like (Fig. 100); and *ligulate* (Lat., *ligula*, a strap), or strap-shaped (Fig. 101) flowers. When irregular corollas are neither labiate, nor personate, nor ligulate, they are sometimes called *anomalous*, from the Greek α , negative, and *μαλος* (*hom-a-los*), equal or similar, as in the fox-glove (Fig. 99).

SECTION XVIII.—ON FRUITS AND THEIR VARIETIES.

We have already remarked that the female parts of a flower are termed carpels, from *καρπος*, *fruit*, because fruit is the result of the development. Sometimes the ovary alone becomes developed into the fruit, but occasionally other parts of the flower attach themselves to the ovary, and thus become incorporated with its substance, helping to form the fruit. In the majority of cases fruit will not ripen except the ovary has been fertilised; but many exceptions occur to this rule. Thus certain varieties of oranges, grapes, and pine-apples ripen freely enough, although the ovaries from which they spring have never been fertilised, and consequently they bear no seed. Now, even in ordinary language, we employ various terms to denominate various kinds of fruit: it follows, therefore, that since botanists recognise many growths as fruits which we in ordinary language fail to dignify by that pleasing term, many botanical designations become necessary. There are two methods of communicating to the reader these distinctions. The first is by telling in what the distinctions consist; the second by showing the various forms which result. Perhaps the latter method will, of the two, be the more simple. We shall therefore give drawings



89. CRUCIFORM COROLLA OF THE CELANDINE. 90. ROSACEOUS COROLLA OF THE STRAWBERRY. 91. CARYOPHYLLATE COROLLA OF THE LYCHNIS. 92. PAPILIONACEOUS COROLLA OF THE PEA. 93. TUBULAR COROLLA OF THE CORN CENTAURY. 94. INFUNDIBULIFORM COROLLA OF THE BINDWEED. 95. CAMPANULATE COROLLA OF THE CAMPANULA. 96. LABIATE COROLLA OF THE DEAD-NETTLE. 97. HYPOCRATERIFORM COROLLA OF THE PERIWINKLE. 98. ROTATE COROLLA OF THE PIMPERNEL. 99. ANOMALOUS COROLLA OF THE FOXGLOVE. 100. PERSONATE COROLLA OF THE SNAPDRAGON. 101. LIGULATE COROLLA OF THE CHRYSANTHEMUM.

of some of the chief varieties of fruit, which are as follow:—
Pomes, or fruits resembling apples (Fig. 102); *drupes*, or fruits resembling cherries, peaches, plums, so called from falling from the tree when ripe—the term *drupe* being derived from the Greek *δρῦπα* (*drup-pa*), an over-ripe olive, or *δρῦπεις* (*drū-pet-ees*), quite ripe, which is derived from *δρῦς* (*droos*), an oak or tree, and *πίπτω* (*pip-to*), to fall (Fig. 103); the *achænium* (from the Greek α , negative, and *χαῖνω* [*ki-no*], to gape), a term applied to hard, dry fruits, such as the fruit of the ramunculus, which do not adhere to the shell or pericarp, and do not open when ripe (Fig. 104); the *caryopsis* (from *καρπov* [*kar-ru-on*], a nut, and *σπρω* [*op-to*], to see), a small, dry, seed-like fruit which coheres inseparably with the seed within, as in buckwheat (Fig. 105); the *follicle* (from the Latin *folliculus*, the diminutive

of *follicis*, a windball or bag), a fruit or seed vessel which splits on one side only, as in the columbine (Fig. 106); the *legume* or pod (from the Latin *legumen*, from the verb *lego*, to gather), a seed-vessel which splits into two valves, having the seeds attached only to one suture or seam at the union of the margin of the valves, as in the whole pea-flower tribe, example the lotus (Fig. 109); the *capsule* (from the Latin *capsula*, a little chest),

Seeds, the reader will remember, belong exclusively to flowering plants; and we shall presently discover that seed-admit of two natural divisions characterised by a difference of structure—one division corresponding with endogenous, the other with exogenous plants.

Did the reader ever remember planting a bean for amusement? Most young people have done this, and we will assume that the reader of this lesson has done it.*

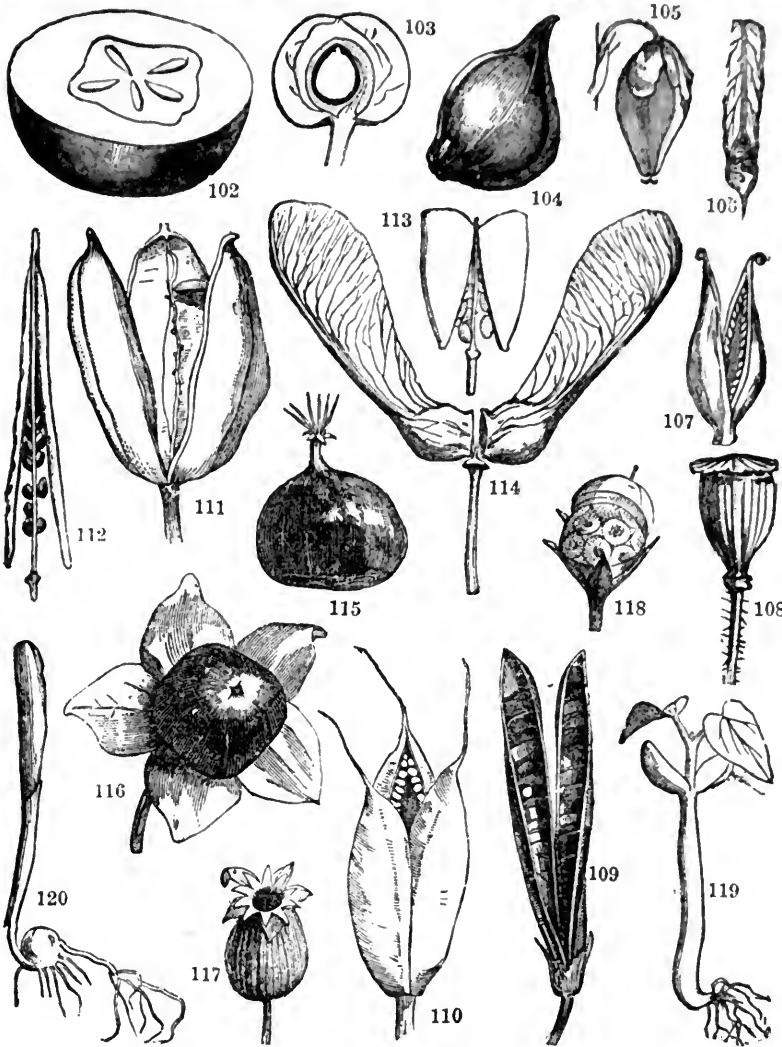
After having remained in the earth a few days, the bean throws up a shoot terminating in two little leaves. These little leaves were embedded, in miniature proportions it is true, in the bean, and may be recognised there by careful examination; however, by planting the bean they are rendered much more evident (Fig. 119). These two thick seed-leaves are termed *cotyledons*, from the Greek *κοτυλη* (*kotylē*), a cup; and the bean, from possessing two of these cotyledons, is called a *dicotyledonous* plant.

Again, perhaps the reader has at some period of his life planted a grain of wheat, barley, or, still better, Indian corn (Fig. 120). If he has done this, he may have remarked the result to have differed from that noticeable when the bean was planted. Instead of two seed-leaves, or cotyledons, only one in this case appears on the young plant, which, therefore, is said to be a *monocotyledonous* plant. Extending these inquiries still further, it will be found that all plants whose fibro-vascular system grows by external depositions, and

which possess reticulated leaves—in other words, all exogenous plants—yield dicotyledonous seeds; and all plants whose stems grow by internal depositions, and which possess straight-veined leaves, yield monocotyledonous seeds.

Thus, then, it follows that even already the reader is so far master of the principles of botanical classification, that he could indicate the grand division of the vegetable kingdom to which any plant belonged by one of three classes of signs—namely,

* The germination of a bean may be watched from day to day by suspending the seed over water in the month of a hyacinth-glass, or crocus-glass. The bean should not be allowed to do more than barely touch the water.



102. POME. 103. DRUPE. 104. ACHELIUM OF THE RANUNCULUS. 105. CARYOPSIS OF THE BUCKWHEAT. 106. FOLLICLE OF THE COLUMBINE. 107. CAPSULE OF THE GENTIAN. 108. CAPSULE OF THE CORN POPPY. 109. LEGUME OF THE LOTUS. 110. CAPSULE OF THE COLCHICUM. 111. CAPSULE OF THE IRIS. 112. SILIQUA OF THE CELANDINE. 113. SILICULE OF THE SHEPHERD'S PURSE. 114. SAMARA OF THE MAPLE. 115. NUT OF THE CHESTNUT. 116. BERRY OF THE DEADLY NIGHTSHADE. 117. CAPSULE OF THE LYCHNIS. 118. PYXIS OF THE PIMPERNEL. 119. GERMINATION OF THE BEAN. 120. GERMINATION OF INDIAN CORN.

a pericarp which may have one cell only, or many cells, and which splits into pieces by valves, as in the gentian (Fig. 107); the colchicum (Fig. 110), the iris (Fig. 111), the lychnis (Fig. 117), and the corn-poppy (Fig. 108); the *pyxis* (from the Gr. *πυξίς* [*pyxis*], a box), a fruit which is like a box and throws off a cap, as in the pimpernel (Fig. 118); the *siliqua* (from the Latin *siliqua*, a husk or pod), a pod which splits into two pieces or valves separating from a frame, and which is longer than it is broad, as in the celandine (Fig. 112); the *silicle* (from the Latin *silicula*), a little pod or husk, the diminutive of *siliqua*, a pod, which splits into two pieces or valves, separating from a frame, and which is about as broad as it is long, as in the Shepherd's Purse (Fig. 113); the *samara* (from the Latin *samera*, an elm-seed), a fruit which is hard, thin, and extended into a wing, as in the maple (Fig. 114); the *nut* (from the Anglo-Saxon *hnut*, or the Latin *nux, nucis*, a nut), as in the chestnut (Fig. 115); and the *berry* (from the Anglo-Saxon *beria*, a grape), a succulent or pulpy fruit containing seeds which have no covering but the pulp or rind), as in the deadly nightshade, the fruit of which is shown in Fig. 116.

SECTION XIX.—THE SEED.

The seed, everybody knows, is that part of a plant which, being sown, gives rise to a new plant. We might write a whole treatise on the nature and varieties of seeds, especially as concerns their anatomical construction, but much of this information would be out of place in a series of elementary papers: we shall, therefore, content ourselves with recapitulating some points that have already been adverted to in relation to seeds, and shall then mention some general facts concerning seeds which must not be forgotten.

the signs of the section of the stem, the signs of the leaf, and, lastly, the signs of the flower. We may, therefore, divide the various members of the vegetable kingdom as follows:—

Cryptogamic, or flowers not apparent.

Phænogamous, or flowers apparent.	{ Endogenous. Monocotyledonous. Leaf-veins parallel. Parts of the flower in fours or fives. Exogeuous. Dicotyledonous. Leaf-veins reticulated. Parts of the flower in threes.

LESSONS IN GERMAN.—XVII.

SECTION XXXI.—INSEPARABLE PARTICLES.

BESIDES the separable particles (Sect. XXVI.), there is another class (be, emp, ent, er, mis, ver, etc., § 94) that, unlike the former, are never used apart from the radical words to which they are prefixed, and hence are called inseparable particles; thus by the union of these particles be, emp, ent, er, etc., with the radicals seßen, etc., we have the compounds befeßen, empfeßen, entfeßen, erseßen, misfallen, verfeßen, zumalmen, etc., corresponding in formation to the English compounds be-tray, de-rive, dis-may, mistake, etc. With few exceptions (as befeigen, befeien), however, German, unlike most English radicals, may be used as well alone as in combination with prefixes; as, stören, to disturb; zerstören, to demolish.

Many particles in German, which are used to modify radical verbs, have their exact equivalents in English, as:—Deuten, to interpret; mißtauten, to misinterpret; fallen, to fall; befallen, to befall, etc. (§ 97. 1, 2, etc.)

In German, as in English, the inseparable particles never take the primary accent. (§ 98.)

1. Ver, which is often rendered by the English "ago," unlike the latter, always precedes the word of time to which it refers, as:—Er war vor zwei Stunden hier, he was here two hours ago (literally, he was here before two hours).

Zeit (since), when used with words denoting time, often answers to "for" or "during," as:—Er ist seit einer Woche krank, he has been (literally is, see Sect. XVII. 6) sick for a week. Ich habe ihn seit einem ganzen Jahre nicht gesehen, I have not seen him during a whole year (a whole year since).

VOCABULARY.

Ant'worten, to answer (intransitive).	Erst, to eat.	Stiefel, m. boot.
Beant'worten, to answer (transitive).	Gewit'ter, n. tempest, thunder and lightning.	Stören, to disturb, interrupt.
Begrün'den, to constitute.	Saten, to hold.	Tragen, to carry.
Beschreib'en, to describe.	Nest, n. nest.	Trinken, to drink.
Be'tragen, to behave.	Paar, n. pair.	Ver'sprechen, to promise.
Erfind'en, to invent.	Reise, f. journey.	Ver'stehen, to understand.
Erhalt'en, to receive.	Reisen, to travel.	Zeit'ung, f. newspaper, gazette.
Ertlic'trigen, to lower.	Schwalbe, f. swallow.	Zerstören, to destroy, demolish.
	Sich, himself, etc. (Sect. XVII. 2.)	

RÉSUMÉ OF EXAMPLES.

Diesen schönen Kanarienvogel hat mein Vater heute Morgen gegeben.	My father gave me this beautiful canary-bird this morning.
Die Freunde haben sich in den Garten begegnet.	The friends have betaken themselves to the garden.
Die feindliche Armee hat sich ergeben.	The hostile army has surrendered (itself).
Der Lehrer hat dem Knaben vergeben.	The teacher has pardoned the boy.

EXERCISE 54.

1. Will Ihr Sohn mein Pferd halten? 2. Er hat es gehalten, aber er hat einen Brief erhalten, welchen er lesen will. 3. Wie hat sich dieser Knabe betragen? 4. Er hat sich gut betragen, er hat meinen Regenschirm getragen. 5. Die Russen haben einen tapfern Felder gewonnen. 6. Die Deutschen haben viele nützliche Künste erfunden. 7. Dieser Bettler hat eine Stunde an der Thüre gestanden, er hat mich nicht verstanden. 8. Hat der Schuhmacher Zeit, mir ein Paar (Sect. LXI.) Stiefel zu machen? 9. Er hat keine Zeit, Ihnen Stiefel zu machen, er hat Andern zu viel versprochen. 10. Hat der Bauer mehr Kaffee zu trinken, als Brod zu essen? 11. Er hat Brod genug zu essen und Wasser zu trinken, aber er hat keinen

Kaffee. 12. Haben Sie dieselben Bücher, welche mein Nachbar gehabt hat? 13. Hat der Matrose seinem Bruder geantwortet? 14. Nein, ich habe seinen Brief beantwortet.

EXERCISE 55.

1. They have recommended the foreigners to me and to you. 2. There lives in Naples a friend of mine; I shall recommend him to you. 3. One of my friends, whom you have seen with me, has travelled in America, and has written a letter to me, in which he describes his journey. 4. A man of honour lowers himself to [ver] nobody, in whatever condition he may find himself. 5. Did you receive the news before us? 6. I received it after you; the whole neighbourhood too was informed of it, as we received your letter. 7. The children promised their father to be obedient. 8. Advantages may be derived from this invention, which nobody can account for.

VOCABULARY.

Anfangen, to begin.	Aus'faher, m. foreigner.	Feuer, n. fire.
Ankommen, to arrive.	Aus'machen, to kindle (to make a fire).	Sech's, six (§ 44).
An'sehen, to light.	Erheben, to raise.	Trösten, to comfort.
Auf'sehen, to rise.	Erzeigen, to render, show, do.	Verletzen, to hurt.
Aus'gehen, to go out.		Ver'nügen, n. pleasure
		Wert, n. word.
		Zweimal, twice (§ 50).

EXERCISE 56.

1. Geht Ihr Herr Vater heute nicht aus? 2. Er ist schon ausgegangen, er ist (Sect. XXII.) heute Morgen sehr früh aufgestanden. 3. Wo ist er hingegangen? 4. Er ist zu seinem Nachbar gegangen, er will auf das Land gehen. 5. Wo wollen Sie hingehen? 6. Ich muß auf den Markt, in den Garten, an den Brunnen gehen. 7. Sein Freund hat ihm geschrieben, daß er in Amerika angekommen ist. 8. Wann haben Sie angefangen, Deutsch zu lernen? 9. Ich habe vor sechs Wochen angefangen zu lesen. 10. Wann wollen Sie anfangen, französisch zu lernen? 11. Ich habe schon angefangen zu lesen, und werde bald anfangen zu sprechen. 12. Wollen Sie mir den Gefallen erzeigen, eine Lampe anzuzünden? 13. Ich will es mit dem größten Vergnügen thun. 14. Hat das Dienstmädchen das Feuer schon angezündet? 15. Nein, sie hat es noch nicht angezündet.

EXERCISE 57.

1. Will you have the goodness to pronounce those words to me? 2. Do you pronounce well? 3. I believe I pronounce well, but my brother pronounces better. 4. Many an innocent mind has been hurt by reading pernicious books. 5. The tempest has disturbed the company in their enjoyments, and has destroyed the house. 6. I have papers to read and letters to write. 7. Those persons who set fire to the house ought to be punished.

SECTION XXXII.—VARIOUS IDIOMS.

Beide (plural) is declined like an adjective, and, unlike its equivalent (both), comes after the article or pronoun with which it is used, as:—Die beiden Hände, both the hands; meine beiden Hände, both my hands. Alle (all) is sometimes, for the sake of emphasis, placed before beide, and may together be translated, "both of them," or simply, "both," as:—Alle beide, both of them; both.

1. Beides (neuter singular) is frequently employed to couple two things different in kind, whether designated by nouns alike or different in gender, as:—Wem gehört (§ 129. 2) dieses Messer und dieses Schwert? Beides gehört meinem Freunde, both belong to my friend. Hat Ihnen der Uhrmacher nur die Uhr, oder auch dieses Ring gemacht? Er hat Beides gemacht; or, Beide gemacht. Sind Sie mit der Uhr und dem Ring zufrieden? Nein, ich bin mit Beidem unzufrieden, denn Beides ist nicht nach meinem Wunsch, no, I am dissatisfied with both, for both are not according to my wish.

2. For the pronoun "neither" the phrase keines or keins von beiden is used, as:—Haben Sie das neue oder das alte Buch? Ich habe keins von Beiden. I have neither (of the two).

3. Recht and Unrecht, like the words "right" and "wrong," are nouns, adjectives, and adverbs. The phrases, however, "to be right, to be wrong," are expressed in German by the noun, with the transitive verb haben, as:—Er hat Recht, he (has) is right. Sie haben nicht Unrecht, you (have) are not wrong.

4. Eben so, before an adjective, signifies "just as," as:—Dieses Kind ist eben so alt wie jenes, this child is just as old as that. Dieser Mann hat eben so viel Klugheit wie Versam, this man has just as much prudence as understanding.

5. Ganz wie, with a verb, signifies "precisely," or "just as," or "like," as:—*Er ist ganz wie ich, he is just as I (am), he is just like me.* Sie reut ganz wie er, she thinks precisely as he (thinks), she thinks precisely like him.

6. Noch, besides meaning "nor," when used in conjunction with *more*, "neither," is variously rendered by "still some, or yet more, another, besides," etc., as:—*Er schläft noch, he sleeps still.* Geb dem Kinde noch *W*er, give the child some more bread. Wann hat er noch ein Pferd gekauft? when did he buy another horse? Einen Apfel hat das Kind gegessen, aber es hat noch einen, the child has eaten one apple, but it has one besides (or another).

7. Mehr, connected with a negative word, is used like its equivalent "more," as:—*Ich habe keine mehr, I have no more.* Ich habe nicht viel mehr, I have not much more. Used with a noun, the adverb follows, while in English it precedes the noun.

8. *Ander* signifies *other*, in the sense of *different*; it must not be used in phrases like, "I saw him *the other day*," which is in German, *Ich sah ihn neulich* (literally, *recently*); or, *Ich sah ihn vor einigen Tagen* (literally, *a few days ago*).

9. The neuter *andere*, preceded by *etwas* (in conversation usually contracted to *was*), is rendered by the phrase "another thing," as:—*Das ist etwas Andere, or, das ist was Andere, that is another thing.*

10. The adverb *andere*s is readily distinguished by its form, and is rendered by "otherwise, differently," etc., as:—*Er spricht andere, als er reut, he speaks otherwise than he thinks.*

VOCABULARY.

Abfahren, to depart, start.	Gustav, m. Gustavus.	Spazie'tenzehen, to take a walk.
Ander, other (R. 8).	Santeln, to act, deal.	Staat, m. state.
Andere (R. 9).	Insgesammt, altogether.	Thaler, m. thaler (a German coin, worth about 3s.)
Anders, otherwise, differently.	Irren, to err.	Trennen, to separate.
Ausbleiben, to remain out.	Kohle, f. coal.	Un'angebau't, uncultivated.
Beide, both.	Liefern, to furnish.	Unmög'lich, impossible.
Beides (R. 1).	Wit'nahmen, to take with.	Unrecht, wrong.
Besuchen, to visit.	Mittel, n. means.	Verständ'ig, intelligent, sensible.
Da'bleiben, to remain (there).	Muster, n. pattern.	Waare, f. ware, goods.
Dampfschiff, n. steamship.	Pennsylvanien, n. Pennsylvania.	Weg'nehmen, to take away.
Eben so, just as (R. 4).	Pflaume, f. plum.	Winter't, m. winter coat.
Einige, some, several.	Recht, n. right.	Wohlfel, cheap.
Elise, f. Eliza.	Reden, to speak, talk.	Zu'schauer, m. spectator.
Erlauben, to allow.	Rühren, to move, affect.	Zweck, m. aim, purpose.
Freutenthräne, f. tear of joy.	Sache, f. thing, affair.	
Geleert, empty.	Som'mer't, m. summer coat.	

RÉSUMÉ OF EXAMPLES.

Er hat zwei Söhne, aber beide sind taubstumm.	He has two sons, but both are deaf and dumb.
Der Riese faßte die Keule mit beiden Händen.	The giant seized the club with both hands.
Hat der Kaufmann ein Pferd oder einen Wagen?	Has this merchant a horse or a wagon?
Er hat Beides.	He has both.
Die Wahrheit und die Rose sind sehr schön, aber Beide haben Dornen.	The truth and the rose are very beautiful, but both have thorns.
Ein aufrichtiger Mann verabscheut eine Lüge.	An upright man abhors a lie.
Nah jeder Mensch hat eben so viel Kummer als Freude.	Nearly every human being has quite as much sorrow as joy.

EXERCISE 58.

1. Wollen Sie ein Muster von diesem oder jenem Tuche haben? 2. Von wem von beiden. 3. Wir geben ihm einen Thaler für jeden der beiden Männer. 4. Trinken Sie Wein oder Bier? 5. Ich trinke weder Wein noch Bier (or, ich trinke keines von beiden). 6. Sie haben Recht, daß Sie das gethan haben. 7. Ist es recht, daß Johann so lange ausbleibt? 8. Nein, es ist unrecht von ihm, ta er seine Aufgaben zu lernen hat. 9. Wie viel Tuch braucht der kleine Friedrich zu (Sect. LXXIII. 1) einem Sommerroco? 10. Er braucht eben so viel, wie zu einem Winterroco.

11. Der Staat Pennsylvania liefert eben so viel Kohlen, als ganz England. 12. Arbeit Gustav nicht eben so viel, wie sein Bruder Hermann? 13. Die kleine Elise gab ihrer Schwester Pauline eben so viel Pfanduen, wie ihrer Freundin Emma. 14. Haben unsere Nachbarn noch keinen Garten? 15. Nein, sie haben noch keinen. 16. Bleiben Sie noch lange auf dem Lande? 17. Ich bleibe noch eine kurze Zeit da, und meine Freunde auch. 18. Geben Sie heute noch spazieren? (Sect. LXIV. 1.) 19. Nein, denn ich muß noch arbeiten. 20. Die Freuenthränen der lang getrennten Freunde ergüßten die Herzen aller Zuschauer. 21. Können Sie die Waaren nicht billiger verkaufen? 22. Es ist kein unmöglich. 23. Sie müssen etwas anderes machen. 24. Was kann ich anders thun? 25. Du kennst anders reden am besten. 26. Ich werde Sie besuchen, wenn Sie es erlauben. 27. Ge erizable wie Sie Sache ganz anders. 28. Es ist etwas anderes, ob ich schreibe: er ist „geleert," oder „geleert."

EXERCISE 59.

1. Has the teacher taken away the paper or the book? 2. He has taken away both; for both belong to him. 3. Both towns are situated on navigable rivers. 4. They may take either way, as they have proceeded so far. 5. A great part of the land in America is still uncultivated. 6. He who wants the purpose, must will the means. 7. The Rhine steamboat has just started for Holland. 8. You err altogether when you say that you have quite surmounted every difficulty, otherwise all that you have stated would be correct. 9. Which of us is right, I or he? 10. You are both wrong. 11. It is quite another thing to say that he was not well, and could not come in consequence of it. 12. I shall speak no more about it; because I have found upon closer investigation, that he is neither covetous nor prodigal. 13. They do not think themselves better than others. 14. Emma is just as intelligent as Eliza. 15. The sailor sets sail for America to-morrow. 16. Do you drink wine or beer? 17. I drink neither wine nor beer, I always drink water. 18. Gustavus gave the boy a thaler to buy some coals for his mother. 19. Pennsylvania is a rich and flourishing state in the United States of America. 20. She is just like her sister. 21. Give the boy some more plums. 22. I have no more. 23. The girl shed tears of joy when she saw her mother. 24. That ware is cheap, and the pattern of it is beautiful. 25. My friend has purchased a new winter coat. 26. This merchant sends his goods to the town in a wagon. 27. Will you take a walk to-morrow? 28. It is impossible.

MECHANICS.—VIII.

THE THREE ORDERS OF LEVERS.—THE COMMON BALANCE.

Of Levers there are commonly reckoned three kinds, of which Figs. 45, 47, and 49 furnish illustrations, in which the bar extends to equal distances on either side of the fulcrum, F; in order that, the centre of gravity being supported at F, it may not by its weight interfere with the action of the Weight and Power. In that case we must consider the true lever only as so much of the bar as is between P and w, or P or w and F, the points of application and the fulcrum. These levers are said to be of three orders.

First Order.—When the fulcrum is between the Power and Resisting Weight.
Second Order.—When the fulcrum is at one end, and the Weight nearer to it than the Power.
Third Order.—When the fulcrum is again at one end, but the Power nearer to it than the Weight.

First Order.—The Condition of Equilibrium in this we have already determined in connection with the balls in Lesson VI. (Fig. 44). The Resisting Weight (Fig. 45) is to the Power inversely as w F to P F, or the weight multiplied by the arm, w F, is equal to the power multiplied by the arm P F. Of this kind of lever the examples are very numerous. In Fig. 46 the crowbar is used as a lever, by means of the fulcrum in the middle, to lift the chest, the push of the hand and the weight of the chest, both parallel



Fig. 45.



Fig. 46.

forces, acting downwards. A poker put into a fire to raise the coals is also an example, the bar of the grate being the fulcrum; the handle by which a pump is worked is another. A pair of scissors is a double lever of this kind, of which the connecting rivet is the fulcrum, the force of the finger and thumb at one end being the power which overcomes the resistance of the cloth to be cut. A gardener at work with his spade is also a familiar illustration. After he has driven it into the ground he forces the handle downwards, making a temporary fulcrum of the harder earth at its back. In all the principle is the same.

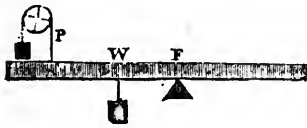


Fig. 47.

Second Order.—This is a no less important class; but the Power and Resistance, not as in the former case, act in *opposite* directions, as in Fig. 47; and this accounts for the fulcrum having both these forces on one side of it, for, as I have shown in the last lesson, the forces being opposite, the resultant, which, for equilibrium, must pass through the fulcrum, cannot lie between them. Moreover, as it has been shown there that the distances of *o* from *A* and *B* (see Fig. 44, page 250) are inversely as the forces, so here the distances *P F* and *w F* must be *inversely* as the power and resistance, or, what is equivalent, the power multiplied by its arm *P F* is equal to the weight multiplied by its arm *w F*. In this order of levers, as in the former, it should be observed that there is a mechanical advantage gained—a larger weight at *w* is overcome by a lesser at *P*, a result always to be secured where the larger arm can be given to the power.

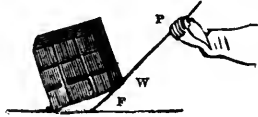


Fig. 48.

As an example of this lever, take the crowbar in the illustration in Fig. 48, used differently from that in Fig. 46. The workman makes the ground at the point of his bar his fulcrum, throws the weight of the chest about the middle, and, instead of pushing downwards with his hand, lifts upwards. The mechanical advantage is clearly on his side. The oar of a boat is also a lever of the second order; the arms of the oarsman furnish the power; but most persons at first imagine that the rowlock is the fulcrum. This is natural, for it looks very like one, but that it is not such is evident from the fact that the boat is the thing he wants to move. To spurt the water about with the blade is not his object, but with each stroke he makes a temporary fulcrum of the water, by which he imparts a smart blow to his boat, and sends it ahead. The fulcrum is then in the water at one end, the resistance in the middle, and the power at the other end. A nut-cracker furnishes another instance—the fulcrum at the joint, the resisting nut in the middle.

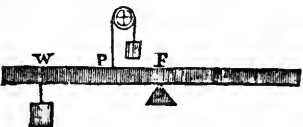


Fig. 49.

Third Order.—Here again the Resistance and Power, as in Fig. 49, are parallel forces acting in *opposite* directions, and the condition of equilibrium is the same as in the last order, and for



Fig. 50.

a similar reason; but the mechanical advantage is against the power, which from being nearer the fulcrum must be greater than the resistance. The best examples are found in the limbs of animals. The leg of a horse is a pair of levers with a joint in the middle, which he can make into one or use separately as

he likes by means of the muscles attached to them along their lengths. The fulcrum is in the shoulder-joint or the knee-joint, and the resistance is at the hoof when he puts forth his strength to pull a load.

If a man stretches his arm out straight, and so lifts a weight, that weight is the resistance; the shoulder is the fulcrum, and he must put forth a strength by his muscles in the middle greater than the weight before he succeeds in lifting it. If he moves only the lower joint, as in Fig. 50, his elbow is the fulcrum, and the power is midway.

It may be asked, Why ever use a lever in which the power is at a mechanical disadvantage? The answer to be given is, that to lift a large weight by a small

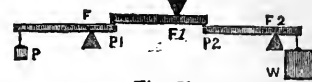


Fig. 51.

force is not the only object aimed at in mechanism, *natural* or artificial. It is as often desirable to give the end of a lever a very rapid motion, and this can be done with most advantage when it is of the third order. The amount of force put forth in such cases is no consideration in comparison to rapidity of action, especially in animal mechanics. To strike a swift and smart blow with the closed hand, or with a sword in the hand, as it is often necessary to do, a lever of the third order is the most effective.

Levers of the various orders are often worked *together*, so as to make compound levers, the resistance end of one working into the power end of the other. In this way the effect of a small power is often very largely multiplied, and a very great resistance easily overcome. Such a compound lever is that in Fig. 51, where all are of the first order, three fulcrums at *F*, *F*₁, *F*₂, a power at *P* overcoming a resistance at *P*₁, and there multiplied overcoming a second resistance at *P*₂, and this eventually lifting the still greater weight *w*. The power is multiplied in the first lever inversely as the length of the arms, also in the second, and so also in the third. Suppose, for example, the power at *P* is *one pound*, and the short arm of each lever a third of the long one, then the 1 pound at *P* produces at the end of the long arm of the second lever at *F*₁ a force of 3 pounds. This again produces at *P*₂ in the third lever 3 times 3, or 9 pounds; and thus 1 pound eventually balances a weight of 27 pounds at *w*, the mechanical advantage gained by the combination being 27 to 1.

But suppose that the lengths of the arms were in the proportion of any other numbers in the several levers—say 9 to 4 in the first, 7 to 3 in the second, 5 to 2 in the third; what weight would 1 pound at *P* support at *w*? It is not difficult to discover, if you know something about multiplying fractions. Now, in the first lever, by the principle of moments, already explained, 9 times the 1 pound at *P* is equal to 4 times the power produced by that pound in the second lever at *P*₁; that is to say, this second power is $\frac{9}{4}$ of a pound. But this force, for the same reason, is multiplied at *P*₂ in the proportion of 7 to 3, and therefore becomes $\frac{7}{3}$ of $\frac{9}{4}$ of a pound, and this eventually balances a weight at *w* of $\frac{7}{3}$ of $\frac{9}{4}$ of $\frac{9}{4}$ of that unit, or, on making the calculation, the 1 pound balances 13 pounds 2 ounces. And, of course, what is true of these numbers is true of all others, and the rule you arrive at is this—

Rule.—Multiply together the fractions which represent the ratios of the Power arms to the Resistance arms, and the product obtained is the number of pounds of the Resistance which each pound of the Power balances. When the Power is more than 1 pound, multiply this number into that of the pounds and fractions of a pound in it.

And this leads us to another result, which expresses the relation between the power and resistance *without fractions*. Since, in the above example, we had the resistance equal to $\frac{7}{3}$ of $\frac{9}{4}$ of the power, it is evident that the three denominators multiplied into the resistance must be equal to the three numerators into the power, and thus, extending the principle, we may say that—

The Power multiplied by the several lengths of the Power arms is equal to the Resistance multiplied by those of the Resistance arms.

And you thus have a result not unlike that established above for a single lever. And observe that this, though proved above only for a combination of levers of the *first* order, holds equally good of other combinations, mixed or unmixed, all of the second, or all of the third, or of two kinds, or of all three together.

The principle of moments is true for each kind, and therefore for their combinations. For this reason I have above avoided, in the statement of the *general principle*, the terms "long arm" and "short arm," but used instead "power arm" and "resistance arm," indicating thereby the arms that work *with* the power or *with* the resistance.

The example of a combination of levers which is most likely to interest you, is the common *weighing machine*, used for weighing loaded market carts, or luggage at railway stations.

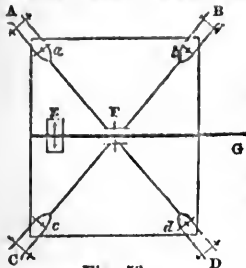


Fig. 52.

cularly from the ground, and is attached above to the short arm of another lever—one of the first order, generally a steelyard, to be afterwards described—to the longer arm of which the weighing counterpoise is attached. We thus have a triple combination of levers, the first four at the bottom, by being united at F, being virtually one lever. On these four at *a, b, c, d*, are four points of hardened steel, presented upwards, on which rests the square wooden platform, on which the cart or luggage to be weighed is placed. The weight pressing at *a, b, c, d*, tends to depress the common end, F, of the four levers, and with it also the end, G, of the lever EFG. The latter tries to pull down the rod, and with it the short arm of the steelyard above, which pull is resisted by the counterpoise on the longer arm of the steelyard, producing equilibrium, and making known the weight of the cart or luggage.

For example, taking the four platform-levers as one, suppose the resistance arms in the combination are each one-fifth of the power arms, then evidently, as proved above, the resistance is 5 multiplied *three times* into the power—that is to say, 1 pound above on the steelyard balances 125 pounds, or 1 cwt. and 13 pounds on the platform. If the proportion were one-eighth, it would balance $4\frac{1}{8}$ cwt. 8 pounds, which strikingly illustrates the mechanical advantage gained in these machines. We will now consider the common balance, and, in the next lesson, examine the principles of other weighing instruments, bent levers, and the wheel and axle, and their combinations.

THE COMMON BALANCE.

Of weighing instruments, the scale, or common balance, claims the first attention. It is a lever of the first order, in which the counterpoise, or power, is equal to the resistance, or substance weighed. There is first the beam, A B, at the ends of which (Fig. 53) are the hooks, from which hang the chains or cords which support the pans or scales below. Since the weights in the scales are required to be equal, the fulcrum, F, should be in the middle of the beam, equally distant from the points of suspension of the chains, else the balance is fraudulent, for the purchaser who has his tea or sugar served to him from the end of the longer arm is getting less than his money's worth. I shall direct your attention to the case in which the line joining the points, A B, of suspension passes through the supporting point of the fulcrum, as it is the simplest; and balances of this kind, as you will see, have a peculiar advantage as to their sensibility.

Now, it is evident, since A B is bisected at F, and the scales, chains, and weights on either side are equal forces, that whatever be the position in which I place the beam, the resultant of these forces must pass through F, and, being there resisted, leave the whole apparatus at rest. Moreover, if the centre of gravity of the beam is at F, so far as its weight is concerned, there will be equilibrium in every position. But such a pair of scales would be utterly useless, since, for equal weights, the arms should rest *only* in an horizontal position.

How, then, is this latter object accomplished? By having the centre of gravity of the beam below the fulcrum, when the

arms are horizontal. The desired position is then one of *stable equilibrium* (see Lesson VII.), to which the beam will revert when displaced from it, and in which the line F G is perpendicular to the line A B, joining the points of suspension of the scales. For a good pair of scales, therefore, there must be *stability* as well as accuracy.

But a balance should also be *sensitive*—should indicate a slight difference of weights in the scales. How is this secured? Suppose the scales equally loaded, and that a slight additional weight (call it P), is thrown into the scale *a* in Fig. 53, causing it to decline through some angle agreed upon as sufficient to indicate a difference of weights to the eye. As *a* descends, the centre of gravity, G, of the beam ascends at the other side, until its weight (call it W), acting at G, balances P. We have thus a new lever, A D, the fulcrum of which also is F, and at whose ends the forces P and W act. And since in that case, as proved in the last lesson, P multiplied by A F must be equal to W multiplied by F D, the length A B, and the weight W, of the beam being the same in any number of balances in a manufactory, that one which moves through the angle agreed on, with the smaller additional weight P, must also have F D smaller; or, which comes to the same thing, since the angles of the triangle F G D are given, that at F being a right angle, it must have F G smaller. Everything else, therefore, being the same, that balance has the greater sensibility, the centre of gravity of whose beam is as little as possible below the fulcrum. Summing up, then, we have for the requisites of a good balance the following:—

1. For Accuracy.—That the arms be equal.
2. For Stability and Horizontality.—That the centre of gravity of the unloaded beam be below the fulcrum, on a line through its supporting point, perpendicular to that which joins the points of suspension of the scales.
3. For Sensibility.—That the centre of gravity of the beam be as little as possible below the fulcrum.

You will observe that the second and third conditions oppose each other. The lower the centre of gravity is below the fulcrum, the greater is its *stability*, but the less its *sensibility*. Both qualities are essential, and are therefore secured only by a compromise; the centre for sensibility may approach the fulcrum, but not too close; for stability it keeps off, but not too far.

Further, observe the consequence of making the line joining the points, A B, of suspension pass through the fulcrum. However the pans are loaded, it is only the *difference* (P) of the weights in them that affects the *sensibility*. The resultant of the lesser one in B, and of as much of that in A as is equal to it, passes through and is resisted by F, and affects neither stability nor sensibility. If A B were not to pass through F, then these weights would have influence as regards these qualities, but that kind of balance we are not here considering.

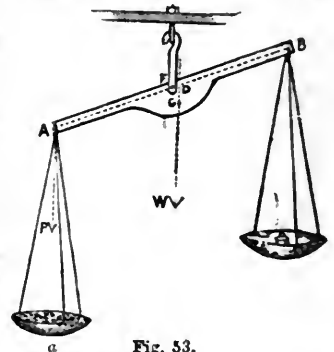


Fig. 53.

A most important question is, how to detect fraud in a pair of common scales. The arms in that case not being equal, all the purchaser has to do, if he doubts the honesty of his tradesman, is, after the first weighing, to make the shop weight and the substance weighed change pans. If the two balance each other equally as before, the scales are honest—the arms are equal; but if not, fraud is proved.

But how, in that case, may the purchaser still get his true pound of tea, or sugar, or other commodity? The shop weight being supposed true, the imperial stamped weight, let the deficient tea be weighed as before from the longer dishonest arm. Leaving it then in the scale, let him require the shopman to remove the weight from the other scale, and fill it with tea until that in the first one is balanced. He now has a true pound of tea balancing the deficient pound, as the imperial weight first did. Let him carry off this pound, and he has his money's worth.

But there is another way by which the purchaser may not

only get his due quantity, but turn the tables on the vendor, and by the very fraudulent balance itself get more than his money's worth. Suppose he is buying two pounds; then let him have one pound weighed in one scale and the other pound in the other scale; it so happens that *invariably* the two together are more than two pounds. The reason you will understand by an example. Suppose one arm is 14 inches long, and the other 15 inches. Then, weighed at the latter arm, the purchaser gets only $\frac{14}{15}$ ths, which is less, but at the former $\frac{15}{14}$ ths, which is more than one pound. But by the latter he gains a $\frac{1}{14}$ th of a pound more than he is entitled to, while at the former he loses only $\frac{1}{15}$ th. So on the whole, since a $\frac{1}{14}$ th is greater than a $\frac{1}{15}$ th, he is a gainer; he has caught the vendor in his own trap. Or, you may add up the two fractions $\frac{14}{15}$ ths and $\frac{15}{14}$ ths, and the sum you will find to be greater than 2 by the fraction $\frac{1}{210}$. And what is true of these numbers is true of all others, which represent the proportion of the arms—what you lose at the long arm is more than recompensed by what you gain at the short one.

READING AND ELOCUTION.—IX.

ANALYSIS OF THE VOICE (continued).

II.—DUE QUANTITY, OR LOUDNESS.

THE second characteristic of good reading, is the use of that degree of loudness, force, "volume," or "quantity," of voice which enables those to whom we read or speak, to hear, without effort, every sound of the voice; and which, at the same time, gives that degree of force which is best adapted to the utterance of the sentiments which are read or spoken.

All undue loudness is a great annoyance to the ear, and an injury to the expression; while a feeble and imperfect utterance fails of the main purposes of speech, by being partly or entirely inaudible, and consequently utterly unimpressive.

The failure, as regards loudness, is usually made on passages of moderate force, which do not furnish an inspiring impulse of emotion, and which depend on the exercise of judgment and discrimination, rather than of feeling.

It is of great service, however, to progress in elocution, to possess the power of discriminating the various degrees of force which the utterance of sentiment requires. The extremes of very "loud" and very "soft," required by peculiar emotions, have been exemplified in the exercise on "versatility" of voice.

There are three degrees of loudness, all of great importance to the appropriate utterance of thought and feeling, required in the usual forms of composition. These are the following:—"Moderate," "forceful," and "impassioned." The first, the "moderate," occurs in the reading of plain narrative, descriptive, or didactic composition, addressed to the understanding, rather than to the feelings; the second, the "forceful," is exemplified in energetic declamation; the third, the "impassioned," occurs in the language of intense emotion, whether in the form of poetry or of prose.

Watchful attention will be required, on the part of the student, in practising the following examples, so as to enable him to detect, and fix definitely in his ear, the exact degree of loudness appropriate to each passage. The exercises should be repeated till they can be executed with perfect precision, so as to form a standard for all similar expression, in subsequent reading.

Exercise in "Moderate" Force.

An author represents Adam as using the following language:—"I remember the moment when my existence commenced: it was a moment replete with joy, amazement, and anxiety. I neither knew what I was, where I was, nor whence I came. I opened my eyes: what an increase of sensation! The light, the celestial vault, the verdure of the earth, the transparency of the waters, gave animation to my spirits, and conveyed pleasures which exceed the powers of utterance."

"Declamatory" Force.

Advance, then, ye future generations! We bid you welcome to this pleasant land of the Fathers. We bid you welcome to the healthful skies and the verdant fields of New England. We greet your accession to the great inheritance which we have enjoyed. We welcome you to the blessings of good government and religious liberty. We welcome you to the treasures of science and the delights of learning. We welcome you to the transcendent sweets of domestic life, to the

happiness of kindred, and parents, and children. We welcome you to the immeasurable blessings of rational existence, the immortal hope of Christianity, and the light of everlasting truth!

"Impassioned" Force.

Shame! shame! that in such a proud moment of life,
Worth ages of history,—when, had you but hurled
One bolt at your bloody invader, that scold
Between freemen and tyrants had spread through the world,—

That then,—oh! disgrace upon manhood!—e'en then
You should linger,—should cling to your pitiful breath,—
Cower down into beasts, when you might have stood men,
And prefer a slave's life to a glorious death!

It is strange!—it is dreadful!—Shout, Tyranny, shout,
Through your dungeons and palaces, "Freedom is o'er!"—
If there lingers one spark of her fire, tread it out,
And return to your empire of darkness once more.

III.—DISTINCT ARTICULATION.

Correct articulation is the most important exercise of the voice and of the organs of speech. A reader or speaker, possessed of only a moderate voice, if he articulates correctly, will be better understood, and heard with greater pleasure, than one who vociferates. The voice of the latter may, indeed, extend to a considerable distance; but the sound is dissipated in confusion: of the voice of the former not the smallest vibration is wasted—every sound is perceived at the utmost distance to which it reaches; and hence it even penetrates farther than one which is loud, but badly articulated.

In just articulation, the words are not hurried over, nor precipitated syllable over syllable; nor, as it were, melted together into a mass of confusion; they are neither abridged nor prolonged; nor swallowed, nor forced, and, if I may so express myself, shot from the mouth; they are not trailed nor drawled, nor let slip out carelessly, so as to drop unfinished. They are delivered out from the lips, as beautiful coins newly issued from the mint, deeply and accurately impressed, perfectly finished, neatly struck by the proper organs, distinct, sharp, in due succession, and of due weight.

This department of correct reading belongs, properly, to the stage of elementary lessons. But negligence in general habit, and remissness in early practice, are extensively the causes of an imperfect articulation.

A paragraph or two of every reading lesson should, previous to the regular exercise, be read *backward*, for the purpose of arresting the attention, and securing every sound in every word.

The design of the present lesson does not admit of detail in the department of elocution now under consideration. The importance, however, of a perfectly distinct enunciation can never be impressed too deeply on the mind of the student. An exact articulation is more conducive than any degree of loudness to facility of hearing and understanding. Young readers should be accustomed to pronounce every word, every syllable, and every letter, with accuracy, although without laboured effort. The faults of skipping, slighting, mumbling, swallowing, or drawing the sounds of vowels or of consonants, are not only offensive to the ear, but subversive of meaning, as may be perceived in the practice of several of the following examples.

Examples.

1. That last till night : that last still night.
2. He can debate on either side of the question : he can debate on neither side of the question.
3. The steadfast stranger in the forests strayed.
4. Who ever imagined such an ocean to exist?—Who ever imagined such a notion to exist?
5. His cry moved me : his crime moved me.
6. He could pay nobody : he could pain nobody.
7. Up the high hill he heaves a huge round stone.
8. Tho' oft the ear the open vowels tire.
9. Heaven's first star alike ye see.

The following description of a whale chase, taken from Goodsir's "Arctic Voyage," will furnish a useful exercise in distinctness of articulation. Read it with animation and "moderate force," but not too fast.

We pulled in the direction in which the whale was "heading," where the rest of the boats already were; before we got up to them, she had made her appearance at the surface; a second boat had got fast to her,

and just in time, as she was seen to be "loose" from the first. She did not take out much line from this boat, but remained away a considerably longer time than usual, greatly to our astonishment, until we found that she was "blowing" in some holes in the floe, a good distance from the edge of it. One of the harpooners immediately proceeded over the ice with a hand-harpoon, trailing the end of the line with him, assisted by part of his crew, and from the edge of the hole drove his weapon into the body of the poor whale; whilst some of the others following plied the bleeding wretch with their long lances, so that she was soon obliged to betake herself again to the open water outside the floe. Here more of her enemies were waiting, for one boat was immediately upon her, and a gun-harpoon was at once driven almost out of sight into her huge side, which was already bristling with weapons. Our boat was on her very back as she dived with an unwieldy roll, which sent it surging gunwale under, taking the line whistling out for a score of fathoms, until the harpooner, knowing she was pretty well exhausted, stopped her way, by taking three or four turns round the "boltard." But every few seconds she would make a start, dawning the boat almost head under, until the line was permitted to run out again, which, as it did so, made a grinding, burring noise, eating deep into the hard lignum vitae of the boltard, enveloping the harpooner in smoke, and causing the most distinct smell of burning, which was only prevented from actually taking place by the line-manager throwing water constantly on it.

Again she appeared at the surface, but far exhausted; still she made a strong fight for it, lashing about with her tail and fins in fury whenever she seemed to have regained breath. It was no very pleasant sight to see her tail quivering high up in the air, within but a short distance of us, and coming down on the water with a loud, sharp crack, like the report of a dozen rifles, and which, had it alighted on any of our boats, had power sufficient to have converted their timbers into something very like lucifer matches. A few more lances soon settled her; and ere long, she was rolling on her back. The usual cheers of triumph were given, and we had time to breathe and shake ourselves, for it may be believed we had not escaped the showers of spray which the defunct had sent about so liberally. The water far around us was dyed with blood, and covered with a thick pellicle of oil, upon which the Mollys were as busy as they could be, whilst the edges of the ice, as far as we could see, were deeply crimsoned; and a hummock, on the edge of the floe, beside which the final struggle had taken place, was from the summit downward streaked with the black blood which the last few blasts of the dying monster had sent over it.

IV.—CORRECT PRONUNCIATION.

That pronunciation is correct which is sanctioned by good usage or custom. Good usage implies the habit of persons of good education, as regulated by the decisions of learning and taste, exemplified in standard dictionaries—a style which is equally free from the errors of uneducated or negligent custom, and the caprices of pedantry—which falls in with the current of cultivated mind, and does not deviate into peculiarities, on the mere authority of individuals. Good taste in pronunciation, while it allows perfect freedom of choice as to the mode of pronouncing words liable to variation in sound or accent, requires a compliance with every fixed point of sanctioned usage.

The subject of pronunciation, like the preceding one—articulation—belongs properly to the department of elementary instruction. But as this branch of elocution does not always receive its due share of seasonable attention, many errors in pronunciation are apt to occur in the exercise of reading, as performed by even the advanced classes in schools. To avoid such errors, it will be found useful to discuss, closely and minutely, the correct pronunciation of every word which in any lesson is liable to be mispronounced, the standard of reference being any good dictionary of the English language.

LESSONS IN GEOMETRY.—IX.

IN the construction of triangles the student has learnt, by Problem XVI. (page 209), how to draw an equilateral triangle of any dimensions, the only two data (or facts given from which other facts may be deduced) that are required in the formation or construction of an equilateral triangle being, the length of one of its three equal sides on the one hand, or its altitude on the other.

It will be remembered that, in Definition 18 (page 53), it was stated that triangles are classified according to the relation of their sides, as—

EQUILATRAL, Having three equal sides;	ISOSCELES, Having two equal sides;	SCALENE, Having three unequal sides;
---	--	--

and according to the relation of their angles, as—

RIGHT-ANGLED, Having one right angle, and, of necessity, two acute angles;	OBTUSE-ANGLED, Having one obtuse angle, and, of neces- sity, two acute angles.	ACUTE-ANGLED, Having three acute angles.
---	---	--

Now, as the three interior angles of a triangle are together equal to two right angles or 180 degrees, and as an obtuse angle is any angle greater than a right angle or 90 degrees, while an acute angle is any angle less than a right angle or 90 degrees, it is manifest that—

An equilateral triangle must necessarily be an acute-angled triangle, since it has three equal angles, each of which is less than 90 degrees, being one-third of 180 degrees; while

An isosceles, or a scalene triangle, may be a right-angled triangle, or an obtuse-angled triangle, or an acute-angled triangle.

To proceed still further into an analysis of the conditions under which the different kinds of triangles will appear, it may be said that—

I. An acute-angled triangle may have—

1. Three sides equal, and three angles equal, when it is an equilateral triangle.
2. Two sides equal, and two angles equal, when it is an acute-angled isosceles triangle.
3. All its sides unequal, and all its angles unequal, when it is an acute-angled scalene triangle.

II. An obtuse-angled triangle may have—

1. Two sides equal, and two angles equal, when it is an obtuse-angled isosceles triangle.
2. All its sides unequal, and all its angles unequal, when it is an obtuse-angled scalene triangle.

III. A right-angled triangle may have—

1. Two sides equal, and two angles equal, when it is a right-angled isosceles triangle.
2. All its sides unequal, and all its angles unequal, when it is a right-angled scalene triangle.

We have already learnt, as it has been said above, how to draw an equilateral triangle of any dimensions, the conditions necessary for its construction being given. Let us now see what data we require to enable us to draw any isosceles or scalene triangle characterised by having one right angle, one obtuse angle, or three acute angles.

To determine any isosceles triangle, it is plain that we must have one or the other of the following series of data.

I. With regard to the sides without the angles:—

1. The length of the two equal sides, and the length of the third side or base.
2. The length of the two equal sides, and the altitude of the triangle.
3. The length of the base, and the altitude of the triangle.

II. With regard to the sides and angles combined:—

4. The angle at the vertex of the triangle, and the length of the two equal sides.
5. The angle at the vertex of the triangle, and the length of the base.
6. The angle at the vertex of the triangle, and the altitude.
7. The equal angles at the base, and the length of the equal sides.
8. The equal angles at the base, and the length of the base itself.
9. The equal angles at the base, and the altitude.

In any case, when the length of the sides or altitude is given, either with or without the extent of the opening of all or any of its angles, an isosceles triangle can be constructed, which is the only form of the isosceles triangle which will satisfy the particular requirements laid down in the data: but where the angles only are given, an endless number of triangles similar in form, but of different superficial areas, may be drawn, all of which shall satisfy the general requirements set forth in the data, for it must be remembered that the size of an angle is determined by the extent of the opening between the lines that form its sides, and not by the length of its sides; and this leads us to the construction of an isosceles triangle under general conditions, namely:—

III. With regard to the angles without the sides:—

10. The angle at the vertex of the triangle.
11. The equal angles at the base of the triangle.

The first case named above of the construction of the isosceles triangle, when the length of the two equal sides, and that of the third side is given, is met by Problem VIII. (page 191), in

which the learner is shown the method of drawing any triangle having its sides equal to three given straight lines; but the second, in which the length of the two equal sides and the altitude of the triangle are the data given, requires further explanation, and brings us to

PROBLEM XXI.—To draw an isosceles triangle of which the length of the two equal sides and the altitude are given.

Let *A* represent the length of the two equal sides, and *B* the altitude of the isosceles triangle required. First draw the line *CD* of indefinite length, and through the point *E*, taken as nearly as possible in the centre of the line as drawn, draw the straight line *EG* perpendicular, or at right angles to *CD*. From the point *E* along the straight line *EG* set off a straight line *EH* equal to *B*, and from the point *H* along the straight line *HF* set off *HK* equal to *A*. Then from the point *H*, as centre, with the distance *HK*, describe the arc *LKM*, cutting the straight line *CD* in the points *L*, *M*. Join *HL*, *HM*. The triangle *HLM* is the isosceles triangle required, for the length of its altitude, *HE*, is equal to *B*, and the length of its equal sides *HL*, *HM*, is equal to *A*.

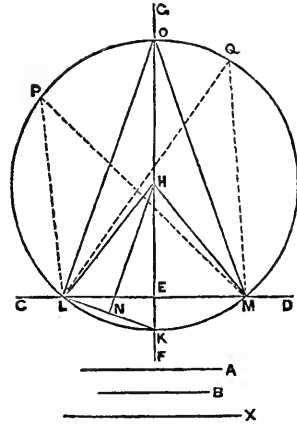


Fig. 30.

altitude of the isosceles triangle required, and *x* the length of its base. First draw the line *CD* of indefinite length, and within its limits set off a straight line *LM* equal to *x*. Bisect *LM* in *E*, and at the point *E* draw *EG* perpendicular or at right angles to *CD*, and from the point *E*, along the straight line *EG*, set off *EH* equal to *B*. Join *HL*, *HM*. The triangle *HLM* is the isosceles triangle required, for it has its base *LM* equal to *x*, while its altitude, *EH*, is equal to *B*.

By the aid of Fig. 30 we may easily discover some more facts in geometry, which the student may prove to be correct to his satisfaction by means of his compasses and parallel ruler.

First join *LK*, and bisect *LK* in the point *N*. Join *HN*. The straight line *HN* bisects the angle *LHK*, or divides it into the two equal angles *LHN*, *NHK*. Now apply the parallel ruler to the straight line *HN*, and by its aid draw through the point *L* a straight line *LO* parallel to *HN*. This straight line *LO* meets the straight line *EG* in the point *O*, and if the circumference of the circle of which the arc *LKM* is a part, be completed, it will also pass through the point *O*, in which the straight line *LO* meets the straight line *EG*. Now by Theorem 2 (page 156) when a straight line intersects two parallel straight lines the alternate angles are equal, therefore the alternate angles *NHL*, *NLO*, formed by the intersection of the straight line *HL* with the parallel straight lines *HN*, *OL*, are equal to one another. But since the triangle *LHO* is an isosceles triangle, of which the side *HO* is equal to the side *HL*, being radii of the same circle, the angle *HLO* is equal to the angle *LOH* or *LOK* (as it does not matter whether we call the opening between the lines *OL*, *OK*, the angle *LOK* or *LOH*), and as the angle *LHN* was shown to be equal to the angle *HLO*, it must be also equal to the angle *LOK*. Now the angle *LHK* is double of the angle *LHN*. Therefore the angle *LHK* is also double of the angle *LOK*.

The next thing to be observed is that the angles *LHK*, *LOK*, each stand on the same base *LK*, and that one of them, the angle *LHK*, has its apex or vertex *H* at the centre *H* of the circle *OLKM*, while the other, the angle *LOK*, has its vertex or apex *O* on the circumference of the circle *OLKM*. And the geometrical fact to be deduced from this is, that when two angles stand on the same base, and on the same side of it, one having its vertex at the centre of a circle and the other having its vertex at the circumference of the same circle, the angle which has its vertex at the centre is double of that which has its vertex at the circumference. This is true at whatever point

of the circumference the vertex of the angle at the circumference may be, the term circumference being understood to apply to that part of the whole circumference of the circle which lies on the same side of the base as that on which the angles are found, as the arc *LOM* of the whole circumference of the circle *OLKM*. Thus the angle *LHM*, standing on the base *LM*, and having its vertex at the centre *H* of the circle *OLKM*, is double of the angle *LOM*, which stands on the same base and has its angle at the circumference. It is also double of the angles *HPM*, *LQM*, which have their vertices at the points *P*, *Q*, of the arc *LOM*. The angles *HPM*, *LOM*, *LQM*, being each of them equal to half of the angle *LHM*, are equal to one another, from which we learn another geometrical fact, namely, that all angles standing on the same base and on the same side of it, and having their tops or vertices in the circumference of a circle, are equal to one another.

In Case 4, where the angle at the vertex of the triangle is given, and the length of the two equal sides, all that is necessary to be done is to draw an angle of the opening required by Problem VII. (page 191), and to set off the length of the two equal sides along the legs of the angle, joining the points in which the legs of the angle are cut in order to form the base; and in Case 10, when the angle of the vertex of the triangle is given, but the length of the equal sides is not stated, the triangle may be completed by cutting the legs of the angle in any two points equidistant from the apex, and joining these points to form the base as before. Case 5, however, on which the length of the base and the angle at the apex of the triangle is given, will require explanation in

PROBLEM XXIII.—To draw an isosceles triangle of which the angle at the vertex of the triangle and the length of the base are given.

Let *A* be the angle at the vertex of the isosceles triangle required, and let *B* represent its base. Draw any straight line, *CE*, of indefinite length, and along *CE* set off *CD* equal to *B*. Then at the point *D* in the straight line *ED* make the rectilinear angle *EDF* equal to the given angle *A* by Problem VII. (page 191); bisect *CD* in *G*, and through *G* draw *GH* perpendicular to *CD* or *CE*. Now, because the three interior angles of a triangle are equal to two right angles, the three interior angles of the isosceles triangle required are together equal to the two angles *CDF*, *FDE*, of which *FDE* is equal to the angle at the vertex; and as the angles at the base of an isosceles triangle are equal, each of the remaining angles is equal to half of the angle *CDF*. Bisect the angle *CDF*, by Problem VI. (page 191), by the line *DK*, and from the point *K* in which the straight line *DK* cuts the perpendicular *GH*, draw the straight line *KC* to the extremity *C* of the base *CD*. The triangle *KCD* is the isosceles triangle required, for its base *CD* is equal in length to *B*, and the angle *CKD* at the vertex of the triangle is manifestly equal to the given angle *A*.

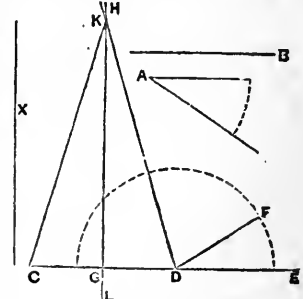


Fig. 31.

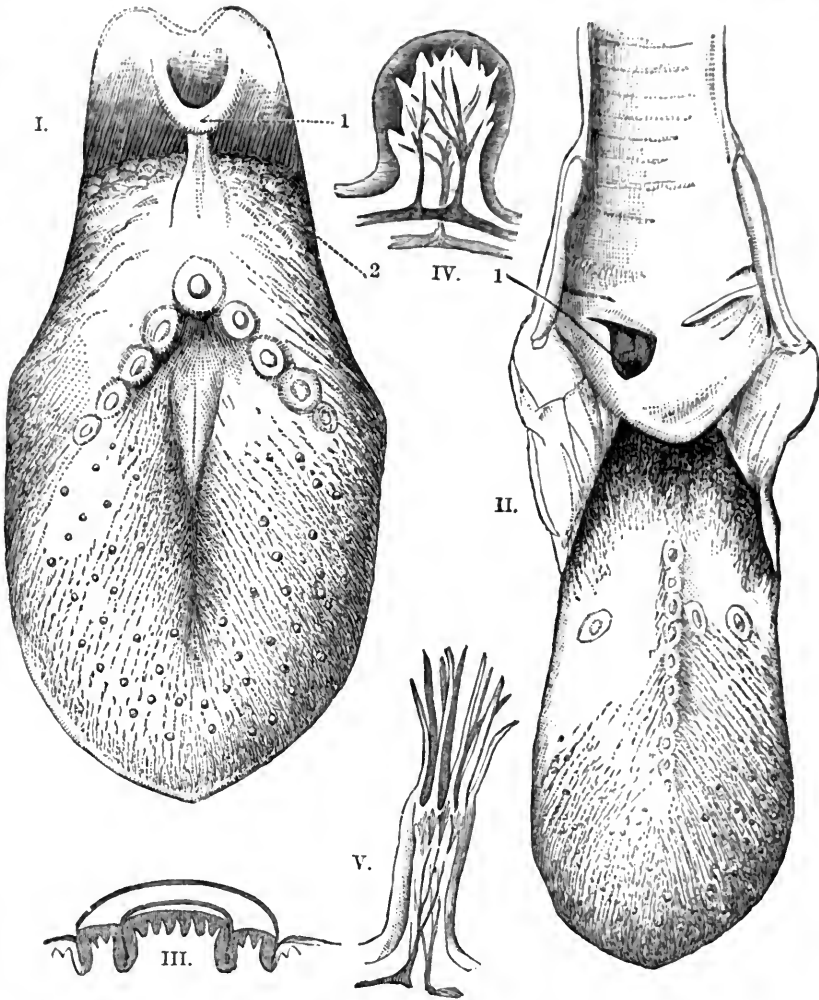
For Case 6, when the angle at the vertex of the triangle and the altitude are given, if in Fig. 31 the straight line *x* represents the altitude, it is manifestly only necessary to make the angle *CKD* equal to the given angle *A*, and then bisect it by the straight line *KL*, and after setting off *KG* along the straight line *KL* equal to the given altitude *x*, to draw *CD* through the point *G* at right angles to *KG*, cutting the legs *KC*, *KD*, of the angle *CKD* in the points *C* and *D*. The triangle *KCD* is of the required altitude, and has the angle *CKD* at its vertex equal to the given angle *A*.

From what has been already said in Problems XXI., XXII., and XXIII., the student will find no difficulty in forming isosceles triangles under the conditions or data set forth in Cases 7, 8, 9, and 11, which will afford useful exercises for practice. The mode of construction is in all cases the same whether the isosceles triangle be a right-angled triangle, an obtuse-angled triangle, or an acute-angled triangle; or in other words, whether it have a right angle, an obtuse angle, or an acute angle at its vertex.

ANIMAL PHYSIOLOGY.—IX.

THE ORGAN OF TASTE.

In proportion as sensations are dissociated from our mental processes, so are they more closely linked with our animal wants. Sensation has two functions; one is to inform the intellect and set the thoughts a-going, and the other to prompt us to do that for the well-being of the body, or for the good of our race, which we should not do, or not do so well and fittingly, unless we were so prompted. All sensations perform both of these functions, but they perform them in very different degrees: thus, the eye, of all the organs of sense, is the most efficient caterer to the mind; but it scarcely prompts directly to any instinctive act. It may stir pleasurable ideas in the mind, but the sensations of sight, irrespective of the ideas they leave, can scarcely be called either pleasurable or painful. Now if we contrast with this most intellectual of all our senses that which is associated with the tongue, we shall find that its relation to these two functions is reversed. The mind, it is true, discriminates between sensations of taste, but it does not dwell upon them, and it cannot readily recall the distinctions to memory. If this statement should be thought to be incorrect because gross sensualists may be said to dwell much upon the gratification of their appetite for meats and wines, it may be answered, that they dwell not so much on the distinctive ideas of the sensations, as on the general remembrance of the gratification they caused; and they dwell on it not as in itself worth entertaining, but as useful knowledge to aid them in repeating the pleasure at some future time. Few men take delight in dwelling on, or describing the sensations of taste; but even an anchorite will own that the pleasures of this sense are, while they last, intense, and quite sufficient to cause ordinary individuals to keep the body well supplied with good food, even though the thought of what quantity or quality of aliment is necessary never crosses the mind. The young, whose tastes have not yet been vitiated, usually eat heartily, with a keen sense of enjoyment while at their meals; but between these their minds are wholly unoccupied with the nature or the pleasures of these meals. The contrast drawn above seems fully to bear



I. HUMAN TONGUE. II. TONGUE OF CHIMPANZEE, WITH LARYNX. III. CIRCUMVALLATE PAPILLE. IV. FUNGIFORM PAPILLE. V. FILIFORM PAPILLE. Ref. to Nos. in Figs. I.—1. Epiglottis; 2. Mucous follicles. II.—1. Bristle passing into the pouch of the larynx.

out the statement that sensations which are good incentives to intellectual action are not good prompters to instinctive action; and that in proportion as senses cease to be discriminating, they become pleasurable or painful. A pleasurable or a painful sight means one which impresses the intellect favourably or not; but an agreeable or disagreeable taste is strictly confined to the sensation itself.

It will be shown, in speaking of the organ of taste, how intimately the gratification of this sense is bound up with the necessities of the body. In the meantime, assuming this to be the case, we remark that, inasmuch as the wants of the mind are insatiable, while those of the body are limited, the senses more intimately connected with each partake of the nature of these different wants; hence, while the eye is never satisfied with seeing, the gustatory sense is soon cloyed, and the appetite it engenders is only intermittent. Again, with regard to those sensuous impressions which are pleasurable, it would seem that Providence has ordained that the pleasure shall be so united to the requirements of the body, as that it shall be impossible fully to enjoy the pleasure without supplying the requisites to health and use. On the other hand, no natural necessity can be satisfied without gratifying the senses. Even our limited understanding recognises that it would be dangerous to entrust men with an animal enjoyment which is objectless, and which could be constantly excited; for this would be a bar to all the higher aspirations of the soul. The

Divine Wisdom has not only recognised this danger, but has provided against it, by such elaborate contrivances, that the attempt to gratify the senses irrespective of the ends for which they were given us—an attempt sure to prove abortive sooner or later—is considered to be not only sensual, but unnatural.

The preceding remarks are necessary to the appreciation of some points in the structure and position of the organ of taste. The sense of taste is not of quite so simple a nature as those of sight and hearing, or even of smell. This sense seems to shade away insensibly on the one hand into that of ordinary touch, which the inside of the mouth shares with the whole surface of the body; and on the other, it graduates into another sense, which may be called a sense of relish, which the mouth shares with the

stomach and alimentary canal. The seat of the sense of taste is the tongue; but here again it is necessary to remind the reader that the uses of this organ are not confined, as those of the eye and ear are, to the reception of the impressions which excite the sense. The tongue is, in its substance, a sheaf of muscles, and it is largely employed in keeping the food between the teeth, that it may be ground down, in crushing the softer mass and mixing it with the saliva, and in propelling it into the throat. It is further employed as an instrument of speech; so much so, indeed, that in poetry, and even in common speech, it is more prominently associated with this office than with any other, and in this capacity has been the object of that powerful and poetic description contained in the Epistle of James. Nevertheless, since the organs of taste are distributed over the surface of the tongue, it seems necessary to describe it as a whole. If the reader will refer to the engraving, he will find the surface of the tongue drawn as it would be seen if the whole of the roof of the mouth and skull was removed, so that he could look down upon it from above. The tongue covers the floor of the mouth; its border lies against the teeth. From the tip it rises to its central part, then slopes away backward to the throat, so that it nearly fills the closed mouth, and its upper convex surface lies along under the concave palate. It has great freedom of movement, so far as its tip and edges are concerned, but cannot be curled completely over and thrust down the throat, because it is confined by a membrane, which attaches the middle line of its under surface to the bottom of the mouth. At one time it used to be the barbarous custom of nurses to cut this membrane in new-born infants, a custom which not infrequently resulted in the child being choked by its own tongue. It is with the upper surface of the tongue we have to do, as there the organs of taste are found, and thereby the food passes, seldom getting below the edges of the tongue. The tongue is covered with a mucous, or slime-secreting, membrane, and this membrane, on its upper surface, has a number of little projections. These projections, or papillæ as they are called, are of three kinds, named respectively circumvallate, fungiform, and filiform papillæ. The circumvallate papillæ are situated at the back of the tongue, and are from eight to fifteen in number, ranged in the form of a V, with its point backwards, towards the throat. They are of singular shape, best explained by the small figure which gives both a section of one of them, and half its surface. They each consist of a button-like projection of the mucous membrane, surrounded by a depression, and then an elevated ring which has another depression around it. They are called circumvallate, or walled round, papillæ, because they may be compared to a central tower surrounded by a wall; but the wall is a sunken wall, only made by sinking two ditches, one outside and the other inside it. The outside ditches of these miniature imaginary fortresses touch one another, and that which lies behind the hindermost one is so deep as to be called the *foramen cæcum*, or blind hole. These papillæ are the largest of all; they are more powerfully affected by flavours than any others, and it is thought that the sapid juices run into the depressions around them, and thus the sense of taste is agreeably prolonged. It will be seen from the engraving that all the papillæ have secondary ones; but while the main papillæ thrust up the outer bloodless coat of the mucous membrane before them, the secondary ones (*i.e.*, the papillæ on the papillæ) do not do this.

The fungiform papillæ are scattered irregularly over the front two-thirds of the tongue, but are more plentifully distributed towards the edges and tip than at the central part. This arrangement prevents the delicate papillæ being crushed by the tongue while it squeezes the food against the hard palate, while, at the same time, they are so placed as that the juices of the food so squeezed run off the summit of the tongue, and come into contact with these little rounded eminences. Should the reader examine his own tongue, he will perhaps not at once detect these round papillæ, for they are obscured by the dense coating of filiform papillæ, which are, under ordinary circumstances, longer than they. If, however, he press his finger on the middle of his tongue, these round knobs will at once start out and become visible, being distended with blood. If, further, a little vinegar be placed on the tongue in a space between these papillæ, no taste is observed; but if it run on to them, they immediately erect themselves, and the sour taste is distinctly conveyed.

The filiform papillæ cover the fore part of the tongue, running in lines from the middle obliquely forward towards the edges, and other lines of them run, outside these, round the extreme point of the tongue. They are long and slender, and much smaller than the others, and are surmounted by a tuft of threads, consisting of thick epithelium (or outer bloodless layer); and hence they look white or yellow, and impart to the whole top of the tongue a light colour, which contrasts with the deep red of its edges and under side. These papillæ are probably rather the ultimate organs of touch than of taste.

All these papillæ are well supplied with blood-vessels, so that, when the outer coat is taken off, they look, under the microscope, to be little else than tufts of blood-vessels. Nerves forming loops have been traced into them, and these are the carriers of the sensuous impressions. These nerves proceed by two different routes to the brain. Those which proceed from the papillæ (including the circumvallate) at the back of the tongue, are gathered into a bundle which joins the eighth pair of nerves; and those from the papillæ at the front unite to form a branch of the fifth pair. Each of these sets of nerves conveys both common sensation and the special sense of taste; but the branch of the eighth is more concerned in carrying gustatory impressions, for the sense of taste is keenest in the large walled-round papillæ, and the pleasures of taste become gradually more intense in proceeding from the front backwards.

Considering, then, the sense of taste in relation to its uses, we find that not only does it stand at the entrance of the passage for food, to guard the gate, in order to admit good citizens and exclude conspirators against the constitution, as the sense of smell does, but it has other important functions.

First, it stimulates to the act of grinding the food and reducing it to a pulp, giving, by the pleasure it occasions during the process, an inducement which the bare knowledge of the fact that this comminution is necessary for the after digestive operations of the stomach, could hardly supply. Secondly, from the sensibility of the tongue becoming greater as the food proceeds backwards, it causes it to be carried in that direction while being masticated; and finally, in order to enjoy the most exquisite sensation of taste, the feeder finds it necessary to fling the bolus backward on to the root of the tongue, and there it becomes the subject of a curious mechanical process. Until the food has reached this point, it is perfectly under the control of the will of the feeder, and it can be moved in any direction, and entirely ejected from the mouth, if he find it hard or nauseous; but directly it has reached this point it passes at once out of his control. The presence of food at this point excites what is called the reflex, or involuntary, action of the muscles of the throat, so that the soft palate above the throat behind seizes it and thrusts it at once rapidly down into the stomach. This involuntary action is curious, not only because the presence of food invariably excites it, but it cannot be excited unless by the presence of some substance at that part. The act of swallowing cannot be effected unless there be something to swallow. Further, if a foreign body touch this sensitive part, and it cannot be swallowed, the stimulus is so violent that, being denied its legitimate result, it will excite the reversed action, and occasion vomiting. Thus, while Nature ungrudgingly grants sensuous gratification where bodily wants exist, she imperiously denies all pleasure if no good end is connected with its gratification. However sad the fact may be to him, the glutton knows that there is a strict limit to his enjoyment. Alas for him! he cannot by any device revel in the pleasures of the table without filling his stomach, and this is of very limited capacity.

In the case of taste, then, the mutual dependence of bodily necessities and the gratification of the sense is very marked; and a consideration of the whole circumstances connected with this sense will furnish a strong argument in favour of the unity of the creation and the omniscience of the Creator; for we have, as essential conditions of the pleasure of eating, four distinct things, in no way necessarily connected with one another, except as they are *designed* to relate to each other. They are these:—The body, requiring aliment; the sense of taste, prompting to feed; wholesome food, fitted to maintain the body in well-being; peculiar, and often superadded flavours, to tempt the sense. Putting these in the order in which they are related to one another, we have—food, flavour, pleasure, health. The distinct links in the chain are all wonderful, but the union proves a unity of design and a benevolence of purpose.

LESSONS IN ARITHMETIC.—XVIII.

SQUARE AND CUBE ROOT.

1. We have already stated that when any number is multiplied by itself any number of times, the products are called the second, third, fourth powers, etc., of the number respectively.

The second and third powers of any number are generally called the square and cube of that number. Thus, 81 is the square of 9, 27 is the cube of 3.

Any power of a number is expressed by writing the number of the power in small figures above the number, a little to the right.

Thus, the square of 9 would be written 9^2 ; the cube of 3, 3^3 ; the fifth power of 7, 7^5 ; and so on.

Conversely, the number which, taken twice as a factor, will produce a given number, is called the square root of that number; that which, taken three times as a factor, will produce a given number, is called the cube root of it; that which, taken four times as a factor, will produce a given number, is called the fourth root of it; and so on.

Any root of a number is represented by writing the sign $\sqrt{\quad}$ over the number, and placing the number corresponding to the number of the root on the left of the symbol, thus: $\sqrt[3]{8}$ indicates the cube root of 8, $\sqrt[4]{81}$ the fourth root of 81.

The square root of a number is generally expressed by merely writing the symbol $\sqrt{\quad}$ over the number, without the figure 2. Thus, $\sqrt{3}$ means the square root of 3; $\sqrt{84}$ the square root of 84.

2. Every number has manifestly a 2nd, 3rd, 4th, etc., power. But every number has not conversely an exact square, cube, third root, etc. For example, there is no whole number which, when multiplied into itself, will produce 7; and since any fraction in its lowest terms multiplied into itself must produce a fraction, 7 cannot have a fraction for its square root. Hence 7 has no exact square root. But although we cannot find a whole number or fraction which, when multiplied into itself, will produce 7 exactly, we can always, as will be shown hereafter, find a decimal which will be a very near approximation to a square root of 7, and we can carry the approximation as nearly to $\sqrt{7}$ as we please. And the same will be true of every number which has no exact square root, third root, etc.

It is desirable that the student should know by heart the squares and cubes of the successive numbers from 1 up to 12, appended in the following table:—

NO.	SQUARE.	CUBE.	NO.	SQUARE.	CUBE.
1	1	1	7	49	343
2	4	8	8	64	512
3	9	27	9	81	729
4	16	64	10	100	1000
5	25	125	11	121	1331
6	36	216	12	144	1728

In finding the square of any number which is not very large—under 100, say—the following method will be found useful:—

3. Short Method for finding the Square of a Number.

Add and subtract from the number its defect or excess from the nearest multiple of 10. Multiply the numbers so found together, and add the square of the defect or excess.

For instance, to find the square of 97:—

100 is the nearest multiple of 10, and 3 is the defect of 97 from it.

$$97 + 3 = 100$$

$$97 - 3 = 94$$

$$3^2 = 9.$$

Therefore the required square of 97 is $100 \times 94 + 9 = 9409$.

Again, to square 44:—

40 is the nearest multiple of 10 to 44, and 4 is the excess of 44 over it.

$$44 + 4 = 48$$

$$44 - 4 = 40$$

$$4^2 = 16.$$

Hence the required square is $1920 + 16$, or 1936.

This operation can be readily performed mentally, as will be found by a little practice.

4. Observe, also, that no square number can end in 2, 3, 7, or 8; but that a cube can terminate in any one of the 10 figures.

A number which has an exact square root is sometimes called a perfect square.

EXERCISE 38.

(1.) Square the following numbers by the method of Art. 3: 17, 23, 57, 45, 68, 79, 93, 103, 107.

(2.) Determine whether the following numbers are perfect squares or perfect cubes; and where they are not, find the least multiplier which will make them so: 72, 125, 164, 1355, 4264, 5010, 4096.

(3.) Take any two numbers, and prove that the difference of their squares is equal to the product of their sum and difference.

(4.) Take any two numbers, and prove that the difference of their cubes divided by their difference is equal to the sum of their squares and their product.

(5.) Take any two numbers, and prove that their product is equal to the square of half their sum—the square of half their difference.

5. Extraction of the Square Root.

The square root of any given whole number or decimal can be obtained, or extracted, as is sometimes said, by means of the following rule, which we give without proof, as it requires the aid of algebra to establish it satisfactorily:—

Rule for the Extraction of the Square Root of any number.

Separate the given number into periods containing two figures each, by placing a point over the unit's figure, and also over every second figure towards the left in whole numbers, but both towards the left and the right in decimals.

Subtract from the extreme left-hand period the greatest square which is contained in it, and put down its square root for the first figure of the required whole square root. To the right of the remainder bring down the next period for a dividend. Double the part of the square root already found, and place it on the left of this dividend for a partial divisor; find how many times it is contained in the dividend, omitting its right-hand figure, and annex this quotient to the part of the root already obtained, and also to the partial divisor. Multiply the divisor thus formed by the last figure of the root, and subtract the product from the dividend, bringing down the next period to the right of the remainder for a dividend. Continue the operation until all the periods have been brought down. If the original number be a decimal, the process above indicated must be performed as if it were a whole number, and a number of decimal places cut off from the root so obtained, equal to the number of points placed over the decimal part of the original number.

6. The process will be best followed by means of examples.

EXAMPLE 1.—Find the square root of 627264.

The greatest square in the first period 62 is the square of 7 or 49. Subtracting 49 from 62, we place 7 as the first figure of the root. We bring down the next period 72 to the right of the remainder 13,

627264 (792	49
149 1372	1341
1582 3164	3164
....	

7344 (271
4
47) 334
320

541
541
...

root already obtained, we multiply the divisor 1582 by this last figure of the root; the product is 3164, which, subtracted from the dividend, leaves no remainder. Hence 792 is the exact square root of 627264.

EXAMPLE 2.—Find the square root of 73441.

Placing a dot over the figure in the unit's place, we put one over every second figure to the right, and then, performing the operation as if 73441 were a whole number, as indicated in the margin, we get 271 as the root. We cut off two decimal places from this, because there are two dots over the decimal part of the original decimal.

The square root is therefore 2.71.

Obs.—At any stage of the process, the product of the com-

pleted divisor into the last figure of the root must not exceed the dividend. Hence, in finding the figure to be placed in the root, care must be taken to observe whether, when the multiplication is effected, the product will exceed the dividend or not. Thus, in the last example, in the case of the dividend 334, the partial divisor 4 will go *eight* times in 33, but since the product 8×48 is greater than 334, 7 is the next figure of the root, and not 8.

7. In the case of a decimal, if the number of decimal places be odd, it should always be made *even* by annexing a cipher, in order that the last period may be completed.

EXAMPLE.—Find the square root of 41·34156.

Here, adding a cipher, we point the decimal thus:—

$$\begin{array}{r}
 41\cdot341560 \quad (6\cdot429 \\
 \underline{36} \\
 124) \quad 534 \\
 \underline{496} \\
 1282) \quad 3815 \\
 \underline{2564} \\
 12849) \quad 125160 \\
 \underline{115641} \\
 9519
 \end{array}$$

And there will be 3 decimal places in the square root obtained.

Here there is a remainder, or the given decimal is not what is called a complete square. By adding, however, more ciphers, more and more figures can be obtained in the root, to any extent of approximation.

This is a similar case to that of $\sqrt{7}$ spoken of in Art. 2.

To approximate to the square root of 7, we should proceed thus:—

$$\begin{array}{r}
 7\cdot0000 \quad (2\cdot64 \\
 \underline{4} \\
 46) \quad 300 \\
 \underline{276} \\
 524) \quad 2400 \\
 \underline{2096} \\
 304
 \end{array}$$

By continually adding ciphers we can carry the approximation to any degree of nearness.

8. Similarly, in the case of any whole number which is not a complete square root, an approximation to the root by means of decimals can be obtained.

The integral part of the root obtained is, of course, the square root of the largest *integral* complete square, which is less than the given number.

LESSONS IN GEOGRAPHY.—X.

DISCOVERIES OF THE NINETEENTH CENTURY.

In tracing the discoveries that have been made in different parts of the world, and the fresh details of foreign countries that have been added to our knowledge of geography during the last forty years, or thereabouts, from 1830 to the present time, our best course, after noting the progress of discovery and exploration in Asia, which was done in the last lesson, will be to glance at Oceania, which comprises the whole of our colonial empire on the south-western borders of the Pacific, and see what has been effected by travellers, voyagers, explorers, and adventurers in that portion of the world's surface.

Lying along the equator, and pretty nearly within a belt bounded by the tenth degree of north latitude on one side, and the tenth parallel of south latitude on the other, are a number of large islands, which form a long chain between South-Western Asia on the north and Australia on the south. These islands, which belong chiefly to the Dutch, are rich in vegetable and mineral produce of all kinds. Chief among them is Borneo, the largest island in the world (since geographers are now agreed in considering Australia as a continent), peopled by a ferocious race of savages, who, like all the inhabitants of the seaboard of the islands of Malaysia, are greatly addicted to piracy. Our knowledge of this part of Oceania, more especially the islands of Java and Sumatra, has been gathered from the works of Sir

Stamford Raffles and others, but since 1840 it has been considerably extended by the investigations made by Sir James Brooke in the Eastern or Asiatic Archipelago.

The story of the adventurous career of this gentleman may be told in a few words. He was an Indian officer who was severely wounded in the Burmese war of 1824-26, and shortly after quitted the service. During a voyage to China in 1830, he saw for the first time the islands of the Asiatic Archipelago, and soon became convinced that they offered a splendid field for enterprise and research. Disliking an idle life, and being a wealthy man and well able to follow up any scheme on which he had set his fancy, he determined to devote his energies and his means to the attempt of civilising the Malay races, and imparting to them the benefits of commerce, gathering at the same time information about the geography and natural history of these almost unknown regions. Returning to England, he made himself acquainted with the practical duties of a sailor, and having purchased the *Royalist*, a schooner yacht of 150 tons, he equipped her and furnished her with costly instruments for surveying, etc., and sailed again for the Eastern Archipelago in 1838, arriving off the coast of Borneo, August 1, 1839. Here he became acquainted with the Rajah Muda Hassim, the uncle of the Sultan of Borneo, and immediately commenced a survey of the north-west coast of the island, which he relinquished in consequence of a rebellion of the Dyaks in that part of Borneo. He then visited Celebes and surveyed the Gulf of Boni, and made a large collection of the quadrupeds, birds, and plants of that island. In 1840 he returned to Borneo, and having rendered considerable assistance to Muda Hassim in the suppression of the rebellion, he was rewarded with a large tract of land called Sarawak, on the north-west coast, and received the title of rajah. He now turned his attention to the suppression of piracy in the Malay waters, and in this he was successful, though the means at his command were but small. Ultimately he was instrumental in procuring the cession of Labuan, an island also on the north-west coast of Borneo, to Great Britain, which is still retained as a British dependency, although the British Government, as lately as 1858, declined to purchase Sir James Brooke's province of Sarawak.

In Australia, prior to 1840, the explorations had been chiefly confined to surveys of the coast, and short excursions inland for distances varying from fifty to one hundred miles from the shore—such as the expedition of Lieutenants Grey and Lushington in 1839, which resulted in the discovery of the Glenelg River on the north-west coast—except in New South Wales and South Australia, where the researches of the colonists had been pushed farther inland with the view of discovering suitable localities for settling and pasture lands fit for sheep-farming. In 1841, Mr. Edward John Eyre left Fowler Bay, on the south coast of South Australia, on February 25, and reached St. George's Sound, a distance of 1,040 miles from the point whence he started, on July 7, having had no other companion during the last half of his journey than a native Australian. The first attempt to traverse the interior of the country, and ascertain its general character, was made in 1844 by Captain Sturt, who had proposed to go through the length and breadth of the country from north to south and from east to west. His scheme was found to be impracticable from its magnitude; but the British Government supplied the necessary funds for the equipment of an expedition under Captain Sturt's command, to proceed along the Darling as far as Laidley's Ponds, and to try to go thence northwards across the country to the Gulf of Carpentaria. The expedition, however, was a failure as far as crossing the continent was concerned, but Captain Sturt reached a spot in latitude $24^{\circ} 5'$ south, longitude $138^{\circ} 15'$ east, about 200 miles from the centre of the continent, beyond which it was found impossible to penetrate, owing to the impracticable character of the country and the want of food and water for the horses. He was therefore reluctantly compelled to retrace his steps and abandon his explorations.

Another Australian traveller, Dr. Ludwig Leichardt, was more successful. Proceeding from Moreton Bay to Jimba, the farthest station on the Darling Downs, Dr. Leichardt, accompanied by a party of seven persons, quitted this point on October 1, 1844, and made his way through the interior by a route nearly parallel to the coast to the south-east corner of the Gulf of Carpentaria, and thence to Port Essington, a distance of 1,800 miles, arriving at his destination on December 17, 1845, after a journey of a

little more than fourteen months. Many rivers were discovered, among which was the Mackenzie, on whose banks some good coal-fields were found, and several tracts of country were crossed consisting of rich arable land, admirably adapted for agricultural purposes. His subsequent expeditions, however, were not attended with the same good fortune. In 1847 he set out on a journey across the Australian continent from Sydney to Swan River, which he was compelled to abandon by events over which he had no control, after reaching as far as the downs of the Upper Mackenzie and Peak River. Nothing daunted by the unsuccessful result of his attempt to traverse Australia, he started once more on his great undertaking about the beginning of 1848, from Moreton Bay, only to meet with fresh failure and death. From that time nothing has been heard either of the

of so barren and desolate a character as had been imagined from the discovery of the great central desert by Captain Sturt in 1844.

To Burke and his companions belong the honour of having been the first to make their way from south to north, across the trackless centre of the Australian continent; but three out of the four were doomed to purchase the distinction they had so gallantly won, at the cost of their lives. Having feasted their eyes with the sight of the blue waters of the Gulf of Carpentaria, the adventurers, worn and weakened by the privations they had endured, and the fatigues and hardships they had undergone in their journey northwards, turned to retrace their steps. Gray died soon after commencing the march homewards; but the three survivors struggled on till, in April, they



COOPER'S CREEK, AUSTRALIA; THE SPOT WHERE BURKE AND WILLS DIED IN 1861.

leader of the expedition or his companions, and although a few traces of their route after quitting the west bank of the Condamine River and Fitzroy Downs have been found, nothing definite respecting their fate and what led to the failure of the expedition has ever been discovered.

The principal journeys of discovery in Australia since the disappearance of Dr. Leichardt have been the expeditions of Mr. Augustus C. Gregory, in West, North-West, and North Australia in 1856 and 1858, in which many important discoveries were effected, and the perilous march of Richard O'Hara Burke, and his companions Gray, King, and Wills, across the continent from Melbourne to the Gulf of Carpentaria in 1860-61. The exploring party started from Melbourne on August 10, 1860, and reached the Gulf of Carpentaria, near the embouchure of the Cloncurry River, on February 11, 1861, having passed for miles and miles through a fertile and well-watered country, thus proving that the whole of the interior, at all events, is not

reached Cooper's Creek, a stream that crosses the boundary line between South Australia and New South Wales, towards its northern limit, where, the year before, Burke had left a few men in charge of a store of provisions. By some sad fatality, the man who had been placed at the head of the little party left to guard the depôt, weary of awaiting the return of the travellers, and thinking that they had all perished, had left the spot only a few hours before Burke and his companions reached it. Knowing that it would be utterly useless to try to overtake them, Burke and his friends directed their steps towards Mount Hopeless, a short range on the west side of Lake Blanch, where they found some settlers who had "squatted" in that locality in as wretched a condition as themselves, without clothes and without food, endeavouring to prolong existence by searching in the marshes and swamps for a plant called *nardou*, which they knew was frequently eaten by the natives when nothing better could be had. Again disappointed of procuring aid, and un-

able to advance any further, Burke and Wills soon died of exhaustion, and King himself was at the point of death, when he was discovered by a party of the natives, who treated him with the utmost kindness, and, when he was sufficiently recovered, brought him on his way towards Melbourne, which he reached in safety towards the close of the year, having met with an expedition which had been sent out to see if any traces could be discovered of the missing travellers.

In other parts of Oceania, little of any importance besides surveys of the coast and different parts of the waters of the Pacific has been effected of late years, nor have any further discoveries been made with regard to the outlying lands of the Antarctic continent that is supposed to encircle the South Pole, girdled by volcanic ranges that seem to forbid all access to whatever may lie beyond, although it may be mentioned that a theory has been broached to the effect that within the belt of burning mountains that line its gloomy ice-bound shores, it is possible there may be a country in which human life may be sustained, and in which may be found productions suitable to its soil and climate, that are amply sufficient for man's requirements.

LESSONS IN FRENCH.—XIX.

SECTION XXX.—RELATIVE PRONOUNS [§ 38].

1. Qui, used as nominative, may relate to persons or to things.

Les fleurs qui sont dans votre jardin. *The flowers which are in your garden.*

2. Qui, used as the object of a verb, can only be said of persons. It is used interrogatively with or without a preposition.

Qui votre frère voit-il ? *Whom does your brother see?*
De qui parlez-vous ce matin ? *Of whom do you speak this morning?*

3. Que may be said of persons or things. It can never be understood, and must be repeated before every verb [Sect. XVIII. 1].

Les personnes que nous voyons, *The persons whom we see.*
Les langues que nous apprenons, *The languages which we learn.*

4. Ce que is employed for *that which*, or its equivalent *what*.

Ce que vous apprenez est utile, *That which you learn is useful.*
Trouvez-vous ce que vous cherchez ? *Do you find what you seek?*

5. Que answers to the English pronoun *what*, used absolutely before a verb.

Que pensez-vous de cela ? *What do you think of that?*

6. Quoi, when not used as an exclamation, is generally preceded by a preposition, and relates only to things.

De quoi voulez-vous parler ? *Of what do you wish to speak?*
A quoi pensez-vous ? *Of what do you think?*

7. Lequel, m., laquelle, f., lesquels, m. pl., lesquelles, f. pl., *which, or which one* [Sect. XVII. 6], or *which ones*, relate to persons or things. They may be preceded by a preposition.

Lequel avez-vous apporté ? *Which one have you brought?*
Duquel parlez-vous ? *Of which one do you speak?*

8. Dont, of *which*, or of *whom*, *whose*, may relate to persons or things, in the masculine or feminine, singular or plural. It can never be used absolutely, and must always be preceded by an antecedent. It is preferable to *de qui* or *duquel*, etc.

Les fleurs dont vous me parlez, *The flowers of which you speak to me.*
Les demoiselles dont votre sœur vous parle, *The young ladies of whom your sister speaks to you.*

9. PRESENT OF THE INDICATIVE OF THE IRREGULAR VERBS.

DI-RE, 4, to say.	FAI-RE, 4, to make, to do.	METT-RE, 4, to put.
Je dis, I say, <i>dō say</i> , or <i>am saying</i> .	Je fais, I make or do, I <i>am making or doing</i> .	Je mets, I put, <i>dō put</i> , or <i>am putting</i> .
Tu dis.	Tu fais.	Tu mets.
Il dit.	Il fait.	Il met.
Nous disons.	Nous faisons.	Nous mettons.
Vous dites.	Vous faites.	Vous mettez.
Ils disent.	Ils font.	Ils mettent.

RÉSUMÉ OF EXAMPLES.

Connaissez-vous le monsieur qui parle à notre cousin ?	<i>Do you know the gentleman who speaks to our cousin?</i>
Je connais celui qui lui parle.	<i>I know him who speaks to him.</i>
Comprenez-vous ce que je vous dis ?	<i>Do you understand what I say to you?</i>
Qui vous a parlé de cette affaire ?	<i>Who has spoken to you of this affair?</i>
L'Anglais dont vous parlez est ici.	<i>The Englishman of whom you speak is here.</i>
L'Espagnol dont la sœur est ici.	<i>The Spaniard whose sister is here.</i>
Que faites-vous ce matin ?	<i>What do you do this morning?</i>
Que dites-vous à notre ami ?	<i>What do you say to our friend?</i>
Nous faisons ce que vous nous dites.	<i>We do that which you say to us.</i>
Pour qui faites-vous cet habit ?	<i>For whom do you make this coat?</i>
De quoi parlez-vous à votre frère ?	<i>Of what do you speak to your brother?</i>
Nous faisons ce que nous pouvons.	<i>We do what we can.</i>
Nous parlons de ce dont vous parlez.	<i>We speak of that of which you speak.</i>

VOCABULARY.

Arriv-er, 1, to arrive.	Habillement, m., dress, clothes.	Nom, m., name.
Avec, with.	Hollandais, -e, Dutch.	Plaisir, m., pleasure.
Coffre, m., trunk.	Linge, m., linen.	Presque, almost.
Command-er, 1, to order.	Monsieur, m., gentleman.	Rien, nothing.
Écossais, -e, Scotch.		Soulier, m., shoe.
Enfant, m., child.		Vrai, -e, true.

EXERCISE 55.

1. Qui connaissez-vous ? 2. Nous connaissons les Hollandais dont vous nous parlez. 3. Quelles leçons apprenez-vous ? 4. Nous apprenons les leçons que vous nous recommandez. 5. Ce que je vous dis est-il vrai. 6. Ce que vous nous dites est vrai. 7. Do qui nous parlez-vous ? 8. Nous vous parlons des Écossais qui viennent d'arriver. 9. Savez-vous qui vient d'arriver ? 10. Je sais que le monsieur que votre frère connaît vient d'arriver. 11. Vos sœurs que font-elles ? 12. Elles ne font presque rien, elles n'ont presque rien à faire. 13. Que mettez-vous dans votre coffre ? 14. Nous y mettons ce que nous avons, nos habillements et notre linge. 15. N'y mettez-vous pas vos souliers ? 16. Nous y mettons les souliers dont nous avons besoin. 17. De quoi avez-vous besoin ? 18. Nous avons besoin de ce que nous avons. 19. Cet enfant sait-il ce qu'il fait ? 20. Il sait ce qu'il fait et ce qu'il dit. 21. Ne voulez-vous pas le leur dire ? 22. Avec beaucoup de plaisir. 23. Faites-vous ce que le marchand vous commande ? 24. Nous faisons ce qu'il nous dit. 25. Il parle de ce dont vous parlez.

EXERCISE 56.

1. Have you what (*ce dont*) you want ? 2. We have what we want. 3. Is the gentleman whom you know here ? 4. The lady of whom you speak is here. 5. Is she just arrived ? (Sect. XXV. 2) ? 6. She is just arrived. 7. Do you know that gentleman ? 8. I know the gentleman who is speaking with your father. 9. Do you know his name ? 10. I do not know his name, but I know where he lives (*demeure*). 11. What do you do every morning ? 12. We do almost nothing ; we have very little to do. 13. Does the tailor make your clothes ? 14. He makes my clothes, my brother's, and my cousin's. 15. Do you know what you say ? 16. I know what I say, and what I do. 17. Do you know the Scotchman of whom your brother speaks ? 18. I know him well. 19. What does he put into his trunk ? 20. He puts his clothes. 21. Is that which you say true ? 22. What I say is true. 23. Do you understand that which I say to you ? 24. I understand all that you say. 25. Of whom does your brother speak ? 26. He speaks of the gentleman whose sister is here. 27. Is your brother wrong to do what he does ? 28. He cannot be wrong to do it. 29. What are you doing ? 30. I am doing that which you do. 31. Where do you put my books ? 32. Into (*dans*) your brother's trunk. 33. Is your brother here ? 34. He is not here. 35. He is at my brother's, or at my father's.

SECTION XXXI.—IDIOMATIC USES OF METTRE, ETC.

1. The verb *mettre* is used in the same sense as the English *to put on*, in speaking of garments. *Mettre le couvert* means *to lay the cloth, or set the table*.

Quel chapeau mettez-vous ? *What hat do you put on ?*
Votre frère met son habit noir. *Your brother puts on his black coat.*
Le domestique va mettre le couvert. *The servant is going to lay the cloth.*

2. *Ôter* means *to take off, to take away, to take out*.
Mon domestique ôte son chapeau. *My servant takes off his hat.*
Ôtez ce livre de la table. *Take away that book from the table.*
N'a-t-on pas ôté le dîner ? *Have they not taken away the dinner ?*

3. The verb *faire* is used before another verb, in the sense of *to have, to cause*.

Votre frère fait-il bâtir une maison? Does your brother have a house built?
Il en fait bâtir plus d'une, He has more than one built.

4. It may be used in the same sense before its own infinitive.

Je fais faire un habit de drap? I have a cloth coat made.
Vous faites faire des souliers de cuir, You have leather shoes made.

5. Vouloir [Sect. XXVII. 6] followed by *dire* is used in the sense of *to mean*.

Que voulez-vous dire? What do you mean?
Votre sœur que veut-elle dire? What does your sister mean?

RÉSUMÉ OF EXAMPLES.

Ne mettez-vous pas vos habits? Do you not put on your clothes?
J'ai peur de les gâter. I am afraid of spoiling them.
Ne portez-vous jamais votre habit noir? Do you never wear your black coat?
Je le mets tous les Samodis. I put it on every Saturday.
Pourquoi n'ôtez-vous pas votre manteau? Why do you not take off your cloak?
J'ai trop froid, j'ai peur de l'ôter. I am too cold, I am afraid to take it off.
Faites-vous raccommoder vos souliers? Do you have your shoes mended?
Je fais raccommoder mes habits. I have my clothes mended.
Je fais faire une paire de bottes. I have a pair of boots made.
Je fais creuser un puits. I have a well dug.
Votre frère que veut-il dire? What does your brother mean?
Que veut dire cela? What does that mean?
Cela ne veut rien dire. That means nothing.
Ôtez-vous vos souliers et vos bas? Do you take off your shoes and stockings?
Je n'ôte ni les uns ni les autres. I take off neither these nor those.
Le dîner est prêt; le domestique va mettre le couvert. Dinner is ready; the servant is going to lay the cloth.
Voulez-vous ôter le couvert? Will you take away the things from the table?
Je vais mettre le couvert. I am going to lay the cloth.
Je vais ôter le couvert. I am going to take away the things.

VOCABULARY.

Apothicaire, m., drug-gist.	Gên-er, 1, to squeeze, cramp, hurt.	Prêt, -e, ready.
Après, after.	Gilet, m., waistcoat.	Raccommod-er, 1, to mend.
Cave, f., cellar.	Grand, -e, large, very.	Remett-re, 4, to replace, to put on again.
Crous-er, 1, to dig.	Manteau, m., cloak.	Tout-à-l'heure, immediately.
Dimanche, m., Sunday.	Midi, noon, midday.	Uniforme, m., uniform.
Diner, m., dinner.	Noir, -e, black.	Velours, m., velvet.
Fâché, -e, sorry, angry.	Pantouffe, f., slipper.	
Gât-er, 1, to spoil.	Pourquoi, why.	

EXERCISE 57.

1. Le Général N. met-il son uniforme? 2. Il ne le met point.
3. Pourquoi ne portez-vous point votre manteau noir? 4. J'ai peur de le gâter. 5. Mettez-vous vos souliers de satin tous les matins? 6. Je ne les mets que les Dimanches. 7. Il est midi; le domestique met-il le couvert? 8. Il ne le met pas encore; il va le mettre tout-à-l'heure. 9. Le dîner n'est-il pas prêt? 10. Le domestique ôte-t-il le couvert? 11. Il ne l'ôte pas encore, il n'a pas le temps de l'ôter. 12. Ôtez-vous votre habit quand vous avez chaud? 13. Je l'ôte quand j'ai trop chaud. 14. Faites-vous faire un habit de drap? 15. Je fais faire un habit de drap et un gilet de satin noir. 16. Ne faites-vous point raccommoder vos pantouffes de velours? 17. Ne faites-vous pas creuser une cave? 18. Je fais creuser une grande cave. 19. L'apothicaire que veut-il dire? 20. Il veut dire qu'il a besoin d'argent. 21. Savez-vous ce que cela veut dire? 22. Cela veut dire que votre frère est fâché contre vous. 23. Avez-vous envie de mettre votre manteau? 24. J'ai l'intention de le mettre, car j'ai grand froid. 25. Je vais l'ôter, car j'ai chaud.

EXERCISE 58.

1. Do you take off your coat? 2. I do not take off my coat, I put it on. 3. Do you take off your cloak when you are cold? 4. When I am cold, I put it on. 5. Does your little boy take off his shoes and stockings [§ 21. 4]? 6. He takes them off, but he is going to put them on again. 7. Does that little girl lay the cloth? 8. She lays the cloth every day at noon. 9. Does she take away the things after dinner? 10. She takes

away the things every day. 11. Do you intend to have a coat made? 12. I intend to have a coat made. 13. I am going to have a coat and a vest made. 14. Does your brother have his boots mended? 15. He has them mended. 16. What does your son mean? 17. I do not know what he means. 18. Is he angry with me or with my brother? 19. He is neither angry with you nor with your brother. 20. Is he afraid to spoil his coat? 21. He is not afraid to spoil it. 22. Does the druggist want money? 23. He does not want money. 24. Has your sister taken my book from the table? 25. She has not taken it away. 26. Why do you take off your shoes? 27. I take them off because they hurt me. 28. Do you intend to have a house built? 29. I intend to have one built. 30. Does the tailor spoil your coat? 31. He does not spoil it. 32. Who spoils your clothes? 33. No person spoils them. 34. What hat do your wear? 35. I wear a black hat.

LESSONS IN DRAWING.—X.

WE must now direct the attention of the pupil to shading and foliage; but before commencing, let us earnestly advise him to go over the previous lessons again, so that he may be well prepared to follow us in a course of instruction that will require all the knowledge he can possibly obtain, and a considerable amount of practice in using the pencil, to give him power, confidence, and freedom of execution, combined with truth of representation. We have already warned him against *sketching* before he can draw well; the danger of falling into a slovenly manner is now before him. He must be careful and slow at first in that which he is about to undertake, for when shading and foliage are introduced, he must bear in mind that in proportion to the care, perseverance, and patience he bestows upon his work, will be the beauty and effectiveness of the result; while, on the other hand, carelessness of execution will degenerate into coarseness and scribble. He will, in the one case, prove himself to be a clever and satisfactory draughtsman, or, in the other, one totally incapable of producing anything worthy of admiration, or fit to be employed for any useful purpose.

The following observations relating to shadows will be found important, as containing principles that influence their treatment under very common and frequent circumstances; they may be classed as *positive* or *decided* shadows, and *half tints*. *Decided* shadows may be divided into *broad* shadows and *cast* shadows. *Broad* shadows are the shadows upon the object. In Fig. 72, *a* is the broad shadow. *Cast* shadows are those which are caused by the object, and are thrown upon the ground, or upon some other object. In Fig. 72, *b* is the cast shadow. As a general rule, for their difference of tone or depth, the *cast* shadow is *darker* than the *broad* shadow, simply because the cast shadow being in most cases thrown upon a more extensive surface (the ground, for instance), there is then round about the cast shadow a *surface* receiving the rays of light which refracts them, or throws them back again, with less power upon the side of the object in broad shadow; this lowers its tone. When it occurs that no cause for refraction is present, then the broad and cast shadows are equal in tone. In Fig. 72 the rays of light coming from the direction of *f* fall upon the ground at *g g g*, and are thrown back again with less power upon *a*, causing the broad shadow *a* to be lighter than the cast shadow *b*, which cannot receive the refracted rays from *g g g*, being the same surface or plane upon which the light falls. Again, the *highest light* and *darkest shadow* are generally *together*; this will be considered more fully in its place presently, when we take up the subject of *half tint*.

The pupil's first essay will be a very simple way of making a flat tone, before he attempts crossing lines; this simple method he will soon understand, and afterwards find to be an easy introduction to the crossing or *cross-hatching* system. When the surface of the shadow is large, fill it up with close perpendicular lines of unequal lengths, not permitting the ends to lap over one another, or terminate on the same level; but if the surface is small, draw continuous lines to the full extent of the shadow, at the same time observing the tone must be regulated by the strength or pressure used in the execution. Draw the square, Fig. 71, in which is shown the method when a broad surface is to be covered by a flat tint of broken lines, as explained above. Fig. 72 is given to represent the continuous lines, commencing carefully and evenly from one side of the shadow, and terminating exactly

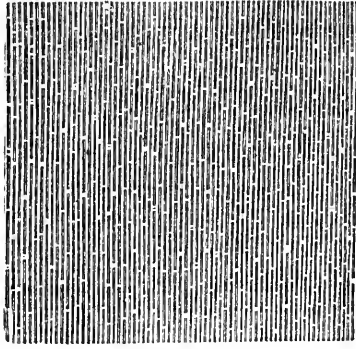


Fig. 71.

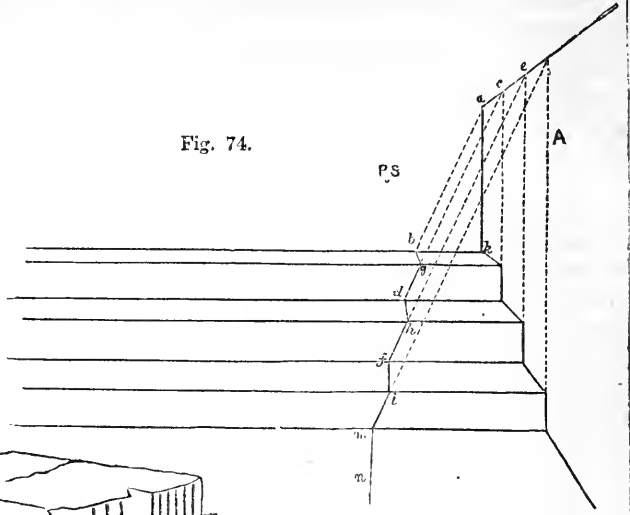


Fig. 74.

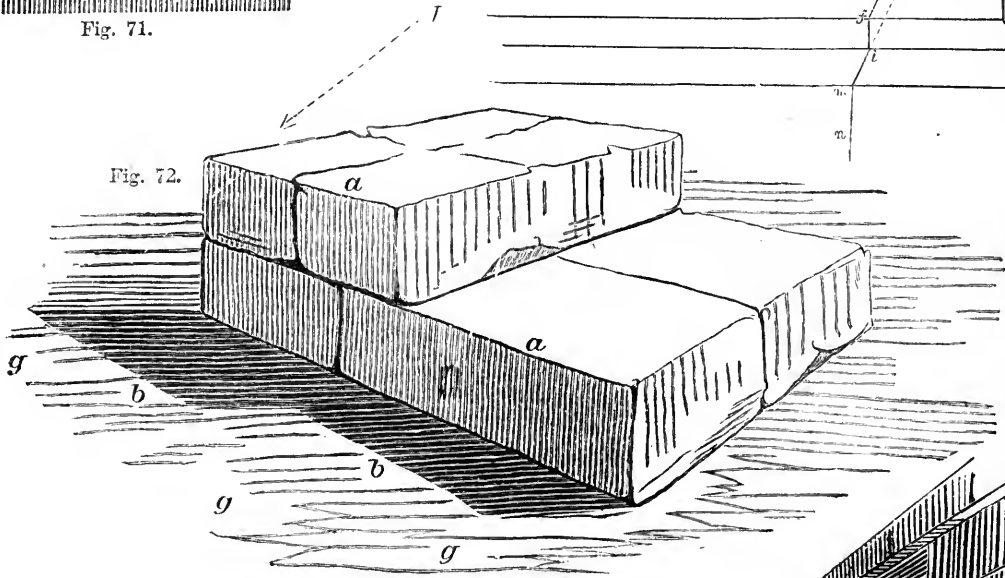


Fig. 72.

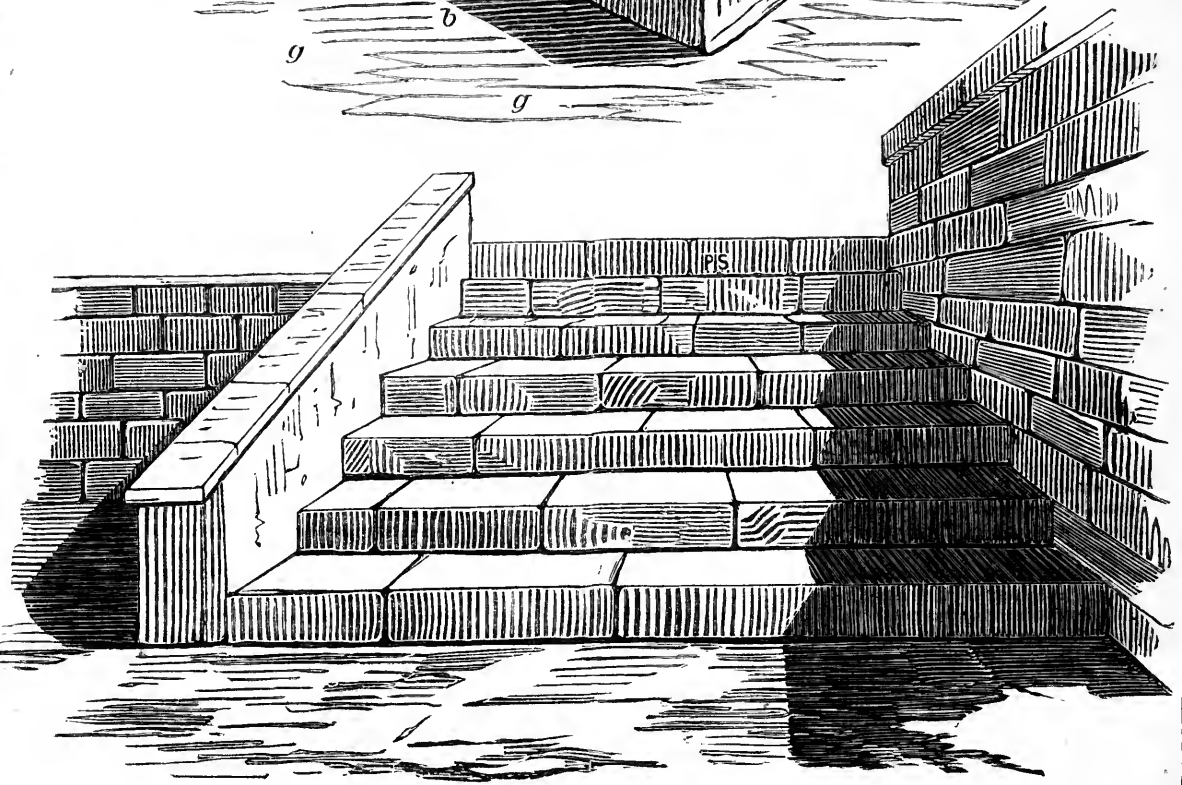


Fig. 73.

at the other side; observe the tone, and consequently the amount of pressure required for the cast shadow.

There is a very useful little instrument for shading, called a *stump*, it is made either of leather or paper, rolled up to about the length and thickness of the finger, and pointed at each end. When used, black chalk or lead is ground to a powder, the point of the stump is dipped into it, and then rubbed over the part to be shaded until an even tint is produced. We merely mention the stump here and explain its use, but at present we will put it aside, and keep to the *line* method until the pupil has thoroughly mastered it; afterwards we will draw his attention to the use of the stump, as capable of producing a *ground* for shadows to be lined over afterwards. The great art of shading a drawing well is to make use of the shadows, half tints, and

our admiration is excited by the correctness and beauty of the form which the line alone determines: now this feeling must be carried on, when introducing the shadows and the infinite number of minor tones, by preserving all that the line intended to give, whilst our attention is engrossed upon the shadows. In Fig. 73 there are several points of importance which must not be passed over: the pupil will notice that the wall to the left has the upper edges of each stone left untouched, because these edges, as they "round off" to the horizontal surface, meeting the mortar, catch the light more forcibly than the faces of the stones which are in a perpendicular position. In old stone walls of ruins these effects are continually to be seen, and must not be disregarded. The depth or intensity of shadows may not only be increased or diminished according to the pressure of the pencil

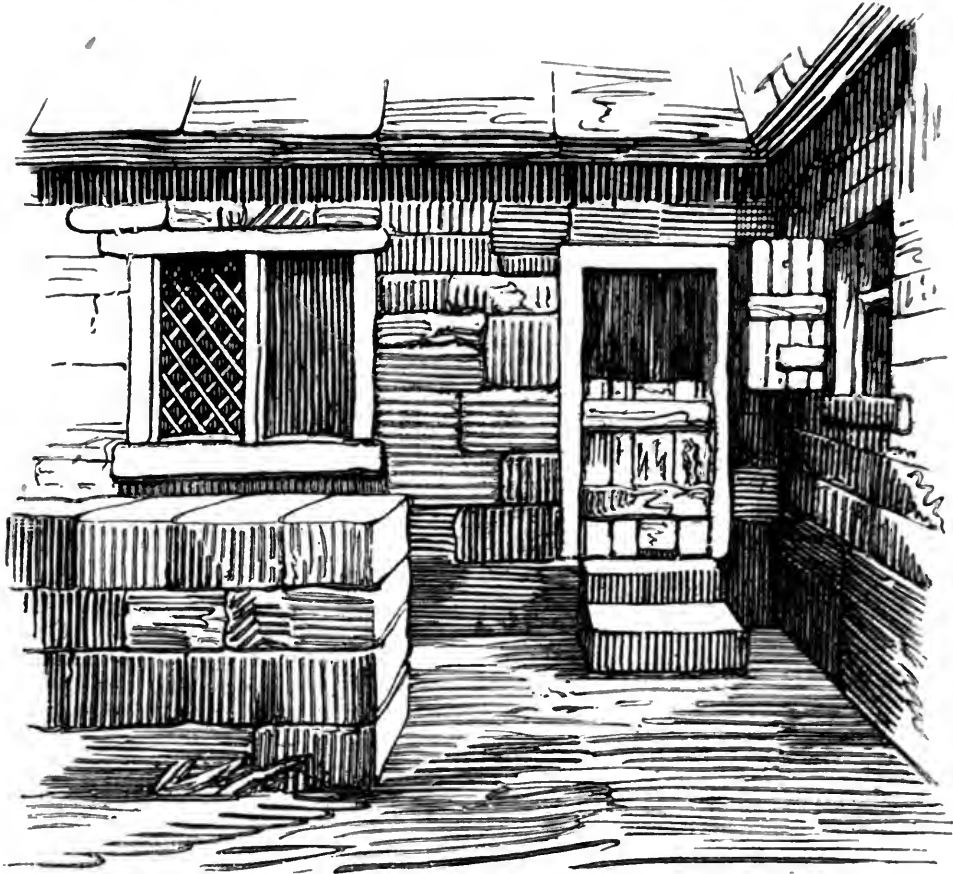


Fig. 75.

minor (or lighter) tones, as a means of distinguishing the form of the object, whether as to its general effect, or to the most minute and delicate details. We know that, in nature, objects are not represented to us by lines drawn about their edges; they are distinguishable from each other *only* by light and shade and colour: therefore, as it is necessary in the first instance to determine by an *outline* the boundary or form of the object, with all its various changes of surface, so we must as we proceed with the picture, by adding light, and shade, and colour, gradually lose the *drawn* line in the work, so as to avoid harshness, and that appearance which would strike us as if it had been cut out with a penknife. Of course we cannot altogether do without the *line* of the form, nor is it desirable that we should; and since our intention is to give as intelligible a representation of the object as we can, lines may be judiciously left without offending the eye by any unseemly harshness of expression. A line only determines the boundary of an object, that is, it gives the *form*; and in simple outline only, where no light and shade are added,

employed, but also by the distance the lines are drawn apart—closer together when depth is required, and wider when the shadows are to be lighter. The lines which produce the cast shadow of the wall on the horizontal surface of the steps must be *drawn towards the vanishing point* of the steps, and the *edge* of the shadow is determined by the following rule:—Let A (Fig. 74) be the wall causing the shadow on the steps; let the dotted lines *a b, c d, e f, etc.*, represent the inclination of the sun's rays (at an angle with the horizon, but parallel with the picture plane). As the end of the wall rises perpendicularly from the end of the step at *k*, therefore the shadow of the upper edge *a* will be at *b*, and the shadow of *a c* will be *b g*, directed towards the vanishing point of the wall; and because the sun's rays are parallel with the picture plane, and the wall at right angles with the picture plane, therefore its shadow will be the same, and consequently both the edge of the wall and its shadow have the same vanishing point, which in this case is the P S (point of sight). Thus it will be seen that the edge of the shadow on the *front* of the

steps is according to the inclination of the sun's rays, whilst the edge on the top or tread of the steps is directed towards the P S; therefore the upper edge of the wall casts its shadow on the line *b g d h f i m n*. In Fig. 75 the pupil will find a useful example for practice in shading. In copying this he must determine the extent of the shadows and the depth of their tints by the directions that have been given above.

LESSONS IN LATIN.—X.

THE THIRD DECLENSION (continued).

ADJECTIVES AND NOUNS OF THE THIRD DECLENSION DECLINED TOGETHER.

Cases.		Singular.	
N.	acer odor, m., a pungent smell.	dulcis mater, f., a sweet mother.	
G.	acris odoris, of a pungent smell.	dulcis matris, of a sweet mother.	
D.	acri odori, to a pungent smell.	dulci matri, to a sweet mother.	
Ac.	acrem odorem, a pungent smell.	dulcem matrem, a sweet mother.	
V.	acris odor, O pungent smell!	dulcis mater, O sweet mother!	
Ab.	acri odore, by a pungent smell.	dulci matre, by a sweet mother.	

Cases.		Plural.	
N.	acres odores, pungent smells.	dulces matres, sweet mothers.	
G.	acrium odorum, of pungent smells.	dulcium matrum, of sweet mothers.	
D.	acribus odoribus, to pungent smells.	dulcibus matribus, to sweet mothers.	
Ac.	acres odores, pungent smells.	dulces matres, sweet mothers.	
V.	acres odores, O pungent smells!	dulces matres, O sweet mothers!	
Ab.	acribus odoribus, by pungent smells.	dulcibus matribus, by sweet mothers.	

Cases.		Singular.	
N.	maius opus, n., a greater work.	rudis miles, m., an untrained soldier.	
G.	maioris operis, of a greater work.	rudis militis, of an untrained soldier.	
D.	maiori operi, to a greater work.	rudis militi, to an untrained soldier.	
Ac.	maius opus, a greater work.	rudem militem, an untrained soldier.	
V.	maius opus, O greater work!	rudis miles, O untrained soldier!	
Ab.	maiore opere, by a greater work.	rudis milite, by an untrained soldier.	

Cases.		Plural.	
N.	maiora opera, greater works.	rudes milites, untrained soldiers.	
G.	maiorum operum, of greater works.	rudium militum, of untrained soldiers.	
D.	maioribus operibus, to greater works.	rudibus militibus, to untrained soldiers.	
Ac.	maiora opera, greater works.	rudes milites, untrained soldiers.	
V.	maiora opera, O greater works!	rudes milites, O untrained soldiers.	
Ab.	maioribus operibus, by greater works.	rudibus militibus, by untrained soldiers.	

FORMS OF NOUNS AND ADJECTIVES OF THE FIRST, SECOND, AND THIRD DECLENSIONS.

EXAMPLE.—Bonus puer, m., a good boy; bona soror, f., a good sister; bonum nomen, n., a good name.

Cases.		Singular.	
N.	bonus puer.	bona soror.	bonum nomen.
G.	boni pueri.	bonae sororis.	boni nominis.
D.	bono puero.	bonae sorori.	bono nomini.
Ac.	bonum puerum.	bonam sororem.	bonum nomen.
V.	bone puer.	bona soror.	bonum nomen.
Ab.	bono puero.	bona sorore.	bono nomine.

Cases.		Plural.	
N.	boni pueri.	bonae sorores.	bona nomina.
G.	bonorum pueroꝝ.	bonarum sororum.	bonorum nominum.
D.	bonis pueris.	bonis sororibus.	bonis nominibus.
Ac.	bonos pueros.	bonas sorores.	bona nomina.
V.	boni pueri.	bonae sorores.	bona nomina.
Ab.	bonis pueris.	bonis sororibus.	bonis nominibus.

EXAMPLES.—Campus viridis, m., a green field; herba viridis, f., a green herb; gramen viride, n., green grass.

Cases.		Singular.	
N.	campus viridis.	herba viridis.	gramen viride.
G.	campi viridis.	herbae viridis.	graminis viridis.
D.	campo viridi.	herbae viridi.	gramini viridi.
Ac.	campum viridem.	herbam viridem.	gramen viride.
V.	campe viridis.	herba viridis.	gramen viride.
Ab.	campo viridi.	herba viridi.	gramine viridi.

Cases.		Plural.	
N.	campi virides.	herbae virides.	gramina viridia.
G.	camporum viridium.	herbarum viridium.	graminum viridum.
D.	campis viridibus.	herbis viridibus.	graminibus viridibus.
Ac.	campos virides.	herbas virides.	gramina viridia.
V.	campi virides.	herbae virides.	gramina viridia.
Ab.	campis viridibus.	herbis viridibus.	graminibus viridibus.

EXAMPLES.—Audax vir, m., a bold man; audax femina, f., a bold woman; audax animal, n., a bold animal.

Cases.		Singular.	
N.	audax vir.	audax femina.	audax animal.
G.	audacis viri.	audacis feminae.	audacis animalis.
D.	audaci viro.	audaci feminae.	audaci animali.
Ac.	audacem virum.	audacem feminam.	audax animal.
V.	audax vir.	audax femina.	audax animal.
Ab.	audaci viro.	audaci femina.	audaci animali.

Cases.		Plural.	
N.	audaces viri.	audaces feminae.	audacia animalia.
G.	audacium virorum.	audacium feminarum.	audacium animalium.
D.	audacibus viris.	audacibus feminis.	audacibus animalibus.
Ac.	audaces viros.	audaces feminas.	audacia animalia.
V.	audaces viri.	audaces feminae.	audacia animalia.
Ab.	audacibus viris.	audacibus feminis.	audacibus animalibus.

According to these paradigms or examples form the following:—

N.	vir major, m., a great man.	silva magna, f., a great wood.
G.	virī majoris, of a greater man, etc.	silvae magnae, of a great wood, etc.
N.	mulier major, f., a greater woman.	leona ferox, f., a fierce lioness.
G.	mulieris maioris, of a greater woman, etc.	leonae ferocis, of a fierce lioness, etc.
N.	acetum acre, n., sharp vinegar.	pratium sterile, n., an unfruitful
G.	aceti acris, of sharp vinegar, etc.	prati sterilis, etc. [meadow.]
N.	audax agmen, n., a daring band.	Julius Caesar, m., Julius Caesar.
G.	audacis agminis, etc.	Julii Caesaris, etc.

N. Cicero disertus, m., eloquent Cicero.
G. Ciceronis disertī, etc.

VOCABULARY.

Avis, -is, f., a bird.	Incumbo, 3 (with in and the acc.), I apply to.	Mores, in the plural, denotes morals, character.
Consto, 1, I consist of.	Litera, in the singular, signifies a letter of the alphabet.	Mortalis, -e, mortal.
Facile, adv., easily.	Litēre, -arum, f., letters, literature, knowledge.	Mos, moris, m., a custom.
Fortis, -e, brave.	Litēre, in the plural, means also a letter, that is, an epistle (epistola).	Omnis, -e, every one; in the plural, all.
Fundamentum, -i, n., a foundation.	Meus, mea, meum, my.	Pietas, -atis, f., piety.
Gravis, -e, heavy, severe.		Tuus, tua, tuum, thine.
Habeo, 2, I have.		Virtus, -utis, f., virtue (originally valour).
Hostis, -is, m., an enemy.		Vox, vocis, f., a voice.
Immortalis, -e, immortal.		
Industria, -ae, f., diligence.		

EXERCISE 33.—LATIN-ENGLISH.

1. Miles forti animo pugnare debet. 2. Homines corpora mortalia, animos immortales habent. 3. Nonne sunt hominibus mortalia corpora? 4. Suavi voce avium delector. 5. Suavine avium voce delectaris? 6. Pueri in literas incumbere debent alicui animo. 7. Cur non in literas incumbitis, pueri, alicui animo? 8. Discipulorum laus constat bonis moribus et acri (severe) industria. 9. Acri industria pater meus incumbit in literas. 10. Pietas omnium virtutum est fundamentum. 11. Tuas virtutes, O mater, me delectant. 12. Viri fortes non vincuntur doloribus gravibus. 13. Non cedimus hostibus audacibus. 14. Vox omnis bene auditur a matre tua. 15. Tuas voces, soror, mihi sunt dulces.

EXERCISE 34.—ENGLISH-LATIN.

1. Brave men yield not to enemies. 2. A bold hand is not easily conquered. 3. My son studies with an active (alacri) mind. 4. Do thy sisters love knowledge? 5. They are delighted by the voices of the birds. 6. The birds of the enemy have sweet voices. 7. My scholars apply well to knowledge. 8. The bold hand is conquered by Julius Caesar. 9. The bodies of men are mortal, the souls immortal. 10. The piety of the mother delights the son. 11. The daughter is delighted by the virtue of the father. 12. The virtue of boys consists in industry and good character. 13. My mother's letter (the letter of my mother) is heard by all.

KEY TO EXERCISES IN LESSONS IN LATIN.—IX.

EXERCISE 29.—LATIN-ENGLISH.

1. Artificers ought to teach boys. 2. The king moves (his) thumb. 3. Kings guard the laws. 4. Laws are guarded by kings. 5. The son bites (his) thumb. 6. The horsemen are harassed (grieved). 7. Artists adorn cities. 8. The wages of artificers support (their) sons and daughters. 9. The bachelor sleeps. 10. The people are defended. 11. The race of the artificer is praised. 12. Hast thou corn-land? 13. The neck of the soldier is injured. 14. The age of the bachelor is great.

EXERCISE 30.—ENGLISH-LATIN.

1. Artifices defendo. 2. Artifices a me defenduntur. 3. Estue illi merces? 4. Pecus non est illi. 5. In corvix pungor. 6. Artifices plingunt pecora. 7. Funestus sunt regum locustæ. 8. Seges equitis creditur. 9. Cur vituperatur cæles? 10. Cæles vituperat plebs. 11. Sunt militibus mercedes. 12. Multa docet ætas.

EXERCISE 31.—LATIN-ENGLISH.

1. Birds deceive bachelors. 2. Mothers are slain by fevers. 3. I greatly like the sea. 4. The sea is liked by sailors. 5. Husbandmen cultivate corn-fields. 6. There are sailors in the ships. 7. There is fire in the globe. 8. The brothers are in the fires (flames). 9. The goddesses have altars. 10. Have not the gods altars? 11. The husbandmen defend the sheepfolds with a hatchet.

EXERCISE 32.—ENGLISH-LATIN.

1. Corporibus naves defendunt nautæ. 2. In rupibus sunt aves. 3. A nautis rupes ne amantur? 4. Nocet plebi cædes. 5. Aves feriant nubes. 6. Securos defendunt naves. 7. Civium aves nocentur. 8. Principis sedile laudatur. 9. Viucinus principum comites.

LESSONS IN ENGLISH.—X.

DERIVATION.—PREFIXES (continued).

IN the prefixes and quotations given in former lessons, we may find a species of indirect history. The facts set forth in connection with them, show us how much ours is a composite language, a language that is like the composite order of architecture, made up of elements derived from different sources. The facts also inform us that the English nation has been closely connected with the French, and so is much indebted to the ancient Latins. To the corrupt Latin of the Middle Ages we are also obviously indebted; and from the Greek tongue we have derived words and parts of words. Nor have Italy and Spain failed to contribute to the enrichment of our language. In historical or genealogical relations, we Englishmen of this day are connected with the Norman baron as well as the Saxon churl; with the monk and the schoolmen, no less than with the conquerors of the world; and may fancy the line of our relationship to stretch from the Thames to the Rhine, and from the Rhine even to the Indus and the Ganges. If every sentence that has been written to convey to the world a history of England had totally perished, still scholars, out of the fossil remains of the nation discoverable in its words, would, after the manner of the geologists, be able to reproduce the great outlines of our English life. Even single words are full of the elements of history. Those elements are often beneath the surface; at least they are not obvious to the common eye. I give you, however, an instance, the historical value of which is clear to all. When, in the early part of the reign of Charles I., the Puritan party began to rise against the royal authority, the more demure members of the party wore their hair cropped so close and short, as, in contrast with the full and flowing locks of the courtiers, to give their heads the appearance of so many bowls. Queen Henrietta Maria, the spouse of Charles, observing this marked peculiarity, graphically as well as wittily termed them roundheads. The particular occasion was the following:—"Samuel Barnadiston, a noted republican, was, in his youth, the leader of a deputation of London apprentices, for the purpose of communicating to Parliament their notions regarding civil and religious government. The queen, who saw this posse arrive at Whitehall, then first noticed the extraordinary roundness of their closely-clipped heads, and saw at the same time that Samuel was a personable apprentice; upon which she exclaimed, 'La! what a handsome young roundhead!' The exactness of the descriptive appellation fixed it at once as a party name; roundheads they were called from that moment, and roundheads they will remain while history endures."* You thus see that the term "Roundhead" contains a history. It also paints a picture. In the word "roundhead" we possess an historical picture; and the picture which it paints all can appreciate. Why? Because the word consists of Saxon terms, nursery terms. Translate the Saxon "roundhead" into Latin, *rotundum caput*, and so far from painting a picture, the term does not convey any meaning to the mere English scholar. If, then, you would be understood by the

people, use words of Saxon origin. But if you would be well acquainted with the English language, study its Latin, and generally its foreign elements, as these are they with which you do not become familiar in the nursery, and which consequently present difficulties, and obstruct the pathway to knowledge. These remarks suggest reasons why we are entering so fully into the composition of English words.

Hyper, of Greek origin (*ὑπερ*, pronounced hu'-per, upon, over, too much), found in *hypercritic*; that is, one who is too critical, unjustifiably critical.

"The hypercritical controuller of poets, Julius Scaliger, doth so severely censure nations, that he seemeth to sit in the chaire of the scornfull."—Camden, "*Remaines*."

Hypo, of Greek origin (*ὑπο*, pronounced hu-po), with the import of *under*, appears in *hypocrixy*, acting under a mask, acting an assumed character, involving both simulation or pretending to something you are not, and dissimulation or concealing what you are. *Hypo* appears also in *hypotenuse* (Greek, *ὑπερ*, pronounced ti-nine, to stretch).

"The square of the hypotenuse in a right-angled triangle is equal to the squares of the two other sides."—Locke, "*Human Understanding*."

Hypo appears also in *hypothesis* (Greek, *ὑποthesis*, pronounced the-sis, a placing), which by its derivation signifies a placing under, as is intimated in the Latin supposition (*sub*, under; and *ponere*, to place). An *hypothesis*, then, is a supposition—something put under certain phenomena or appearances in order to explain their cause or immediate origin.

"Any hypothesis which possesses a sufficient degree of plausibility to account for a number of facts, helps us to digest these facts in proper order, to bring new ones to light, and to make *experimenta crucis* (that is, decisive tests) for the sake of future inquiries."—Hartley, "*On Man*."

In, of Latin origin, signifying *in*, *into*, and *upon*, having also a negative force, appears in these forms, namely, *ig*, *il*, *im*, *in*, *ir*, *is*.

Ig, as in the Latin word *ignoramus*, denoting one who knows nothing. Here *ig* makes the statement in the verb equivalent to a negative proposition. *Ignoramus* properly signifies *we are ignorant*. An *ignoramus* once in a letter to me spoke of *ignorami*, fancying, with a smattering of Latin, that the plural of *ramus* was *mi*. If *ignoramus* is used in the plural, it must stand as *ignoramuses*; but Beaumont uses *ignoramus* itself as a plural.

"Give blockheads beere,
And silly ignoramus, such as think
There's powder-treason in all Spanish drink."

Ignoramus is used also as an adjective; e. g.,

"Let ignoramus juries find no traitors;
And ignoramus poets scribble satires."

Il, as in *illegal*, *not legal*; *illegitimate*, *not legitimate*; the root of both being *lex*, *legis*, Latin, a law. In *illustrate* (Latin, *lux*, light), the *il* denotes *upon*; *illustrate* is to throw light upon a subject. In *illusory* (Latin, *ludo*, I play, cheat), *deceptive*, the *il* seems to be little more than intensive.

In, *into*, as *imbibe* (Latin, *bibo*, I drink), *imbody* (*embody*).

"The soul grows clotted by contagion,
Imbodies and imbrates, till she quite lose
The divine property of her first being."—Milton.

In *imbitter*, the *im* (or *em*) is intensive or augmentive. In *immature* (Latin, *maturus*, ripe), the *im* is negative—*immature* means *unripe*; *im* is negative also in *immemorial* (Latin, *memor*, mindful); *immemorial usage* is *usage time out of mind*.

"And though some impious wits do questions move,
And doubt if souls immortal be or no,
That doubt their immortality doth prove,
Because they seem immortal things to know."

The root of *immortal* is the Latin *mors* (*mortis* in the genitive), *death*; whence *mortal*.

In, *in*, as in *inclose* (Latin, *claudio*, I close), to shut in; *in*, *into*, as *income*; *in* means also *not*, as *incognito* (abridged into *incog.*), a word coming to us from the Latin *incognitus*, *unknown*, through the Spanish *incognito*. *Inconvenient* is made up of *in*, *not*, *cum*, *with*, and *venio*, I come; *inconvenient*, therefore, is that which does not come with you, does not agree with your

* "Lives of the Queens of England," by Agnes Strickland, vol. viii., p. 99.

condition, position, or wishes. In *indigent* (Latin, *indigeo*, *I want*, from *in* and *ego*), *needy*, the *in* is augmentive.

"Themistocles, the great Athenian general, being asked whether he would choose to marry his daughter to an *indigent* man of merit, or to a worthless man of an estate, replied, that he should prefer a man without an estate, to an estate without a man."—*Spectator*.

Ir, not, as in *irreparable* (from the Latin through the French; Latin, *reparare*, to get again), not to be got again, not to be regained or restored.

"Nor does she this irreparable woe
To shipwreck, war, or wasting sickness, owe;
But her own hands, the tools of envious fate,
Wrought the dire mischief which she mourns too late."
Lewis, "Statius."

In *irruption* (Latin, *rumpo*, *I break*), the *ir* has the force of *into*; the opposite of *irruption*, a *breaking into*, is *eruption*, a *breaking out of*. Compare *corruption*, a *breaking together*, a *breaking up*, a *crumbling*.

In *passes into the form is in isolated* (Latin, *insula*, an island), derived immediately from the French *isolé*; *isolated*, or rather *insulated*, means *standing alone*, like an island in the sea. The French form gains prevalence, and has given rise to the verb *isolate* and the noun *isolation*.

Inter, of Latin origin (compare *enter* as above), signifying *between*, *among*; as *intermarry*, said of families, members of which marry one another; *inter* is found also in *interpolate*, to *introduce*. This is a word which has given trouble to the etymologists. Both Richardson and Du Cange connect it with *polire*, to *polish*. This view makes *interpolation* a sort of amendment, whereas the word carries with it the idea of corruption and deprivation. *Interpolation* seems to me a low Latin word, whose root is the classical Latin *pello* (*pulsus*), *I thrive*, so that *interpolation* is something thrust in, something foisted on. This is the sense in which the word is generally used, denoting the unjustifiable additions and insertions made to manuscripts by later hands than those by which they were originally composed.

"The very distances of places, as well as numbers of the books, demonstrate that there could be no collusion, no altering nor interpolating one copy by another, nor all by any of them."—Bentley, "On Free-thinking."

"The larger epistles of Ignatius are generally supposed to be interpolated."—Jortin, "Ecclesiastical History."

Inter-minable is thus printed in "Richardson's Dictionary," as though the word was from the Latin *inter*, and *minor*, *I threaten*; whereas it is made up of *in*, *not*, and *terminus*, a *limit*, or *boundary*, and so is equivalent to *unlimited*, or *unbounded*; as in

"Plains immense
Lie stretched below, interminable meads
And vast savannas, where the wandering eye,
Unfixt, is in a verdant ocean lost."
Thomson, "Summer."

Intra, of Latin origin, signifying *within*, occurs in the forms *entra* and *intro*, e.g., as in the recent word *intramural* (Latin, *murus*, the wall of a city), *intramural interments*, and *introduce* (Latin, *duco*, *I lead*), to lead *within*; also *intromit* (Latin, *mitto*, *I send*), to send or let in.

"So that I (Guido Remi) was forced to make an introspection into mine own mind, and into that idea of beauty which I have formed in my own imagination."—Dryden, "Parallel."

Magn, of Latin origin (*magnus*, great), in the forms *magna* and *magni*, enters into the composition of the following words: *magnanimity* (Latin, *animus*, mind), greatness of mind; *magnify* (Latin, *facio*, *I make*), to make great, extol; *magniloquence* (Latin, *loquor*, *I speak*), great talk. *Magnify* is connected with the words *magnificence*, *magnificent*, *magnifier*. From *magnus*, great, comes also *magnitude*.

"To these, thy naval streams,
Thy frequent towns superb, of busy trade,
And ports magnific add, and stately ships,
Innumerosus."
Dyer.

Mal, or *male*, of Latin origin (*malum*, evil), forms a set of words the opposites of words containing *bene*; as *malevolence*, *benevolence*; *malediction*, *benediction*. *Male* is found in *mal-administration* and *mal-treat*; *malefactions* (Latin, *facio*, *I do*), are misdeeds.

"I have heard

That guilty creatures sitting at a play,
Have, by the very cunning of the scene,
Been struck so to the soul, that presently
They have proclaim'd their malefactions."

Shakespeare, "Hamlet."

Melan, of Greek origin (*μελας*, pronounced mel-as, black), to disorder, presents itself in *melancholy*, literally, *black bile* (from the Greek *μελας*, black, and *χολη*, pronounced kol'-e, bile), whence it was thought came habitual sadness.

"But hail, thou goddess, sage and holy,
Hail, divinest melancholy!
Whose saintly visage is too bright
To hit the sense of human sight;
And therefore to our weaker view
O'erlaid with black, staid Wisdom's hue."

Milton, "R Penseroso."

Meta, of Greek origin (*μετα*, pronounced met-ta), signifying *after*, and denoting *change*, *transference*, is found in *metaphor* (from the Greek *φερω*, pronounced fer-ro, *I bear*), a figure of speech in which there is a transference of the literal meaning of the word. Words originally represented objects of sense. It is only by accommodation or transference that the word which set forth some sensible objects has come to denote a state of mind or feeling. Thus *acute*, which now describes a shrewd, clever mind, properly signifies sharp, piercing—from the Latin *acu*, a *needle*. In this view, all words now applied to mental or moral phenomena, contain metaphors. Instances may be given in *reflect* (Latin, *re*, back, and *flecto*, *I bend*), *abstract* (Latin, *ab*, from; and *traho*, *I draw*), *conceive* (Latin, *cum*, with, and *capio*, *I take*), and of course their corresponding nouns; also, in *hard* (*hard* heart), *open* (*open* disposition), *light* (*light*-hearted). The term *metaphor*, however, is specially given to more marked and striking, not to say artificial instances of transference, on the ground of some real or supposed resemblance between the material and the mental objects. Thus, the sun is termed *the king of day*, and the moon *the queen of night*.

"An horn is the hieroglyphick of authority, power, and dignity, and in this metaphor is often used in Scripture."—Brown, "Vulgar Errors."

Meta forms the two first syllables of *metaphysics* (in Greek, *μετα τα φυσικα*, pronounced met'-ta tar fu'-se-ka, *after the physics or natural sciences*). The force of the word will be learnt in these quotations:—

"The one part which is *physic* (physics, relating to matter) inquireth and handleth the material and efficient causes; and the other, which is *metaphysic* (metaphysics, the plural is now generally used), handleth the formal and final causes."—Bacon, "Advancement of Learning."

"From this part of Aristotle's logic there is an easy transition to what has been called his *metaphysics*; a name unknown to the author himself, and given to his most abstract philosophical works by his editors, from an opinion that these books ought to be studied immediately after his *physics*, or treatises on natural philosophy."—Gillies, "Analysis of Aristotle's Works."

Meta also enters into the Greek word *metempsychosis* (*em*, in, and *ψυχη*, pronounced su'-ke, the soul), the passage of the soul from one body to another.

"The souls of usurers, after their death, Lucan affirms to be *metempsychosed*, or translated into the bodies of asses, and there remain certain years, for poor men to take their pennyworth out of their bones."—Peacham.

EXERCISE.

1. Parse the following sentences:—

July is a very hot month. In July the grass and flowers are burnt. Why do you not water your garden? The children go under the bushes. A bee is on the honeysuckle. The bee will carry the honey to the hive. Look at puss! She pricks up her ears. She smells the mice. Puss wants to get into the closet. The mice have nibbled the biscuits. February is a cold month. It snows. It freezes.

2. Form sentences having in them these words:—

Signification; prevent; incrustation; excommunicate; efflorescence; encamp; survey; office; entertainment; epitaph; equivocation; despot; forbid; pardon; hieroglyphics.

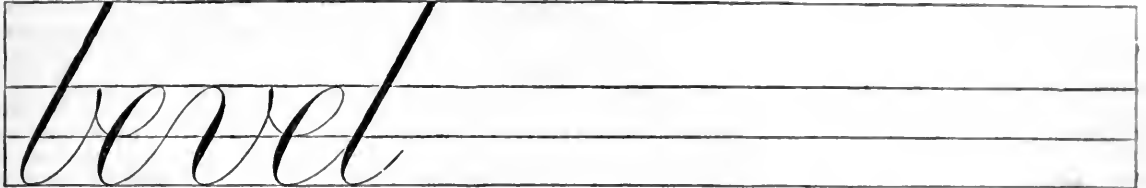
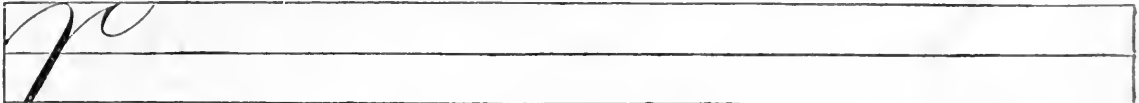
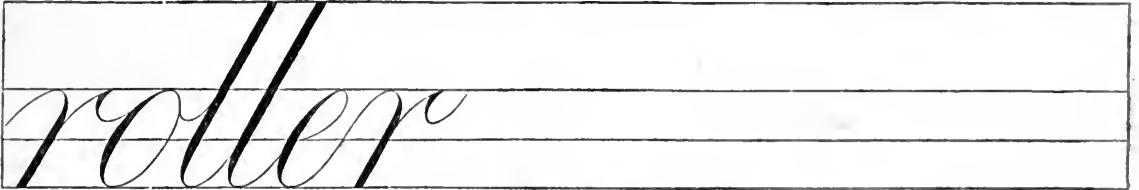
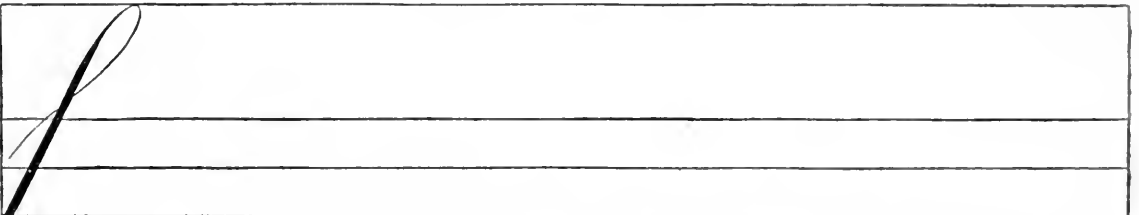
3. Write a theme on each of the following subjects:—

1. Joseph and his brethren. 2. A May morning. 3. The Invincible Armada. 4. The Solar System. 5. The chief river in the neighbourhood where you live, and any objects of interest on or near its banks.

LESSONS IN PENMANSHIP.—XIX.

IN Copy-slips Nos. 67 and 68 the learner will see how the letters *v*, *w*, and *b* are joined to letters that precede and follow them, and in these he will also find examples of the method of bringing the final curve to the right, which terminates the letters that have just been named, in a downward direction, in order to carry it with greater facility into the line that forms the loop

No. 70. An inspection of these elementary strokes will show that the letter *r* is formed of the top-turn, with the addition of a fine hair-stroke brought upwards along the right-hand side of the thick down-stroke of the top-turn as far as the line *cc*, when it is carried out to the right, in a graceful curve, as far as the line *aa*. The pen is then brought downwards, and the letter is terminated by a curved or hooked stroke, resembling in a great measure a small bottom-turn. When the letter *r* is

COPY-SLIP NO. 67.—THE WORD *WAVE*.COPY-SLIP NO. 68.—THE WORD *BEVEL*.COPY-SLIP NO. 69.—ELEMENTARY STROKES FORMING THE LETTER *r*.COPY-SLIP NO. 70.—THE LETTER *r*.COPY-SLIP NO. 71.—THE WORD *ROLLER*.

COPY-SLIP NO. 72.—ELEMENTARY LOOPED STROKE, TOP-TURN.

of the letter *o*, which would be greatly curtailed in size and robbed of its proper proportions if the final curve of the *v*, *w*, or *b* that precedes it were carried to the right midway between the lines *aa*, *cc*, in the ordinary way, instead of being brought downwards as far as the line *cc* and then turned into the loop of the letter *o*.

The four remaining letters of the writing alphabet—namely, *r*, *f*, *k*, and *z*—each exhibit a peculiarity of form that is not to be found in any other letter. The elementary strokes which are combined to form the letter *r* are shown in Copy-slip No. 69, and the letter *r* itself in a complete form in Copy-slip

followed by *o*, the finishing turn, as in the case of the final curve terminating the letters *v*, *w*, and *b*, is made larger in order to carry it into the fine up-stroke commencing at *cc*, which forms the loop of the letter *o*.

An example of the letter *r*, in conjunction with letters preceding and following it, will be found in Copy-slip No. 71, in the word *roller*. The elementary looped stroke, turned at the top, which generally forms the upper part of the letter *f*, is given in Copy-slip No. 72. It resembles the loop-stroke, turned at the bottom, which enters into the composition of the letters *j*, *g*, and *y*, in a reversed position.

LESSONS IN GERMAN.—XVIII.

SECTION XXXIII.—PECULIARITIES IN VERBS, ETC.

1. THE infinitive of the active voice, in certain phrases, is, especially after the verb *sein*, often employed in a *passive* signification, as:—*Er ist zu ehren*, he is to be *honoured*. *Er ist zu loben*, he is to be *praised*. *Laf ihn rufen*, let him be *called*. This use of the infinitive prevails to some extent in English. Thus, we may translate literally the following examples:—*Dieses Haus ist zu vermieten*, this house is to let. *Dieser Knabe ist zu tadeln*, this boy is to blame.

2. *Heißen* signifies "to name, to call;" also, sometimes, "to command." In the sense of naming or calling, it is most generally used in a *passive* signification, as:—*Wie heißen Sie?* how are you called? or, what is your name? *Ich heiße Raphael*, I am called *Ralph*, or, my name is *Ralph*.

VOCABULARY.

<i>Aus'sprache, f.</i> pronunciation.	<i>Heißen</i> , to name (R. 2.)	<i>Schnell</i> , quick, rapidly.
<i>Bei'tragen</i> , to contribute.	<i>Herstellen</i> , to restore, re-establish.	<i>Uebung, f.</i> practice, use.
<i>Braun'schweig, n.</i> Brunswick.	<i>Himmel, m.</i> (the) heavens, sky.	<i>Ueberreden</i> , to persuade.
<i>Durch</i> , through, by means of.	<i>Jacob, m.</i> James.	<i>Uebersehen, m.</i> oversight.
<i>Einzig</i> , single, only.	<i>Letzte</i> , or <i>jezte</i> , the (Sect. XXX. 6).	<i>Ueberzeugen</i> to convince.
<i>Erklimmen</i> , to climb.	<i>Kunswerk, n.</i> work of art.	<i>Vermieten</i> , to let.
<i>Erwerben</i> , to win, gain.	<i>Mühe, f.</i> pains, toil.	<i>Verzeihen</i> , to pardon, excuse.
<i>Glückseligkeit, f.</i> felicity.	<i>Dync</i> , without.	<i>Vollkommen</i> , perfect.
		<i>Wertvoll</i> , valuable.

RÉSUMÉ OF EXAMPLES.

<i>Ein böses Gewissen ist nicht zu beruhigen.</i>	An evil conscience is not to be quieted.
<i>Ein Gelehrter ist leichter zu überzeugen, als ein Dummer.</i>	A learned man is easier to convince, than a stupid (one).
<i>Weisheit ist nicht wie eine Waare zu kaufen.</i>	Wisdom is not to be bought like wares.
<i>Die Rose heißt die Königin der Blumen.</i>	The rose is called the queen of flowers.
<i>Der Löwe heißt der König der Thiere.</i>	The lion is called the king of the beasts.

EXERCISE 60.

1. Diese großen, schönen Häuser sind alle zu vermieten. 2. Das eine Haus ist zu vermieten, das andere zu verkaufen. 3. Es ist nicht zu glauben, daß er uns verlassen hat. 4. Dieses Buch ist bei Herrn Westermann in Braun'schweig zu haben. 5. Kein einziger Stern war am ganzen Himmel zu sehen. 6. Wie ist dieses lange Wort auszusprechen? 7. Wo sind die besten Stiefel, Schuhe und Ueberstühle zu finden? 8. Die besten, die ich gesehen habe, sind bei meinem alten Nachbar N. zu finden. 9. Das Feuer brannte so schnell, daß nichts im Schlosse zu retten war. 10. Nichts Wertvolles ist ohne Mühe zu gewinnen. 11. Dieser hohe Felsen ist nicht zu erklimmen. 12. Dieses alte Haus ist nicht mehr herzustellen. 13. Durch diesen Wald ist nicht zu kommen. 14. Er ist weiter zu überzeugen, noch zu überreden. 15. Sein Betragen ist gar nicht zu verzeihen. 16. Wie heißt Ihr Freund? 17. Er heißt Jacob. 18. Wie heißt das auf Deutsch? 19. Es heißt eine Brille. 20. Ein Kunstwerk ist desto schöner, je vollkommener es ist, das heißt, je mehr Theile es hat, und je mehr alle rize Theile zum Zwecke beitragen.

EXERCISE 61.

1. The pronunciation of foreign words is only to be acquired through practice. 2. Nothing is to be learned without pains. 3. Perfect felicity is not to be found in this world. 4. You speak so quick, that you are not to be understood. 5. Health is not to be bought with money. 6. The peace of the town was not to be restored through severe orders. 7. How do you call these flowers? 8. They are called tulips. 9. The intelligent scholars are to be praised. 10. The difference between to buy and to sell must, by this time, be known to the scholar. 11. This book is to be had of the bookseller C. in London. 12. A valuable work of art cannot be made without much toil. 13. The rose and the violet are valued for their perfume, the tulip for the brilliancy of its colours. 14. James is going to

Brunswick to-morrow. 15. The heavens declare the glory of God.

VOCABULARY.

<i>Ab'holen</i> , to fetch, call for.	<i>Gerum'</i> , about, round.	<i>Wie'ternehmen</i> , to take again, back.
<i>Ab'reisen</i> , to depart.	<i>Hin'schicken</i> , to send to.	<i>William</i> , m. William.
<i>Ab'schreiben</i> , to copy.	<i>Sohnen</i> , John.	<i>Zurüd'</i> , back.
<i>Clavier'unterricht, m.</i> instruction on the piano.	<i>Lust, f.</i> desire, wish.	<i>Zurüd'kommen</i> , to come back.
	<i>Mit'bringen</i> , to bring.	<i>Zurüd'schicken</i> , to send back.
	<i>Mit'gehen</i> , to go with.	
	<i>Zeit</i> , since.	
<i>Gärtner, m.</i> gardener.	<i>Spazier'gang, m.</i> walk.	

EXERCISE 62.

1. Wo schicken Sie Ihren Briefen hin? 2. Er ist krank, er kann nirgends hingehen. 3. Schreiben Sie diesen Brief ab? 4. Ich habe ihn schon abgeschreiben. 5. Glauben Sie, daß der Buchbinder mir meine Bücher zurüd'schickt? 6. Hat Ihre Schwester die Blumen erhalten, die ich ihr gekauft habe? 7. Der Gärtner kommt morgen und wird sie mitbringen (Sect. XXVI. 2). 8. Wann geht Johann in die Schule? 9. Er geht morgen dahin, und der kleine Heinrich geht auch. 10. Wo sind die neuen Tische, welche der Schreiner gemacht hat? 11. Haben Sie den schönen Wagen gesehen, in welchem Herr G. seine Frau und seine Kinder abholte? 12. Wann kommt Ihr Herr Bruder von Paris zurüd? 13. Er ist schon seit (Sect. LVII.) fünf Tagen zurüd. 14. Haben Sie Lust, einen Spaziergang zu machen? 15. Nein, ich habe schon einen Spaziergang um die Stadt gemacht.

EXERCISE 63.

1. He was beginning to tell us what he had written, but he was interrupted by the arrival of a stranger. 2. When did your sister start for France? 3. She left the day before yesterday. 4. Has she taken little Mary with her? 5. It will be very difficult to make his conduct agree with the principles that he professes. 6. You, who have forsaken your friends, are entitled to no confidence. 7. Good women are the most charming class of society; they comfort us, raise our minds, constitute our happiness, and have no vices but those which we communicate to them.

SECTION XXXIV.—PECULIARITIES IN VERBS, ETC.—

(continued).

Werden is used as an auxiliary in forming the future of all German verbs; and, in this use, is translated by our auxiliary "shall" or "will." (§ 70. 6.)

1. As an independent verb *werden* signifies, "to become, to grow, to get," etc., as:—*Er wird alt*, he is *growing* old. *Das Wetter wird kälter*, the weather is *growing* colder. *Es wird dunkel*, it is *getting* dark. *Der Rabe wird sehr alt*, the raven *becomes* very old (lives or attains to a great age).

2. *Werden* with the dative often denotes possession, as:—*Mir wird immer das Meinige*, I always obtain my own (to me comes [becomes] always my own). *Meinen armen Lutterthänen muß das Ihrige werden*, my poor subjects must have their own (property).

CONJUGATION OF THE VERB *werden*, IN THE INDICATIVE.

Infinitive.

Participles.

PRES. *Werden*, to become.

PRES. *Wertend*, becoming.

PERF. *Werden sein*, to have become.

PERF. *Geworden*, become.

PRESENT.

Singular.
Ich werde, I become;
Du wirst, thou becomest;
Er wird, he becomes;

Plural.

Wir werden, we become.
Ihr werdet, you become.
Sie werden, they become.

IMPERFECT.

Ich wurde or wart, I became;
Du wurdest or wartst, thou be-
camest;
Er wurde or wart, he became;

Wir wurden, we became.
Ihr wurdet, you became.
Sie wurden, they became.

PERFECT.

Ich bin geworden, I have be-
come;
Du bist geworden, thou hast be-
come;
Er ist geworden, he has become;

Wir sind geworden, we have be-
come.
Ihr seid geworden, you have be-
come.
Sie sind geworden, they have be-
come.

PLUPERFECT.

Ich war geworden, I had become; wir waren geworden, we had become.
 Du warst geworden, thou hadst thy wertest geworden, you had become;
 Er war geworden, he had become; sie waren geworden, they had become.

FIRST FUTURE.

Ich werde werden, I shall become; wir werden werden, we shall become;
 Du wirst werden, thou wilt become; ihr werdet werden, you will become;
 Er wird werden, he will become; sie werden werden, they will become.

SECOND FUTURE.

Ich werde geworden sein, I shall have become; wir werden geworden sein, we shall have become.
 Du wirst geworden sein, thou wilt have become; ihr werdet geworden sein, you will have become;
 Er wird geworden sein, he will have become; sie werden geworden sein, they will have become.

IMPERATIVE.

Werde tu, become thou; wertet ihr, become you.
 Werde er, let him become; wertet sie, let them become.

3. Often, when repeated or customary action is implied, the genitive of a noun is made to supply the place of an adverb, as:—Des Morgens schläft, des Mittags liest, und des Abends friert er, he sleeps in the morning, reads at noon, and plays in the evening. (§ 101.)

4. Als (as), after *so* viel, so viel, so weit, etc., is frequently omitted, but must be supplied in translating, as:—So viel ich weiß, so far as I know. So gut ich kann, as well as I can. Sobald er kommt, as soon as he comes, etc. For other uses of *als*. see Sect. LX.

VOCABULARY.

Auge, n. eye.	Finster, dark.	Sinken, to sink.
Aus'mantern, to emigrate.	fröhlich, to feel.	Sobald', as soon as.
Beendigen, to end, finish.	heiß, hot.	Tagelöhner, m. day-labourer.
Gemein', m. comrade.	hoffen, to hope.	Tausent, thousand (§ 44).
Daraus', thereout, therefrom.	hundert, hundred.	Vermögen, to be able.
Druck, m. pressure.	Jahr, n. year.	Vorhaben, to intend.
Dürfen, to be permitted (§ 25).	Krieger, m. warrior.	Werden, to become, etc. (R. 1).
Erblicken, to desery, see.	Lager, n. couch.	Ziel, n. limit, goal, aim.
Erwarten, to await.	Längstens, at the longest.	Ziemlich, tolerably.
Fertig, ready.	Meer, n. sea.	Zuerst', previously.
	Plötzlich, suddenly.	Zufünftig, futuro.
	Schlacht, f. battle.	
	Republik', f. republic.	
	Seufzen, to sigh.	

RÉSUMÉ OF EXAMPLES.

Sobald' er das hörte, stand er auf. As soon (as) he heard that, he stood up (got up).
 So viel ich weiß, ist er ein ehrlicher Mann. As much (as) I know (so far as I know), he is an honourable man.
 Sobald' die Nachricht von dem Verräthe Görgey's eintraf, sank der Mut der Ungarn. As soon as the report of the treachery of Görgey arrived, the courage of the Hungarians sank.
 Sobald' die Sonne untergeht, wird es Nacht. As soon as the sun goes down, it (becomes) is night.
 Was ist aus ihm geworden? What has become of him?
 Die Stunden werden zu Tagen, die Tage zu Wochen, die Wochen zu Monaten, und die Monate zu Jahren. The hours (become) grow to days, the days to weeks, the weeks to months, and the months to years.

EXERCISE 64.

1. Wir werden alt und älter, und sind eher am Ziele, als uns angenehm ist. 2. Es ward so finster, daß wir unsere Hände nicht vor den Augen zu erblicken vermochten. 3. Um fünf Uhr wird es dunkel. 4. Stehen Sie ras Morgens früh auf? 5. Sobald es Tag wird, verlasse ich mein Lager.

6. Wollen Sie dieses Jahr noch nach Amerika auswandern? 7. Ich habe es vor, aber ich glaube nicht, daß etwas daraus werden wird. 8. Frankreich wurde im Jahre eintausend achtshundert acht und vierzig eine Republik. 9. Gott sprach: es werde, und es ward. 10. Ist Ihre neue Grammatik schon fertig? 11. Noch nicht, aber ich hoffe, daß sie in längstens vierzehn Tagen fertig werden wird. 12. Was soll aus mir werden? 13. Es wird ein heißer Tag werden, sprach ein alter Krieger, wenige Stunden vor der Schlacht, zu seinen Kameraden. 14. Die Sonne sank in das Meer, und es ward Nacht. 15. Der Kranke seufzt auf seinem Lager: „will es denn nie Tag werden?“ und der Tagelöhner unter dem Drucke seiner Arbeit: „wird es denn nicht bald Nacht werden?“ 16. Das Wetter ist schon ziemlich kalt geworden.

EXERCISE 65.

1. The present [Gegenwart] we know, the future [Zukunft] we know not of, and honour to that man who can quietly await [ruhig erwarten] the future. 2. Became your sister suddenly ill? 3. No, she felt a violent headache eight days previously. 4. Do you intend to become a learned man? 5. Let us go home before it gets dark. 6. Most people become ill through neglect [durch Vernachlässigung]. 7. Many a one [Mancher] has become quite another man, after he has received a more careful education. 8. Most people become slaves of wealth instead of masters of it. 9. As soon as it becomes spring, the whole of nature revives again [belebt sich wieder].

OUR HOLIDAY.

GYMNASTICS.—VI.

THE construction we have next to notice among the appliances of the Gymnasium is that known as

THE VAULTING HORSE.

This consists in a figure made of wood, something in the form of the body of a horse, and the character of which will be seen by our illustration (Fig. 19). It is desirable that the block which forms the body of the horse should be covered with leather and well padded, but this is not indispensable. The legs, which must be very firmly fixed in the ground, should be so contrived as to be capable of elevating or lowering the body of the horse at pleasure, and the pommels also should be movable, so as to be adjusted at the most convenient distances for the performance of the different exercises.

In some gymnasias a more simple kind of construction, named a Vaulting Buck, is employed for the use of learners in the preliminary exercises among the Vaulting Horse series. The buck is a solid block, in form an oblong square, and supported either on four legs, or on one stout one, so fixed in the centre that the body of the buck revolves upon it. But as the first few of the exercises we have now to mention closely resemble those which are performed on the vaulting buck, we need not here make more than a passing allusion to the latter.

The body of the vaulting horse is divided into three portions, the neck, the saddle, and the croup. The saddle is, of course, the space between the two pommels; the neck, the narrower portion in advance of the pommels; and the croup, behind them. *Near side* is the side on your left hand, looking towards the neck from behind; and *off side*, the side on your right.

1. The first position for the learner to practise is the *rest* (Fig. 20). You vault into this position from the ground, either with or without a run. Placing the hands on the pommels of the horse you spring lightly up, until the thighs rest on the body of the horse, as in the illustration. Then descend to the ground, and, without leaving your hold of the pommels, spring up again and again several times in succession.

2. Still in the position of the rest, practise the free movement of the legs, first one and then the other, sideways as far as you can extend them. Afterwards move both together in the same way. The object of this exercise is to prepare the learner to mount the horse in a free and easy manner.

3. The *saddle mount* is performed in the following manner:—Go into the rest on the near side, then throw the right leg upward, and let it pass over the croup; remove the right hand at the same time, and place it either upon the saddle or upon the front pommel, when you can come down easily astride the horse. This position is said to be *crossways* to the horse, and you are *sideways* when in the rest.

4. For the *croup mount*, you raise both legs upward from the

rest, and, opening them when they are above the croup, you come lightly down into the seat.

5. In the *neck mount*, you start as with the saddle mount, but throw the right leg over both croup and saddle, removing both hands as the leg passes.

6. In *dismounting* from the saddle seat, the right hand rests upon the pommel in front of you, and the left is placed upon the saddle; you then throw the left leg backward over the croup, and, at the same time, grasp the back pommel with the left hand. This brings you back to the position of the rest, but on the off-side of the horse, and you then spring

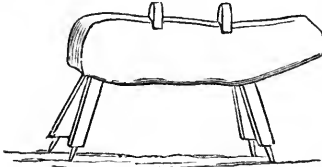


Fig. 19.

lightly to the ground. In dismounting from the croup, you throw up both legs backwards, and come to the ground on the off-side, without an intermediate position. From the neck you dismount as from the saddle, by swinging the left leg backwards, or you may occasionally descend to the ground by the direct leap forward.

There are various other ways of mounting and dismounting, more or less fantastic in their nature, but it would require too much space, and serve no practical purpose, to describe them here.

7. In descending from the horse, both in the exercises just described and in the more advanced of the series, the *backward swing off* may be performed with advantage, as follows:—When the position of the rest is reached, grasp the pommels firmly, throw up the legs backwards, and, at the same moment, pushing off lightly with the hands, you descend to the ground some distance from the horse. In descending in this manner, you may also either turn to the right or to the left before coming to the ground, or completely round, so that the back is towards the horse when the feet touch the earth.

8. *Balancing* upon the horse is performed in a variety of ways, but in these exercises the legs must not touch the horse. One form of balancing is shown in Fig. 21. In executing this balance you start from the croup seat, and throw your legs gradually behind you, leaning well forward upon the hands at the same time, the weight of the body resting upon them. In this way you raise the legs to the position shown in the illustration, and, as you become more expert and confident, you may continue the upward movement until you stand upon the hands. But when attempting to perform this feat, it is necessary that some one should be close by the gymnast to render assistance in case it is required.

9. The same kind of movement may be performed from the position already described as the *rest* (Fig. 20), but in this case the legs, even from the moment of starting, may be kept entirely clear of the horse. Grasping both pommels firmly, gradually



Fig. 20.

raise the legs from the ground until the knees pass between the arms, but without touching the saddle. Then you may continue the movement until the legs are thrust entirely through the arms, and extended straight before you, when you are, as it were, in a sitting position, but resting entirely upon the hands. This is a capital exercise, and, with a little care, may be performed in perfect safety. When weary of the position, spring forward to the ground, descending on the other side of the horse, but without allowing any portion of the body to touch it in passing. Remember here the rule already given in our paper on leaping exercises, to alight on the balls of the feet, bending the knees slightly as you touch the earth, and you thus come

down without a violent shock.

10. Starting from the saddle seat, grasp the forward pommel, and then, keeping the legs just clear of the horse, raise the back until it forms almost a straight line with the head, the legs extending straight downwards on either side. After you can do this with ease, you may bring the head downward until it touches the horse, and stand on your head, the hauds, of

course, grasping the pommel; but here, again, it is necessary to have one or two persons by to assist you in case of a slip.

11. The balancing movement will assist you in changing readily from one seat to another. Thus, from the croup seat you raise the body as in Fig. 21, the legs being close together; you then throw the legs downward and forward along the side of the horse, and, when level with the saddle seat, pass one leg over; then removing the hands to the front pommel, the change of seat is complete. The change from the saddle to the neck may be made in the same manner.

12. In changing from the croup to the neck without the intermediate seat, you first grasp one pommel in each hand, then raise the legs (Fig. 21), and swing them forward as before, but as you pass one leg over the neck you face about, and come into the seat with the forward pommel in front of you. These exercises may be done on both the near and off sides of the horse in turn.

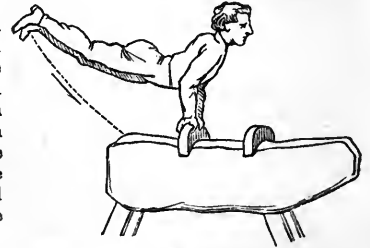


Fig. 21.

13. Sit on one side of the croup, and grasp one pommel in each hand, then raise the body and pass it completely over and round the horse until you reach the neck seat, and descend into it, facing about as before. In this exercise the body describes a complete semicircle, the weight resting upon the hands.

14. There are various ways of vaulting over the horse, one of which is shown in Fig. 22. Grasp both pommels before taking the spring, but relinquish the hold of one hand as the body passes over. A run of a few paces will give an additional impetus for the spring, but the movement should also be practised from the standing position.

15. Vault straight over the horse, after a short run, by placing the hands upon the pommels and springing upward, the legs passing between the arms, and the knees being raised towards the chest as you pass over. This exercise may afterwards be done with the knees lowered and the legs bent straight behind in taking the jump, which will give variety to the movement. But these vaults should be practised only by an expert gymnast.

Other vaults are taught in our gymnasia, some of a much more difficult and daring character. Among these may be mentioned the leap over the horse without touching it with any part of the person, technically known as the *free leap*. It is usual to prepare for this exercise by vaulting from the ground on to the saddle, resting one foot thereupon; and after the gymnast can accomplish this, he is allowed to attempt the free leap. There is a still more hazardous feat, known as the *tiger leap*, which is performed by springing from the ground with the head thrust forward and the arms extended, and so clearing the horse something in the manner in which a cat would perform the movement—whence its name. Again, *somersaults* over the horse are practised occasionally, generally starting from the position of the rest;

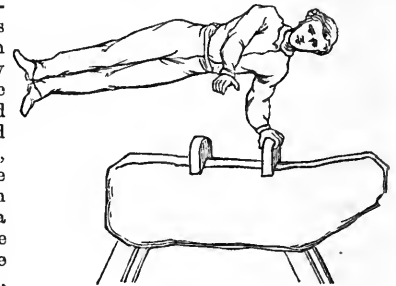


Fig. 22.

but we cannot commend any of these performances to the emulation of our readers. In the gymnasia in which they may occasionally be seen, only advanced gymnasts are allowed to attempt them, nor is even the expert performer left without the aid of one or more attendants, who stand by in readiness to give any assistance that may be required. Even in the simpler performances upon the horse caution is requisite, as in many other gymnastic exercises.

LESSONS IN BOTANY.—X.

SECTION XX.—FURTHER CLASSIFICATION OF VEGETABLES.

ALL the general principles we have discussed and taken advantage of hitherto have merely furnished us with the means of dividing vegetables into three sections; the question, therefore presents itself, how we are to continue the division, how arrange the classification of the hundreds of thousands of plants which exist? Various methods have been at different times proposed for accomplishing this. We shall not mention them in the order of their organisation, nor shall we fully describe them, such not being the object with which these papers are written. We shall mention the general principles involved in effecting some of these classifications, and shall point out in what respects certain classifications are better than others.

Of all the different schemes of classification which have ever been proposed or carried into execution, that of the celebrated Swede, Linné or Linnaeus, undoubtedly attained to the greatest popularity. Indeed, so firm is the hold which it took of popular appreciation that no inconsiderable number of those who even now study Botany fancy they have nothing more to learn than the number of pistils and stamens which are contained in different flowers, totally unconscious of all natural alliances. Suppose that some eccentric ethnologist should adopt the grotesque idea of classifying human races according to the number of wives the individuals of each race were in the habit of marrying. Suppose that in reference to this master-idea the ethnologist should arrive at the conclusion that inasmuch as Mussulman Turks, and Mussulman negroes, and Mussulman Kalmucs, and Malays, all marry a great many wives, that for this reason Turks, and negroes, and Kalmucs, and Malays, must all belong to the same race of men. Would not such a classification awaken a smile at its grotesque whimsicality? and would it not be considered an eminently false classification, not to say absurd?

Yet this is almost a parallel arrangement to that of Linnaeus, who effected his celebrated artificial division of plants according to the number and position of the male and female parts (*stamens* and *pistils*) of flowers.

Nevertheless, the artificial classification of Linnaeus has acquired a celebrity so great, and is so interwoven with popular botanical ideas, that it cannot be dismissed with the casual notice we have already afforded it. Let us, therefore, proceed to examine the general principles on which it is based.

In the first place, Linnaeus divided plants into cryptogamic and flowering, as we have done. The department of cryptogamic botany was, however, very imperfectly known to Linnaeus; it was to the classification of flowering plants that his chief efforts were directed, and it is his mode of effecting this that we have to examine. Linnaeus arranged all flowering plants under twenty-three classes, founded on the number and arrangement of the male parts (*stamens*) of the flower.

The names of his twenty-four classes, including cryptogamic plants as the twenty-fourth, are as follows:—

1. *Monandria*—one stamen. 2. *Diandria*—two stamens. 3. *Triandria*—three stamens. 4. *Tetrandria*—four stamens. 5.

Pentandria—five stamens. 6. *Hexandria*—six stamens. 7. *Heptandria*—seven stamens. 8. *Octandria*—eight stamens. 9. *Enneandria*—nine stamens. 10. *Decandria*—ten stamens. 11. *Dodecandria*—eleven to nineteen stamens. 12. *Icosandria*—twenty or more on the calyx. 13. *Polyandria*—twenty or more on the receptacle. 14. *Didynamia*—four, two long, two short. 15. *Tetradynamia*—six, four long, two short. 16. *Monadelphia*—stamens joined by their filaments into one body. 17. *Diadelphia*—stamens joined into two bodies. 18. *Polyadelphia*—stamens joined into more than two bodies. 19. *Syngenesia*—stamens joined by their anthers into a cylinder. 20. *Gynandria*—stamens adherent to pistil. 21. *Monœcia*—flowers bearing pistils exclusively, and flowers bearing stamens exclusively, on the same plant. 22. *Diœcia*—flowers bearing pistils exclusively, and flowers bearing stamens exclusively, on different plants. 23. *Polygamia*—flowers bearing stamens exclusively, or pistils exclusively, or hermaphrodite, on the same or on different plants. 24. *Cryptogamia*.

In the annexed illustration, a representation is given of the fleshy rhizome, leaves, and flower of the *Iris florentina*, or White Iris, a beautiful species of the family *Iridaceæ*, and a native of Southern Europ. It flowers in May. According to the division adopted by Linnaeus, this plant belongs to the first order *Monogynia* (having one pistil), of the third class *Triandria* (having three stamens).

From an inspection of this arrangement, we observe that up to the eleventh class the number of stamens alone furnishes the distinctive sign, after which other circumstances are taken cognizance of. These circumstances are sufficiently indicated in the list of classes given above; but it is desirable to present the reader with the derivation of the names. It will be remembered that the stamens are the male organs of the flower, and the names given to the first eleven classes are compounded of the Greek words for the numerals, one, two, three, four, five, six, seven, eight, nine, ten, and twelve, and the Greek noun *ανηρ* (*an'-eer*), genitive *ανδρος* (*an'-dros*), a man. *Icosandria* is formed of the same Greek noun, and *εικοσι* (*ei'-ko-si*), the Greek for twenty; *polyandria* from the same Greek noun, *ανηρ*, and the adjective *πολυς* (*pol'-use*), much or many. The term *didynamia* means *two-powered*, from the Greek *δυο* (*du'-o*), two, and *δυναμις* (*du'-na-mis*), power; the reason why the term is applied will be seen by referring to the explanation given above. *Monadelphia* means *one brotherhood*, from the Greek *μονος* (*mon'-os*), one, and *αδελφος* (*a-del'-phos*), brother, because all the stamens are connected together. *Syngenesia* is another term signifying *a growing together*, from the Greek *συν* (*sune*), together, and *γινωμαι* (*gi'-no-mi*, the *g* hard), I grow. *Gynandria* is derived from the Greek *γυνη* (*gu'-ne*, *g* hard), woman, and *ανηρ*, genitive *ανδρος*, a man, because the pistils and stamens are attached. *Monœcia* signifies *one-housed*, from the Greek *μονος*, one, and *οικος* (*oi'-kos*), house, for a reason which will be evident. *Polygamia* is derived from the Greek *πολυς*, many, *γαμος* (*gam'-os*), marriage; the meaning of which term will also be evident by a simple inspection of the list of classes. In order that the student may become practically acquainted with the respective peculiarities of these classes, we shall now mention in



THE IRIS, AN EXAMPLE OF THE LINNEAN CLASS TRIANDRIA.

connection with each class a corresponding flower, in which the characteristic mark of distinction may be recognised:—

<i>Examples.</i>	<i>Classes.</i>
1. Centaureus	Monandria.
2. Veronica	Diandria.
3. Iris	Triandria.
4. Plantain	Tetrandria.
5. Pimpernel	Pentandria.
6. Lily	Hexandria.
7. Horse Chestnut	Heptandria.
8. Evening Primrose	Oetandria.
9. Bay-Laurel	Euceandria.
10. Pink	Decandria.
11. Houseleek	Dodecandria.
12. Strawberry	Icosandria.
13. Ranunculus	Polyandria.
14. Foxglove	Didynamia.
15. Wall-flower	Tetradynamia.
16. Mallow	Monadelphía.
17. Pea	Diadelphía.
18. St. John's Wort	Polyadelphía.
19. Blue Corn-Flower	Syngenesia.
20. Orchis	Gynandria.
21. Arum	Monœcia.
22. Nettle	Dicœcia.
23. Pollitory of the wall	Polygamia.

With respect to further divisions of these classes, the first thirteen of them are divided into orders founded on the number of free carpels or styles entering into the composition of the pistil. In the order *monogynia* the pistil is formed of one single carpel, or many carpels united into one single body by their ovaries or their styles; in *digyria* there are two distinct ovaries, or styles; in *trigynia*, three; in *tetragynia*, four; in *pentagynia*, five; in *hexagynia*, six; in *polygynia*, a number exceeding ten. The fourteenth class includes two orders: *gymnospermia*, in which the pistil is composed of four achænia, having the appearance of naked seeds; *angiospermia*, in which the seeds are included in a capsule. The fifteenth class, or *tetradynamia*, is divided into two orders, *siliquosæ* or *siliculosæ*, according as the fruit happens to be longer than broad, or broader than long. The sixteenth, seventeenth, eighteenth, twentieth, twenty-first, and twenty-second classes, have their orders established in conformity with the number and the mode of connection of the stamens and the styles (triandria, pentandria, polyandria, monogynia, polygynia, monadelphía, etc.). The nineteenth class is sub-divided into *polygamia æqualis*, in which all the flowers of the head contain both stamens and pistils; *polygamia superflua*, in which the central flowers of the capitulum contain both stamens and pistils, and those of the circumference pistils only; *polygamia frustranea*, when the flowers of the circumference have neither stamens nor pistils; *polygamia necessaria*, when all the central flowers contain stamens, and those of the circumference pistils.

The botanist who sets about applying the principles of Linnæus soon finds that the same class is made to contain plants of different natural families, whilst others having affinities to each other are widely separated.

It would be unjust to the memory of Linnæus not to say that he recognised the desirableness of classifying vegetables according to their natural alliances, if this could be done; but at the time when he lived a sufficient number of facts to admit of this had not been collected. "All plants," remarks Linnæus, in his botanical philosophy, "are allied by affinities, just as territories come in contact with each other on a geographical chart. Botanists should unceasingly endeavour to arrive at a natural order of classification. Such natural order is the final aim of botanical science. The circumstance rendering such a plan defective now is the insufficient knowledge we have of plants, so many species of which are yet undiscovered. When these species are discovered and described, a natural classification will be accomplished, for nature does not proceed abruptly, as it were by leaps."

These sentiments, made known by the great Swede himself, prove to us that he only intended his artificial classification to be a provisional arrangement.

Waiving the question of its intrinsic utility, the artificial system of Linnæus is not always so easy of application as it might at a first glance be thought. The characters of the stamens and the pistils necessary to be made out before the class and

order of any particular vegetable can be determined, are not so easily discriminated as might be supposed. Dodecandria, icosandria, and polyandria, are occasionally very difficult to distinguish one from the other. In didynamia and tetradynamia the stamens are sometimes equal, whilst in other classes, in which they form two series, their inequality is manifest; such is the case in pinks and geraniums. Monadelphia and diadelphía are sources of continual mistakes; many plants called monadelphous in the system of Linnæus scarcely present an appreciable junction of the stamens; many plants called diadelphous are really monadelphous. Syngenesia should as fairly include the cyclamen as the violet. Monœcia and dicœcia furnish many characteristic appearances which are not taken cognisance of; and many other objections might be readily cited.

READING AND ELOCUTION.—X.

ANALYSIS OF THE VOICE. (continued.)

V.—TRUE TIME.

By true time in elocution is meant an utterance well-proportioned in sound and pause, and neither too fast nor too slow. We should never read so fast as to render our reading indistinct, nor so slow as to impair the vivacity, or prevent the full effect, of what is read.

Everything tender or solemn, plaintive or grave, should be read with great moderation. Everything humorous or sprightly, everything witty or amusing, should be read in a brisk and lively manner. Narration should be generally equable and flowing; vehemence, firm and accelerated; anger and joy, rapid; whereas, dignity, authority, sublimity, reverence, and awe, should, along with deeper tone, assume a slower movement. The movement should, in every instance, be adapted to the sense, and free from all hurry on the one hand, or drawing on the other. The pausing, too, should be carefully proportioned to the movement or rate of the voice; and no change of movement from slow to fast, or the reverse, should take place in any clause, unless a change of emotion is implied in the language of the piece.

The "slowest" and the "quickest" rates of utterance have been exemplified under the head of "versatility" of voice, and need not be repeated here. They occur in the extremes of grave and gay emotion.

There are three important applications of "time" in connection with "rate" or "movement," which frequently occur in the common forms of reading and speaking. These are the "slow," the "moderate," and the "lively." The first of these, the "slow," is exhibited in the tones of *awe*, *reverence*, and *solemnity*, when these emotions are not so deep as to require the slowest movement of all: the second, the "moderate," belongs to *grave* and *serious* expression, when not so deep as to require the "slow" movement; it belongs, also, to all unimpassioned communication, addressed to the understanding more than to the *feelings*; and it is exemplified in the utterance of *moderate*, *subdued*, and *chastened emotion*: the third rate, the "lively," is perhaps sufficiently indicated by its designation, as characterising all *animated*, *cheerful*, and *gay expression*.

All the exercises on "time" should be repeated till they can be exemplified perfectly and at once. Previous to practising the following exercises, the student will be aided in forming distinct and well-defined ideas of "time," by turning back to the example under "versatility," marked as "very slow," and repeating it, with close attention to its extreme slowness. He will observe that, in the repeating of this example, the effect of "time," or proportion of movement, is to cause a remarkable lengthening out of the sound of every accented vowel; an extreme slowness in the succession of the sounds of all letters, syllables, and words: and along with all this, an unusual length in all the pauses. It is this adjustment of single and successive sounds and their intermissions, which properly constitutes the office of "time" in elocution: although the term is often indefinitely used rather as synonymous with the word "movement," as applied in music.

The "slow" movement differs from the "slowest," in not possessing the same extreme prolongation of sound in single vowels, or the same length of pause. The slow succession of sound is, however, a common characteristic in both.

Example of "Slow" Movement.

Thou, who didst put to flight
 Primeval silence, when the morning stars
 Exulting shouted o'er the rising ball;
 O Thou, whose word from solid darkness struck
 That spark, the sun, strike wisdom from my soul!

"Moderate."

There is something nobly simple and pure in a taste for the cultivation of forest trees. It argues, I think, a sweet and generous nature, to have a strong relish for the beauties of vegetation, and a friendship for the hardy and glorious sons of the forest. There is a grandeur of thought connected with this part of rural economy. It is worthy of liberal, and freeborn, and aspiring men. He who plants an oak looks forward to future ages, and plants for posterity. Nothing can be less selfish than this. He cannot expect to sit in its shade, and enjoy its shelter; but he exults in the idea that the acorn which he has buried in the earth shall grow up into a lofty tree, and shall keep on flourishing, and increasing, and benefiting mankind, long after he shall have ceased to tread his paternal fields.

"Lively."

How does the water come down at Lodore?

Here it comes sparkling,
 And there it lies darkling;
 Here smoking and frothing,
 Its tumult and wrath in,
 Till in this rapid race
 On which it is bent,
 It reaches the place
 Of its steep descent.
 The cataract strong
 Then plunges along,
 Striking and raging,
 As if a war waging,
 Its caverns and rocks among;
 Rising and leaping,
 Sinking and creeping,
 Swelling and sweeping,
 Showering and springing,
 Flying and flinging,
 Writhing and ringing,
 Eddying and whisking,
 Spouting and frisking,
 Turning and twisting
 Around and around,
 With endless rebound;
 Smiting and fighting,
 A sight to delight in;
 Confounding, astounding,
 Dizzying and deafening the ear with its sound.
 And so never ending, but always descending,
 Sounds and motions for ever and ever are blending,
 All at once and all o'er, with a mighty uproar;
 And this way the water comes down at Lodore.

VI.—APPROPRIATE PAUSES.

The grammatical punctuation of sentences, by which they are divided into clauses by commas, although sufficiently distinct for the purpose of separating the syntactical portions of the structure, are not adequate to the object of marking all the audible pauses, which sense and feeling require, in reading aloud. Hence we find, that intelligible and impressive reading depends on introducing many short pauses, not indicated by commas or other points, but essential to the meaning of phrases and sentences. These shorter pauses are, for the sake of distinction, termed "rhetorical."

Powerful emotion not infrequently suggests another species of pause, adapted to the utterance of deep feeling. This pause sometimes takes place where there is no grammatical point used, and sometimes is added to give length to a grammatical pause. This pause may be termed the "oratorical," or the pause of "effect."

The length of the rhetorical pause depends on the length of the clause, or the significance of the word which follows it. The full "rhetorical pause" is marked thus ||, the "half-rhetorical pause" thus |, and the short "rhetorical pause" thus '.

Rules for "Rhetorical" Pauses.

The "rhetorical" pause takes place, as follows:—

1. Before a verb when the nominative is long, or when it is emphatic:—

Life || is short, and art | is long.

2. Before and after an intervening phrase:—

Talents || without application || are no security for progress in learning.

3. Wherever transposition of phrases may take place:—

Through dangers the most appalling || he advanced with heroic intrepidity.

4. Before an adjective following its noun:—

Here was a soul || replete with every noble quality.

5. Before relative pronouns, prepositions, conjunctions, or adverbs used conjunctively, when followed by a clause depending on them:—

A physician was called in || who prescribed appropriate remedies.
 The traveller began his journey || in the highest spirits || and with the most delightful anticipations.

6. Where ellipsis, or omission of words, takes place:—

To your elders manifest becoming deference, to your companions || frankness, to your juniors || condescension.

7. Before a verb in the infinitive mood, governed by another verb:—

The general now commanded his reserve force || to advance to the aid of the main body.

Exercise on "Rhetorical" Pauses.

Industry || is the guardian of innocence.
 Honour || is the subject of my story.
 The prodigal || lose many opportunities of doing good.
 Prosperity || gains friends, adversity || tries them.
 Time || once passed || never returns.
 He | that hath no rule | over his own spirit, is like a city | that is broken down, and without walls.
 Better | is a dinner of herbs || where love | is, than a stalled ox || and hatred | therewith.
 The veil | which covers | from our sight | the events | of succeeding years, is a veil | woven by the hand of Mercy.
 Blessed || are the poor in spirit.
 Silver | and gold || have I none.
 Mirth || I consider | as an act, cheerfulness || as a habit | of the mind. Mirth || is short | and transient, cheerfulness || fixed | and permanent. Mirth || is like a flash of lightning, that glitters | for a moment: cheerfulness || keeps up a kind of daylight | in the mind.
 Some || place the bliss | in action, some || in ease;
 Those || call it pleasure, and contentment || these.

The habitual tendency of young readers being to hurry, in reading, their pauses are liable to become too short for distinctness, or to be entirely omitted. In most of the above examples, the precision, beauty, and force of the sentiment, depend much on the careful observance of the rhetorical pauses. The student may obtain an idea of their effect, by reading each sentence first, without the rhetorical pauses—secondly, with the pausing as marked.

Rule on the "Oratorical" Pause.

The "oratorical" pause is introduced into those passages which express the deepest and most solemn emotions, such as naturally arrest and overpower, rather than inspire utterance.

Examples.

The sentence was—DEATH! There is one sure refuge for the oppressed, one sure resting-place for the weary—THE GRAVE.
 It was the design of Providence, that the infant mind | should possess the germ | of every science. If it were not so, the sciences could hardly be learnt. The care of God || provides | for the flower of the field | a place | wherein it may grow, regale the sense | with its fragrance, and delight the soul | with its beauty. Is his providence | less active | over those, to whom this flower offers its incense?—No. The soil | which produces the vine || in its most healthy luxuriance, is not better adapted to that end, than the world we inhabit, to draw forth the latent energies of the soul, and fill them | with life | and vigour. As we | might the eye | see | without light, or the ear | hear | without sound, as the human mind | be healthy | and athletic | without descending into the natural world, and breathing the mountain air.
 Is there aught in Eloquence | which warms the heart? She draws her fire | from natural imagery. Is there aught in Poetry | to enliven the imagination? There | is the secret | of all her power. Is there aught in Science | to add strength | and dignity | to the human mind? The natural world | is only the body, of which | she | is the soul. In books, Science | is presented to the eye of the pupil, as it were, in a dried | and preserved | state. The time may come, when the in-

structor ¹ will take him by the hand, and lead him ¹ by the running streams, and teach him all the principles of Science, as she comes from her Maker; as he would smell the fragrance ¹ of the rose, without gathering it.

This love of nature; this adaptation of man ¹ to the place assigned him ¹ by his heavenly Father; this fullness ¹ of the mind ¹ as it descends into the works of God, is something, which has been felt ¹ by every one, though to an imperfect degree, and therefore ¹ needs no explanation. It is the part of science, that this ¹ be no longer a blind affection; but ¹ that the mind ¹ be opened ¹ to a just perception ¹ of what it is, which it loves. The affection, which the lover first feels ¹ for his future wife, may be attended ¹ only by a general sense ¹ of her external beauty; but his mind ¹ gradually opens ¹ to a perception ¹ of the peculiar features of the soul, of which ¹ the external appearance ¹ is only an image. So it is ¹ with nature. Do we love to gaze on the sun, the moon, the stars, and the planets? This affection ¹ contains ¹ in its bosom ¹ the whole science of astronomy, as the seed ¹ contains the future tree. It is the office of the instructor ¹ to give it an existence ¹ and a name, by making known the laws which govern the motions of the heavenly bodies, the relation of these bodies to each other, and their uses.

Have we felt delight ¹ in beholding the animal creation,—in watching their pastimes ¹ and their labours? It is the office of the instructor ¹ to give birth to this affection, by describing the different classes of animals, with their peculiar characteristics, which inhabit the earth, the air, and the sea. Have we known the inexpressible pleasure ¹ of beholding the beauties ¹ of the vegetable world? This affection ¹ can only expand ¹ in the science of botany. Thus it is, that the love of nature ¹ in the mass ¹ may become the love of all the sciences, and the mind will grow and bring forth fruit ¹ from its own inherent power of development.

LESSONS IN GEOMETRY.—X.

In our last lesson we considered the various series of data necessary for the construction of an isosceles triangle: we will now do the same for any kind of scalene triangle, or triangle of which all three sides are unequal.

A scalene triangle, as it has been stated, may be an acute-angled triangle, an obtuse-angled triangle, or a right-angled triangle. To determine any scalene triangle, it is plain that we must have one of the following series of data.

- I. With regard to the sides without the angles :—
 1. The length of each of the three unequal sides.
 2. The length of two sides and the altitude of the triangle.
- II. With regard to the angles without the sides :—
 3. Any two of the angles of the triangle.
- III. With regard to the sides and angles combined :—
 4. The length of any two of the sides of the triangle and one of its angles.
 5. The length of one side of the triangle and two of its angles.
 6. The length of one side of the triangle, its altitude, and one of its angles adjacent to the given side.

As in the construction of the isosceles triangle, the first case is met by Problem VIII. (page 191), but the second brings us to

PROBLEM XXIV.—To draw a triangle of which the length of two of its sides and the altitude are given.

Let A and B (Fig. 32) represent the length of two of the sides of the triangle required, and c its altitude. In any straight line, DE, of indefinite length, set off FG equal to B, and by Problem X. (page 192), draw the indefinite straight line, HK, parallel to DE, at a distance from it equal to c, the altitude of the required triangle. Then from F as centre, with a radius equal to A, draw an arc cutting HK in the point L. Join LF, LG; the triangle LFG is a triangle answering the requirements of the data, for its sides, LF, FG, are equal to A and B respectively, and its altitude shown by the dotted line LN is equal to the given straight line c. The triangle MFG, drawn in the same way, is also a triangle which meets the requirements of the data, for its sides, MG, GF, are equal to A and B respectively, and its altitude, shown by the dotted line MO, is equal to c.

The triangles LFG, MFG, are equal to each other in every respect, namely, the length of their sides, their altitude, and their superficial area. They are upon the same base, FG, and between the same parallels, DE, HK, and they are what we may term symmetrical triangles. From this we learn that symmetrical triangles on the same base and between the same parallels are equal to one another; and this is true, not for symmetrical

triangles only, but for any triangles, whether symmetrical or not, that are upon the same base and between the same parallels. Thus, the triangles LFG, MFG are each of them equal to the triangle PFG, which is on the same base, FG, and between the same parallels, DE, HK, and each of them would be equal to any triangle that may be formed by drawing lines from the points F and G to any point in the straight line HK, produced both ways indefinitely.

Triangles also which stand upon equal bases and between the same parallels are equal to one another. Thus, the triangles LFG, MFG, which stand on equal bases, NG, FO, and between the same parallels, DE, HK, are equal to one another, as are also the triangles LNF, MGO, which are between the same parallels and stand on equal bases NF, GO.

And this is also as true of unsymmetrical triangles as of symmetrical triangles, for if we join the dotted line NP, the triangles LNF, PNF, are equal to one another, because they are on the same base, NF, and between the same parallels; and since the triangle MGO is equal to the triangle LNF, it must also be equal to the triangle PNF.

In Case 3, when two of the angles of the required triangle are given, it is manifestly necessary only to make at two points in the same straight line, and on the same side of it, two angles equal to the given angles, each having its opening turned towards the apex of the other, and then, if necessary in order to complete the triangle, to produce the sides of the angles that are inclined to the side that is common to both. The student must notice that when two angles of a required triangle are given without any special requirement as to their relative position, an endless number of pairs of symmetrical triangles may be drawn, similar in form but of different superficial areas, all satisfying the general requirements set forth in the data.

Thus, in Fig. 33, if A and B represent the given angles of the triangle required, it is plain that to make a triangle having two angles equal to the given angles A and B, we have only to make at any point, c, in a straight line, XY, of indefinite length, the angle YCE equal to A, and at another point, D, in the same straight line, the angle XDE equal to B, each angle having its opening opposite or turned towards the apex of the other, as, in this figure, the opening of the angle at c is opposite the apex D of the angle at D, and vice versa; and to complete the triangle produce the sides, CE, DE, of the angles at c and D that are inclined to the common side, CD, until they meet. If we reverse the position of the angles, making the angle at c equal to the angle at B, and the angle at D equal to the angle at A, the triangle assumes the form shown by the triangle FCD in the figure. The triangles ECD, FCD, are symmetrical and equal in every respect. The triangles KGH, LGH, shown by dotted lines, are also equal and symmetrical in every respect, and satisfy the general conditions of the data, although their superficial area is greater than the area of the triangles ECD, FCD,

because the points G and H, at which the angles necessary for the construction of the triangle required are made equal to A and B, are taken on the indefinite straight line, XY, at a greater distance apart than c and D.

PROBLEM XXV.—To draw a triangle of which two sides and one of the angles are given.

First, let the given angle be included between the given sides, and let the straight lines b, c represent the length of the given sides of the triangle required, and A the given angle included between them (Fig. 34). Draw any straight line, XY, of indefinite length, and at any point, D, in XY, make the angle YDE equal to the given angle A. Along DY set off DF, equal to c,

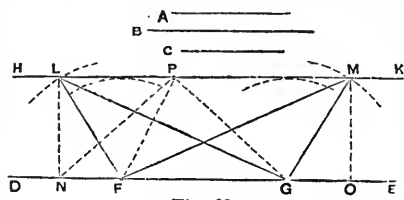


Fig. 32.

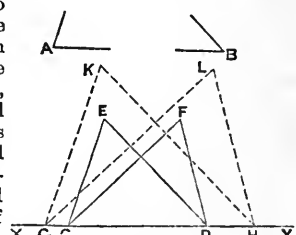


Fig. 33.

and along DE set off DG , equal to B . Join GF ; the triangle GDF answers the requirements set forth in the data, as does also the triangle KDH , obtained by setting off DH along DY equal to B , and DK along DE equal to C .

The triangles GDF , KDH are symmetrical and equal in every respect; but if the position of the given angle had been required to be opposite to one of the given sides, instead of being included between them, a very different result would have been obtained.

We will suppose, firstly, that it is required to place the angle opposite the shorter of the two given sides. At the point L in the straight line of indefinite length, XY , make the angle XLN equal to the given angle A , and as this angle is to be opposite to the shorter side, set off along LX the straight line LN , equal to c ; and from N as a centre, with a radius equal to B ,

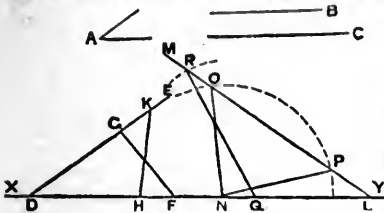


Fig. 34.

describe the arc OP , cutting the straight line LM in the points O, P . Join ON and PN . Either of the triangles ONL, PNL , will satisfy the requirements of the data, for in the triangle ONL the sides ON, NL are equal to B and c respectively, while the angle OLN is opposite to the shorter side ON ; and in the triangle PNL , the sides PN, NL are equal to B and c respectively, while the angle PLN is opposite to the shorter side PN .

If it be required to place the angle opposite to the longer of the two given sides, it is manifest that we must set off LQ along LX equal to B ; and from Q as centre, with a radius equal to c , describe an arc cutting the straight line LM in R . By joining RQ , we get a triangle, RQL , that satisfies the requirements of the data, the sides LQ, QR being equal to B and c respectively, and the angle QLR , which is equal to the angle A , opposite to the longer side RQ .

The learner may make an endless variety of practical exercises on this problem, by varying the length of the given sides and the opening of the given angle. Practice of this kind will be found to ensure neatness and accuracy in geometrical or mechanical drawing, and will tend to render the draughtsman skilful in the use of his compasses and parallel ruler.

PROBLEM XXVI.—To draw a triangle of which one side and two of the angles are given.

Let A represent the length of the given side of the required triangle, and B and c the given angles, and first let both of the given angles be adjacent to the given side, or in other words, let them be at its opposite extremities, on the same side of it.

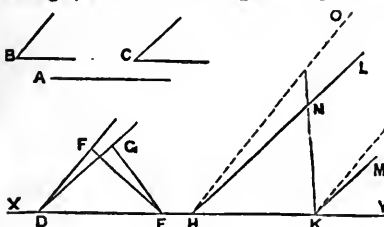


Fig. 35.

Draw any straight line, XY , of indefinite length, and in it take DE equal to A . At the point D make the angle EDF equal to the angle B , and at the point E make the angle DEF equal to c . Let the sides DF, EF meet in the point F ; the triangle FDE satisfies the requirements of the data; as will also the triangle GDE , constructed by making the angle GDE equal to c , and the angle GED equal to B .

Next, let one of the given angles be opposite to the given side, as, for example, when the angle equal to the larger angle B is required to be in this position. Take HK , in the straight line of indefinite length, XY , and at the point H make the angle KHL equal to the angle c . Through K draw KM parallel to HL , and at the point K in the straight line HM make the angle MKN equal to the angle B , and let the straight line KN meet the straight line HL in N . The triangle NHK has the angle KHN equal to c , and the angle HKN equal to B (for it is equal to its alternate angle NKM , which was made equal to B), and the larger angle HNK is opposite to the side HK , which is equal

to A . If it be required to have the smaller angle opposite to the given side, the angle KHO must be made equal to the larger angle B , and the same method of construction followed as indicated by the dotted lines in the figure.

PROBLEM XXVII.—To draw a triangle of which one side, its

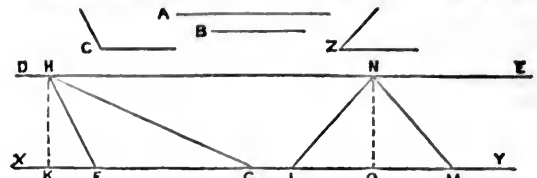


Fig. 36.

altitude, and one of its angles adjacent to the given side, are given.

Let A represent the length of the given side of the required triangle, B its altitude, and c the given angle. Draw any straight line, XY , of indefinite length, and, by Problem X. (page 192), draw the straight line DE , also of indefinite length, parallel to it, at a distance from it equal to B . Set off FG in XY equal to A , and at the point F in the straight line GF make the angle GFH equal to the given angle c . Let FH meet DE in H . Join GH . The triangle GFH answers the requirements of the data, for it has a side FG equal to A , an angle GFH equal to c , and it is of the altitude B , which is equal to the given altitude B . A triangle equal to the triangle GFH in every respect, and symmetrical with it, may be obtained by making an angle at G , in the straight line FG , equal to c , and following the same process of construction.

If the given angle be an obtuse angle, as c , the line which represents the altitude of the triangle required will fall on a point in XY without the line which is set off upon it equal to the given side. If it be an acute angle, as the angle z , the line representing the altitude of the triangle may fall between the extremities of the line set off equal to the given side, as NO in the triangle NLM , which is drawn having the side LM equal to A , and the angle MLN equal to the given angle z ; but whether this be the case or not depends entirely on the size of the angle and the relative proportions of the altitude and given side.

In the construction of right-angled triangles, as one angle is always necessarily known, less data are required than in the construction of obtuse-angled and acute-angled triangles; thus any right-angled triangle may be constructed if we know—

1. The length of either of the sides containing the right angle (as AB and AC in Fig. 37).
2. The length of either of the sides containing the right angle, and the side which subtends the right angle (as AB and BC , or AC and BC , in Fig. 37).*
3. The side which subtends the right angle, and the perpendicular let fall on it from the right angle (as AD and BC in Fig. 37).

Thus, if the sides that contain the right angle be equal to P and R , draw at right angles to each other AB and AC , and make AB equal to P , and AC equal to R , and join BC : ABC will be the triangle required.

Again, if one of the sides containing the right angle be given equal to P , and the side that subtends the right angle equal to s , draw BC equal to s ; bisect it in E , and from E as centre, with the distance EB or EC , describe the semicircle BAC . Then from B as centre, with a radius equal to P , draw an arc cutting the semicircle BAC in A . Join AB, AC ; the triangle ABC will be the triangle required.

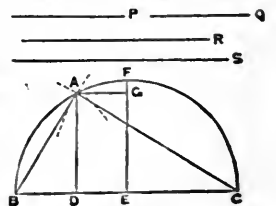


Fig. 37.

If the side which subtends the right angle be given equal to s , and the perpendicular let fall on it from the right angle equal to q , draw BC equal to s , bisect it in E , and draw the semicircle BAC as before: through E draw EF perpendicular to BC , and along it set off EG equal to q . Through G draw GA parallel to BC , cutting the circumference in A , and from A draw AB, AC , to the points B and C . The altitude, AD , of the triangle ABC is equal to q .

LESSONS IN GERMAN.—XIX.

SECTION XXXV.—PECULIARITIES IN VERBS, ETC.—
(continued).

For "any" and "some," as generally used before a noun, the German has no corresponding word, as:—Haben Sie Brod? have you some bread? Haben Sie Sete? have you any silk? Ich habe Bücher, I have some books.

1. The indefinite adjective pronoun "some" is expressed in German by *welcher*, *welche*, *welches*, as:—Haben Sie Wasser? Ich habe *welches*; I have "some." For the genitive of *welcher*—which, however, is usually left out—we employ the personal pronoun preceded by "of," as:—Haben Sie viel Wasser? have you much water? Ich habe (dessen) viel, I have much of it (literally, I have of it much). Haben Sie viel Hüte? have you many hats? Ich habe (deren) viele, I have many of them (I have of them many). From these examples it will be seen that the *partitive* word in German is placed after the pronoun, while in English it is placed before it. In this use it is declined like the relative *welcher*.

DECLENSION OF *welcher* AS A PARTITIVE.

	<i>Singular.</i>		<i>Plural</i>
<i>Masculine.</i>	<i>Feminine.</i>	<i>Neuter.</i>	<i>of all genders.</i>
N. <i>Welcher</i> ,	<i>welche</i> ,	<i>welches</i> ,	<i>welche</i> , who.
G. <i>Dessen</i> ,	<i>deren</i> ,	<i>dessen</i> ,	<i>deren</i> , whose.
D. <i>Welchem</i> ,	<i>welcher</i> ,	<i>welchem</i> ,	<i>welchen</i> , to whom.
A. <i>Welchen</i> ,	<i>welche</i> ,	<i>welches</i> ,	<i>welche</i> , whom.

2. *Genug* like "enough," is indeclinable, and generally follows its noun, or stands independently. *Viel* and *wenig* are frequently used without declension. (§ 53.)

3. *Das*, as also *ties* (*ties* being a contraction of the neuter *tiefes*) is frequently used in referring to nouns of both numbers and all genders, as:—Wer ist das? who is that? Dies ist mein Freund, This is my friend. Das sind Franzosen, those are Frenchmen. Das and *ties*, however, never precede and qualify a noun, except of the neuter gender. (§ 134. 1.)

4. *Es*, like its English equivalent, may refer to nouns of both numbers and all genders, as:—Es ist mein Freund, it is my friend. When *es* refers to a noun in the plural, the verb must agree in number with the *noun*, while in English it agrees with the *pronoun*, as:—Es sind die Russen, die Ungarn überwunden haben, it is (German, *sind*) the Russians who have overpowered (conquered) Hungary. (§ 57. 8.)

5. *Es* sometimes answers to our word "so" or "one," as:—Er ist gesund, oder scheint es zu sein, he is healthy, or appears so to be. Er ist Soldat, aber ich bin es nicht, he is (a) soldier, but I am not one. *Es* is likewise rendered by "there" (Sect. XXXVI. 3), as:—Es stand in alten Zeiten ein Schloss so hoch und hehr (Hlamm), there stood in ancient times a castle so high and lofty. Es war ein König in Thule (Oesthe), there was a king in Thule. (§ 57. 8.)

6. *Es* is often so used as to have no equivalent in English, as:—Es reden und träumen die Menschen viel von besseren künftigen Tagen (Schiller), men talk and dream much of better future days. Ich weiß es, daß er da war, I know (it) that he was there. Es leben die Freiheitskämpfer, (long) live the champions of liberty. Es lebe die Republik, (long) live the republic.

VOCABULARY.

Arzt, m. physician.	Gram, m. grief, affliction, sorrow.	Kurz, short.
Reiß, m. diligence.	Sting, prudent, judicious.	Milch, f. milk.
Gedehrsamkeit, f. erudition, learning.	Köchin, f. cook.	Nagel, m. nail.
Glück, n. luck, fortune, happiness.	Summet, m. anxiety, distress.	Pulver, n. powder.
		Stahl, m. steel.
		Stolz, m. pride.

RÉSUMÉ OF EXAMPLES.

Er hat mir Äpfel und Birnen gegeben.	He has given me (some) apples and pears.
Wollen Sie Brod oder Kuchen haben?	Will you have (some) bread or (some) cake?
Haben Sie feines schwarzes Tuch?	Have you (some, any) fine black cloth?
Hat er Geld genug, oder hat er keines?	Has he money enough, or has he none?
Er hat (dessen) genug.	He has enough (of it).
Hat sie Bücher genug?	Has she books enough?

Sie hat (deren) genug, aber zu wenig Zeit, dieselben zu lesen. She has enough of them, but too little time to read them.
Wissen Sie, wer das ist? Do you know who that is?
Es ist mein Vater, meine Mutter, mein Kind. It is my father, my mother, my child.

EXERCISE 66.

1. Wie alt ist dieser Mann? 2. Er ist nicht sehr alt. 3. Hat er viel Geld? 4. Ja, und er hat auch viele Freunde und viele Feinde. 5. Welcher Knabe hat viel (R. 2, above) Messel und Birnen? 6. Einer von den Söhnen des Bauern hat viel Messel, der andere viel Birnen. 7. Der eine hat viel Müch, der andere hat nur Oram und Summer. 8. Wie viel Brod hat der Bäcker? 9. Er hat sehr viel Brod, aber nur wenig Mehl. 10. Dieser Mann hat wenig Geld, aber viel Verstand. 11. Diese Stiefel sind mir viel zu groß, und die Schuhe sind meinem Bruder ein wenig zu kurz. 12. Wird Ihr Oheim viel Pulver kaufen? 13. Er wird nur wenig kaufen, denn er hat zu wenig Geld. 14. Wer ist das? 15. Es ist ein alter Freund des Arztes. 16. Wer hat gutes Wasser? 17. Der Matrose hat welches. 18. Warte ich morgen die Bücher bekommen? 19. Sie sollen schon heute welche haben. 20. Hat der Bauer viel Weizen? 21. Er hat dessen nicht viel. 22. Hat der Schmied viel Stahl? 23. Er hat (dessen) viel. 24. Hat er viel Nägel? 25. Er hat (deren) viel. 26. Wer hat Milch? 27. Der Bauer hat welche. 28. Hat er (deren) sehr viel? 29. Er hat genug.

EXERCISE 67.

1. We must be cautious in the choice [vorsichtig in der Wahl] of him to whom we confide important concerns [wichtige Angelegenheiten anvertrauen]. 2. They that (who) speak evil [übel] of others are often worse [schlimmer] than those whose failings they lay open [erschließen]. 3. He professed [bekamte] that religion whose origin is divine [Ursprung göttlich ist]. 4. This boy has too much pride and too little diligence. 5. That is the man through whose help he was saved. 6. Which pleased you the most? This or that? Neither. 7. Can those be loved whose vices are detested by everybody [Jedermann]? 8. How many hats has that boy? 9. He has three of them. 10. Who sells here good bread? 11. Our baker sells very good bread.

SECTION XXXVI.—IMPERSONAL VERBS.

Impersonal verbs are confined to the third person singular, and have as their subject or nominative only the pronoun *es*, as:—Es regnet, it rains. Es donnert, it thunders. Es blizt, it lightens. (§ 81. 1.)

1. Besides those verbs that are merely impersonal, others may be thus employed, as:—Es scheint, daß er krank ist, it appears that he is sick. Es schmerzt mich, daß zu hören, it pains me to hear that, etc.

2. Many verbs, however, that in German are used impersonally have, in this respect, no verbs of the same kind in English to correspond, as:—Es gelingt mir, I succeed (it succeeds to me), etc.

3. *Geben*, "to give," is often, with its proper case (the accusative), employed to denote *existence* in a manner general and indefinite, and is translated like *sein*, "to be," as:—Es giebt (not es sind) Leute, die alle Tage auf den Markt gehen, there are (i.e., there exist) people who go to the market every day. Es sind (not es giebt) viele Leute auf dem Markte, there are many people to-day at the market. Es giebt keine Rosen ohne Dornen, there are (there exist) no roses without thorns. Es sind (not es giebt) viele Kinder in dieser Schule, there are many children in this school. Es giebt (there exist) noch Riesen in der Welt, there are still giants in the world.

VOCABULARY.

Armee, f. army.	Erst, noble, magnanimous.	Rückzug, m. return.
Aufgang, m. rising, ascent.	Es, n. ice.	Schneien, to snow.
Bis, until, up to.	Erklären, to explain.	Stürmen, to storm.
Witzen, to lighten.	Feindlich, hostile.	Tagen, to dawn, become day.
Brechen, to break.	Fürchten, to fear.	Thauen, to thaw.
Ding, n. thing, affair.	Georg, m. George.	Vergeßen, to forgive.
Donnern, to thunder.	Hageln, to hail.	Wahr, true.
	Leicht, easy, easily.	Wolf, m. wolf.
	Reißend, ravenous.	Zufucht, f. refuge.

RÉSUMÉ OF EXAMPLES.

Es wird immer Leute geben, die sich gegen die hellsten Wahrheiten empören, wie viele giebt es deren heut zu Tage nicht! There will always be people who exalt themselves against the clearest truths; how many of those are there (not) at the present day!

Es war einmal ein Weiser, welcher behauptete, daß es kein besseres Gut gebe, als eine gesunde Vernunft in einem gesunden Körper.

There was once a sage who maintained that there was no better possession than a sound understanding in a sound body.

Günige behaupten, daß es Güniger wohnt im Monte gebe. (Sect. XLII.)

Some maintain that there are inhabitants in the moon.

Es ist kein Mensch unglücklicher, als der, welcher nie Weiterwärtigsten erduldet.

There is no mortal more unfortunate than he (that one) who never endured reverses of fortune.

Es giebt wenig Felsen, die ihren Character bis in ihr Alter behaupten.

There are few heroes who maintain their character till (in) their old age.

Es ist nichts so bedauerlicher, als andere dasjenige zu lehren, was man weiß.

There is nothing more praiseworthy than to teach what one knows to others.

EXERCISE 68.

1. Es giebt dieses Jahr sehr viel Obst. 2. Es ist heute sehr schönes Wetter. 3. Es giebt mehr arme, als reiche Leute. 4. Es ist ein wahres Vergnügen, diesen Morgen spazieren zu gehen. 5. Giebt es in Deutschland auch reisende Thiere? 6. Es giebt noch viele Wäse in den Gebirgen. 7. Die feindlich Armee ist auf ihrem Rückzuge. 8. Giebt es etwas Schöneres, als den Aufgang der Sonne? 9. Es hat den ganzen Tag geschneit. 10. Gehen Sie diesen Nachmittag mit mir auf's Eis? 11. Nein, es thut schon, und das Eis kann leicht brechen. 12. Wenn es regt, werde ich Sie zu einem Spaziergang abholen. 13. Es schneit heute den ganzen Tag. 14. Regnet es schon? 15. Nein, aber es wird bald anfangen zu regnen. 16. Wie lange hat es geregnet? 17. Es hat bis vier Uhr geregnet. 18. Donnert es? 19. Ja, es donnert und blüht, und ich fürchte, daß es auch hageln wird. 20. Wo waren Sie, während es schneit? 21. Ich suchte in der Capelle des St. Georg Zuflucht, denn es schneite nicht nur, sondern es flümete und hagelte auch. 22. Ich sage Ihnen nur das, was (Sect. XXI. 1) ich gehört habe.

EXERCISE 69.

1. It seemed this morning as if it [as ob es] would rain, but now the weather begins to be fine. 2. It happened [es ereignete sich] that it rained just as the battle commenced, and it thundered and hailed throughout the whole day. 3. It has rained, hailed, snowed, and frozen this winter. 4. As long as it rains I cannot depart. 5. It appears that there are many strangers in this hotel. 6. There are (exist) many things which we cannot explain. 7. As soon as it becomes day, I shall call upon you to go and see the rising of the sun. 8. Exists there anything more noble than to forgive an enemy? 9. Do you intend to go tomorrow with me upon the ice? 10. No, I fear that it thaws already, and it would be dangerous to venture it [gefährlich sein, es zu wagen]. 11. As soon as the wind abates it will rain. 12. In every community there exist more blockheads than villains, and more ignorant men than learned.

HISTORIC SKETCHES.—X.

THE KNIGHTS TEMPLARS, OR RED CROSS KNIGHTS.

ON the borders of the debateable land where the jurisdictions of the Queen and of the Lord Mayor of London conflict and conjoin, is a stately monument (not Temple Bar), rich in historic interest, and in memories of bygone men. Hidden away under the block of buildings which form the south side of Fleet Street, one does not notice, without seeking for them, the colleges of the Inner and Middle Temple, which constitute the monument alluded to. It is from the river, from Waterloo or Blackfriars Bridge, or better still from the Surrey shore, that one sees

“Those bricky towers,
The which on Thames' broad, aged back do ride,
Where now the studious lawyers have their bowers,
There whilome wout the Templar knights to bide,
Till they decayed through pride.”

Within those “bricky towers” do now study and work the apprentices, barristers, and sergeants of the law who are members of the two societies of the Temple; there are collected some of the brightest minds which the Universities of the kingdom have trained, some of the wittiest heads that ever Nature looked upon and smiled, some of the most intellectual, polished, and

learned men that are owned by the three kingdoms. They call themselves Templars, they worship in common in the Temple Church, and they preserve the devices and traditions of an order of knights whose name they bear, and in whose souls they sit. How is this? Was it always so? Certainly not. The lines of Edmund Spenser, quoted above, testify as much, and their witness, as we shall see in the course of this sketch, is exactly even with the truth. Let us inquire somewhat into the history of these colleges of law, and see how they came to be colleges at all; let us glean something out of the historic memories which cling around them, and follow the path pointed out by the finger of Time till it leads us to the epoch when the lawyers dwelt not in the Temple, but armed Christianity stalked her horse and sharpened her sword there.

There was a cry in Christendom that the heathen had entered into the inheritance of God, and had defiled His holy places. Stories the most pitiable were told of what the infidels had done to those who went up to Jerusalem to worship; how that once more the wicked had given the dead bodies of God's servants to be meat for the fowls of the air, and the flesh of His saints to the beasts of the land. A thrill of horror went through men as they listened to the accounts, most likely exaggerated, which were repeated from mouth to mouth, “and the sensation vibrated to the heart of Europe.” Swiftly there followed upon this a determination to be up and doing, a stern sentiment founded on religion and soldierly anger, prompting men to exact satisfaction at the risk of their lives for the blood of Christ's children which had been shed. This was in the year 1090.

The Saracens (a people often confounded with Turks, from whom they were altogether dissimilar), from Arabia, had conquered Palestine in the year of our Lord 637, driving out the authority of the declining Greek emperors, and establishing the religion and the state system of Mahomet. The Caliphs, or chiefs of the Saracens, had so far respected the religion and social habits of the conquered Christians, that they had allowed them to retain about one-fourth of the city of Jerusalem, besides numerous places in the provinces. Among other things which they were permitted to keep was the Church of the Holy Sepulchre, which the Empress Helena, mother of the first Christian Emperor, Constantine, had built over the spot where the Saviour was supposed to have been buried. The Christians experienced at the hands of the Saracens the greatest moderation, though the character and principles of the two religions were essentially different, and in some particulars diametrically opposed. Pilgrims flocked in hundreds and thousands from all parts of Europe, to see the places which had been honoured by the real presence of their Lord, to utter their prayers in the very places where He had prayed, to abase themselves on the very scene of His sufferings, and to adore Him in Jerusalem, “the place where God ought to be worshipped.” Though their numbers must have proved inconvenient, one would think, to the Mussulman authorities, and though their enthusiasm was not unlikely to have produced breaches of the peace, we do not hear of their having been interfered with. Occasionally, perhaps, there was a disturbance, but that in all probability was due rather to the imprudence of the Christians than to the tyranny of the Caliph; so the pilgrimages went on, and were accounted by the religious system of the day for righteousness in those who performed them.

But a change came. In the year 1065, the year before the conquest of England by the Normans, Palestine was wrested from the Saracens by the Turcoman troops, whom they had hired, in the decline of their own vigour, to defend them. The power of the Arabian Caliphs was over; that of the Turkish Sultans or Emirs had taken its place. A very different sort of power the Christians found it. Though professing the same creed as the Saracens, the Turks had none of their moderation. Brutality coupled with fanaticism—these were the principles on which the new rulers proceeded to govern. Forthwith came a wail of misery from the Holy Land; pilgrims were ill-treated, insulted, and put to death. Women (it was customary even for women to go) were outraged; taxes the most offensive were exacted from those pilgrims who had money, and those who had none were driven back with the sword, whilst great numbers perished through the instrumentality of the Turks. A golden fee was required of every one before he could be admitted to the Holy Sepulchre. The Patriarch of Jerusalem was dragged across his church by the hair of his head, and flung into

a dungeon, in order that he might be induced to procure the large ransom demanded of him. These and other tales came to Europe, brought by the wayworn and pitiable-looking objects who returned from their pilgrimage with life, and the effect of them was to arouse in the minds of all men the feelings of indignation and pity which have been already referred to—feelings akin to those, though far more ecstatic, which were felt in England when the story of the Indian mutiny came over, or, in a less degree, which were felt when the refusal of Abyssinian Theodore to give up his captives was made known.

Men's minds were ripe for action. They only wanted, as they ever want, some master-mind to take the lead. That master-mind was found in Peter the Hermit, who marched barefoot through Europe, preaching up a holy war, and exhorting Christians not to suffer infidels to crucify the Lord afresh in the persons of His children, and to put Him to an open shame. Pope Urban II. backed the hermit with all his influence, and Christendom roused as one man. "It is the will of God! it is the will of God!" the people shouted on the plains of Auvergne, when Peter stirred up many thousands of them with the burning words of his eloquence. A vast mob, numbering over 500,000, possessed with plenty of enthusiasm, but little military knowledge, marched forth with under the guidance of Peter the Hermit and Walter the Moneyless; but they melted like snow under the hardships of the journey and by reason of the divisions which sprang up among them. Before they reached Constantinople, then the capital of the Christian Greek Empire (Constantinople was not taken by the Turks under Mahomet II. till 1453), they became a mere rabble, and went no farther. Other hordes, under military leaders, and in numbers 700,000 strong, marched to the Crusades notwithstanding. Princes, barons, knights, esquires, yeomen, priests, hastened to enrol themselves under the banner of the Cross, and streamed eastward, possessed with the one idea of rescuing the Holy Land from the clutches of infidels, happy if only they might tread the land which had been trod by holiest feet. There were many of these crusades, the most notable being that led by Richard the Lion-hearted in the year 1190.

It is not surprising that such desperate enthusiasm should have succeeded in doing somewhat. Jerusalem was taken by the Crusaders. The Mussulmans were driven to the mountains, and a Latin kingdom, based upon the feudal principle (for an account of this principle see "Historic Sketches," I., p. 9), was established in their place.

The dangers surrounding this kingdom were great and perennial. The Turks, commingled now with their Saracen brethren in faith, were ever on the watch to inflict injury on the invaders, and to play the part of the enemy who sowed the tares, if perchance at any time the Christians slept. For a while the conquerors, reinforced by numerous additions from home, held their own, and kept up their communications with the sea; but gra-

dually, as zeal grew faint, these succours became less, and there was considerable difficulty experienced by the Kings of Jerusalem in protecting their subjects, let alone visitors. It should be mentioned that the first and most renowned of the Christian Kings of Jerusalem was Godfrey de Bouillon, who mortgaged his Duchy of Bouillon in the Ardennes in 1095 to the Bishop of Liege, to raise the funds necessary to enable him to take part in the first Crusade. Following in the track of Peter the Hermit, he reached Palestine after encountering and surmounting difficulties of no ordinary nature; and having been joined by the forces that marched under Robert of Normandy, Bohemond of Tarentum, and other leaders, he was unanimously elected to the supreme command of the Christian hosts in the Holy Land. After a long siege Antioch yielded to the repeated attacks of the Crusaders in 1098, and about a year after Jerusalem was taken by assault, July 15, 1099. The guardianship of the Holy City was vested in Godfrey de Bouillon, who received the title of King of Jerusalem. He did not long enjoy

his sovereignty, for in a year and three days after the capture of Jerusalem, he died suddenly, having been, it is supposed, poisoned by the Emir of Casarea.

Pilgrims continued to journey to the Holy City, receiving as their reward the assurance from the priests of absolution even from the most deadly sins. And certainly they deserved something substantial, for at this time they had not only to bear the enormous expense which a pilgrimage, say from Northampton to the East, cost in those days, but they had to incur, in addition to this, to say nothing of the risks of climate, etc., the certain hostility of deadly foes, well acquainted with the country, and whose business in life it was to go about seeking what Christians they might devour. The journey from the coast to Jerusalem, no matter at what port the pil-

grims disembarked, was full of peril. Numbers of travellers were cut off even in sight of the Holy City, and the King of the place was not able to succour them. Afflicted beyond measure at the sight of so much wrong, anxious to redress, as far as in them lay, the injuries suffered by the pilgrims, nine knights bound themselves by a solemn vow to devote themselves wholly and unreservedly to the sacred duty of shielding the pilgrims and of punishing their oppressors. A brotherhood of arms was formed under the most solemn circumstances, and vows were taken by the nine in the presence of the Patriarch, to the effect that they would devote themselves to this work; that they would be chaste, poor, and obedient, and do all to the glory of God. They called themselves *The poor Fellow-soldiers of Jesus Christ*.

They acted as the police of the Latin King in the matter of Turks, infidels, and heretics; and the idea on which the brotherhood was founded, coupled with the reputation their prowess soon acquired, made the service of the Poor Fellow-soldiers very popular in Europe. A humorous writer has thus analysed the motives which induced men to go to the Crusades,

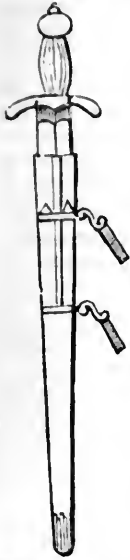


ARMS AND COSTUME OF THE KNIGHTS TEMPLARS.

showing that "for sake of the party" most men were most moved:—

Religion	1	Because it's the fashion	4
Hatred of Turks	2	Love of bloodshed	5
The wish of my lady-love	3	For the sake of the party	15

It may have been so with those who joined the brotherhood. Certain it is the number of the order soon exceeded the original number, and some of the "best blood" and the first military talents were to be found among its members. Baldwin II., King of Jerusalem in the year 1118 (nineteen years after the conquest of the place), granted the knights a dwelling-place in the enclosure of the Temple on Mount Moriah, the re-edified Temple of Solomon, and from that time the knights were known as the *Knighthood of the Temple of Solomon*.



SWORD OF GODFREY DE BOUILLON. FROM THE ORIGINAL PRESERVED AT JERUSALEM.

Ten years afterwards, the knights having formed themselves into a body of military monks, bound by the same rules as monks, and yet soldiers still, obtained recognition from the Pope (Honorius), and were favoured with many honours of an ecclesiastical kind. St. Bernard, Abbot of Clairvaux (author, among other things, of the hymn "Jerusalem the Golden"), himself drew up the rules of the order, which are exceedingly curious and sufficiently stringent.

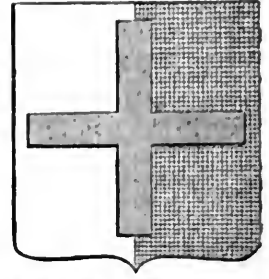
Constant attendance on prayer, self-mortification, complete self-surrender, fasting—these were the principles on which the rules were framed. The twentieth rule prescribed white dresses for the knights. "To all the professed knights, both in winter and summer, we give, if they can be procured, white garments; that those who have cast behind them a dark life, may know that they are to commend themselves to their Creator by a pure and white life. For what is whiteness but perfect chastity, and chastity is the security of the soul, and the health of the body. And unless every knight shall continue chaste, he shall not come to perpetual rest, nor see God, as the Apostle Paul

witnesseth: Follow after peace with all men, and chastity, without which no man shall see God." Esquires and retainers were to be clothed in black cloth, or, failing that, of brown or some mean colour; "it is granted to none to wear white habits, or to have white mantles, excepting the above-named knights of Christ." Gold or silver was forbidden to be worn on the harness and trappings of the knights—simplicity and unrichness were to be the order of the brotherhood. All money and all gifts were to be in common. There was not to be any communication with the outer world except through the master, and sporting of all kinds was strictly forbidden. For the purposes of the brotherhood it was permitted the knights to possess lands and husbandmen, "and the customary services ought to be specially rendered unto you." Rule 66 says, "It is, moreover, exceedingly dangerous to join sisters with you in your holy profession, for the ancient enemy hath drawn (St. Bernard spake as a monk) many away from the right path to paradise through the society of women." In the last clause of the rules this warning is repeated, with a prohibition:—"Lastly, we hold it dangerous to all religion to gaze too much on the countenance of women; and therefore no brother shall presume to kiss neither widow nor virgin, nor mother nor sister, nor aunt, nor any other woman. Let the knighthood of Christ shun feminine kisses, through which men have very often been drawn into danger, so that each, with a pure conscience and secure life, may be able to walk everlastingly in the sight of God."

These rules were confirmed by the Pope, and Hugh de Payens was chosen Master of the Knights. De Payens travelled through

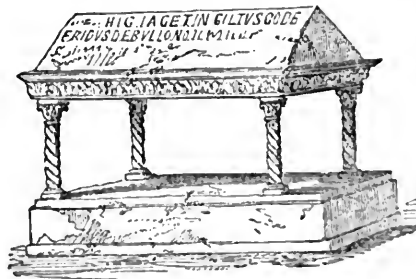
Europe, amassing gifts, and getting recruits for the brotherhood. In England he was well received in the year 1128, and there he founded a branch establishment of the Knights, under the wardenship of a Prior, who was, on the appointment of sub-priors over other branches in England, called the Grand Prior, and subsequently Master of the Temple, the title of the supreme head in Palestine being at the same time changed into that of Grand Master.

On the spot where "now the studious lawyers have their bowers," the English Templars dwelt, their Master a peer of Parliament. At first, however, they lived in the Old Temple without Holborn Bars, close to the spot where Southampton Buildings now stand; and it was not till many years after the establishment of the order in England that they bought the ground on which they built the New Temple, the site of the present law colleges. Numerous branch depôts in the country sent up men and money to the central body in London, and the Master and Knights in London supplied the wants of the order at Jerusalem. In other countries, especially in France, the Templars took deep root, and enormous possessions in land and money were bestowed upon them. The order became very popular, and its numbers increased so that the muster-roll of the Knights included the names of many thousands of warriors, picked men from the flower of European chivalry. In the course of a few years they rose into such prominence that kings were glad to court their favour; to the King of Jerusalem they were in the stead of a standing army, and upon them devolved the never-ceasing warfare which was necessary to defend the Latin settlement from destruction.



SHIELD OF A KNIGHT TEMPLAR.

About the year 1146, when the second Crusade was being prepared, the Templars assumed, by permission of the Pope, a red cross, which was worn on the left breast of their mantles, and which obtained for them the name of Red Friars, or Red Cross Knights. They also obtained, at the same period, large additional benefices. Their work was not all rose-water, however; far from it—they had rough and constant employment against enemies both to race and religion, men embittered by years of mutual injury, by fanaticism, by every strong impulse. At times they conquered, at others they fell—even their Grand Master on one occasion being taken and kept in prison till he died. Saladin, the hero of many a romance, a most able warrior and statesman, was the great foe of the Christians; and as under his auspices the Crescent grew, the light of the Cross became pale in Palestine. At one time the whole of the brethren in garrison at Jerusalem having been captured, and offered the alternative of death or the Koran, elected the former, and were beheaded accordingly. By way of reprisal for these things, it often happened that the Knights forgot the Christian quality of mercy, and involved in one common destruction the whole of their captives; indeed, in the end the war between Cross and Crescent became a war to the knife. The Templars were a terror to all but the best of the Turkish soldiers, and rode through their lines in splendid charges, which made the earth quake beneath them.



TOMB OF GODFREY DE BOUILLON AT JERUSALEM.

The Knights Templars had been instituted as a rival order to that of the Knights of St. John of Jerusalem, which was organised as a military body about 1099. This order was never at any time of its existence so wealthy and powerful as that of the Templars, and on this account always held a higher position in popular favour. The Templars, on the other hand, were being spoiled by prosperity, and their wealth was now beginning to stir up the envy and desire of the needy. In every country in Europe they had property either in land or money—nine thousand manors in all, besides other riches; and their privileges,

obtained both from kings and from the pope, were calculated to arouse the jealousy of the people. Riches, too, in the hands of the "Poor Fellow-soldiers of Jesus Christ," the men who had taken vows of poverty, did not cause their possessors to prosper; the military monks grew less and less chary of going to fight in the Holy Land; and when, in 1187, Saladin re-conquered Jerusalem, and put all the Templars there, together with the other defenders of the place, to the sword, the rest of the fraternity were still less inclined to make an effort to rescue the city, and to re-found the Latin Kingdom in the East. They remained, therefore, at home, living upon their property, jealously preserving the rights granted to them under widely different circumstances, and making themselves obnoxious by their pride and worldliness. The annual income of the order was estimated at £6,000,000.

A society so rich and so powerful could not but have enemies. It began to be whispered that not only did they visibly neglect the obligations of their vows, but secretly they conducted themselves in the most abominable manner; that they worshipped the devil, and dealt in magic, and that one part of the ceremonial admission to the order was the act of spitting on an image of the Saviour. These and other grave charges were brought against them, but their pride would not allow of their making any reply, till colour having been given to them by the irregularities of some of the brethren, Philip the Fair, of France, who had an eye to confiscations, resolved, in 1296, to proceed against them. As they had no friends, he thought he might safely kick them. After a splendid defence of each one of their posts in Syria, which they lost in succession, overwhelmed by great numbers, after the death in battle of their last notable Grand Master, and after their final expulsion from the Holy Land, their influence diminished with the disgrace that had come upon them.

Philip gave ear to the scandal bruited concerning the Knights. James de Molay, of a noble Burgundian family, was Grand Master. He was an illustrious warrior, who had fought in all the latest battles in Palestine, and had, in conjunction with the Persian King, to whom he at one time allied himself, re-conquered for a while the lost ground in Syria. He had held King Philip at the baptismal font. He was approved an honest man as well as a noble soldier in the sight of all men, and the voice of calumny was not able to speak against him. Yet Philip, having invited him from Cyprus, his stronghold, flung him into prison, and kept him there five years and a half. Meantime information, much of it of an absurd and ridiculous character, was gladly received from any quarter by the King. Pope Clement V., who was wholly under French influence (the Papal Court was then at Avignon), issued bulls ordering inquisition to be made into the conduct of the monks. In France this inquiry was made under torture, and more than a hundred Knights died under the tormentors' hands. Some confessed, under the smart of pain, to foul and unnatural crimes, which they denied afterwards to the death; and upon evidence of this kind, and other evidence quite as unsatisfactory, several hundreds of Templars were burned at slow fires—more than a hundred and ten in Paris on one occasion. France was the only country in which this excessive barbarity was practised, but as in all countries the wealth of the order was a great crime, the fate of the order itself was decided simultaneously everywhere. Their possessions were confiscated throughout Europe, and given, part to the rival order of the Knights of St. John of Jerusalem, part to the princes who had seen them to their end; and the Pope, in 1327, issued a decree abolishing the whole order.

James de Molay, the Grand Master, having endured five years and a half of rigorous confinement, and having probably suffered torture therein, was led out in company with three of his chief officers, on the 18th of March, 1313, to recite in the hearing of the people of Paris the charges he had confessed while under torture. The Bishop of Alba read the confessions, and then called on the prisoners to affirm them. Two of the unhappy Knights, worn out by torture and suffering, assented, but the Grand Master, loaded with chains, called out with a loud voice that for him to affirm an untruth was a crime of which he would not be guilty; and he added, "I do confess my guilt, which consists in having, to my shame and dishonour, suffered myself, through the pain of torture and the fear of death, to give utterance to falsehoods imputing scandalous sins and iniquities to an illustrious order, which hath nobly served the

cause of Christianity. I disdain to purchase such a wretched and disgraceful existence by engrafting another lie upon the original falsehood." Guy, the Grand Preceptor, having said something to the same effect, Philip became enraged, and that same evening, at dusk, the two unfortunate Knights, the last Grand Master, and the last Grand Preceptor, were taken to a spot outside Paris, and slowly roasted to death.

Fuller says, "The chief cause of the ruin of the Templars was their extraordinary wealth. As Naboth's vineyard was the chiefest ground of his blasphemy, and as in England Sir John Cornwall, Lord Fanhope, said merrily, not he, but his stately house at Amphill, in Bedfordshire, was guilty of high treason, so certainly their wealth was the principal cause of their overthrow."

In England, while much of the property of the Knights was seized by the King (Edward III.), a large portion, including the Temple in London, was given to the Knights of St. John of Jerusalem, who let it to the lawyers, and continued to do so down to the time of the suppression of monasteries in 1539, when the Knights of St. John, in common with all other conventual institutions in England, ceased to exist. The property of the Knights was resumed by the Crown, and various noblemen enjoyed the grant of the Temple in London, until the reign of James I. That monarch granted it to the executive members of the two law societies which had flourished there since the downfall of the Templar Knights, and they still hold it by virtue of King James's grant, on condition of paying a quit rent of ten pounds a year.

CHRONOLOGICAL TABLE OF THE CRUSADES AND PRINCIPAL EVENTS IN THE HISTORY OF THE ORDERS OF THE KNIGHTS TEMPLARS AND KNIGHTS OF ST. JOHN OF JERUSALEM.

Crusades suggested by Peter the Hermit, and sanctioned by Pope Urban II.	1094	Jerusalem taken by the Turks	1217
First Crusade under Godfrey de Bouillon and others (temp. William II.)	1096	Sixth Crusade under Frederick II. of Germany (temp. Henry III.)	1228
Jerusalem taken	July 15, 1099	Jerusalem again taken by the Turks	1239
Latin Principalities of Jerusalem, Antioch, and Edessa founded	1099	The Temple Church built	1240
Military Order of the Knights of St. John of Jerusalem founded	1099	Seventh Crusade under Louis IX. of France (temp. Henry III.), unsuccessful	1249
Order of Knights Templars founded by Baldwin II. of Jerusalem	1118	Eighth and last Crusade commenced by Louis IX. of France (temp. Henry III.)	1270
Templars establish themselves in England	1128	Carried on by Prince Edward, afterwards Edward I. of England	1271
Edessa conquered by the Saracens	1144	Christian Troops finally withdrawn from the Holy Land	1291
Fresh Crusade preached by St. Bernard of Clairvaux	1146	Knights of St. John retire to Cyprus	1291
Second Crusade under Conrad II. of Germany and Louis VII. of France (temp. Stephen), unsuccessful	1147	Rhodes occupied by Knights of St. John	1310
Jerusalem taken by the Saracens under Saladin	1187	Order of Templars suppressed in France	1312
Third Crusade commenced by Frederick Barbarossa, Emperor of Germany	1189	Grand Master, James de Molay, burned in Paris	1314
Carried on by Richard I. of England and Philip II. of France	1190	Templars suppressed in England	about 1340
Fourth Crusade under Henry V. of Germany (temp. Richard I.)	1195	Rhodes taken by Solyman II.	1522
Fifth Crusade under Baldwin of Flanders, who stopped at Constantinople instead of going to the Holy Land (temp. John)	1204	Knights of St. John retire to Sicily	1522
		Malta given to the Knights of St. John by Charles V. of Germany	1530
		Order of Knights of St. John finally suppressed in England	1539
		Malta taken by Bonaparte	1798
		Malta taken by the British	1800
		From this time the Knights of St. John have ceased to hold any territory.	

CHRISTIAN KINGS OF JERUSALEM.

Godfrey de Bouillon	1099	Amaury	1162	Amaury de Lusignan	1197
Baldwin I. (brother of Godfrey)	1100	Baldwin IV.	1173	Jeanne de Brienne	1210
Baldwin II.	1118	Sibyl	1185	Frederick II. of Germany	1229
Fulk of Anjou	1131	Baldwin V.	1185	This King was expelled by the Turks	1239
Baldwin III.	1144	Guy de Lusignan	1186		
		Henry de Champagne	1192		

LESSONS IN FRENCH.—XX.

SECTION XXXII.—UNIPERSONAL VERBS.

1. By unpersonal verbs is simply meant those verbs which are used only in the third person singular. Having, properly speaking, no personal subject, they are sometimes called impersonal; for the third person singular, used in English, is *neuter*, and in French, though *il* be used, it is understood and translated as *neuter* by the word *il*. These verbs express chiefly an abstract opinion or sentiment; most frequently they denote the state or change of the weather; and they generally precede or announce the occurrence of an event, as, *it happened*.

2. The unpersonal verb is conjugated only in the third person singular of a tense. Its nominative pronoun *il, it*, is used absolutely, i. e., it represents no noun previously expressed.

Il pleut aujourd'hui,

It rains to-day.

3. The unpersonal verb assumes the termination of the class or conjugation to which it belongs. Some verbs are always unpersonal, and will be found in § 62. Others are only occasionally so, and if irregular, will be found in the *personal* form in the same § 62.

4. PRESENT OF THE INDICATIVE OF THE UNIPERSONAL VERBS.

Y AVOIR, to be there.	PLEUVOIR, to rain.	NEIGER, to snow.
Il y a, there is, there are.	Il pleut, it rains, it is raining.	Il neige, it snows, it is snowing.
GRÊLER, to hail.	GÊLER, to freeze.	DÉGÊLER, to thaw.
Il grêle (§ 49), it hails, it is hailing.	Il gèle (§ 49), it freezes, it is freezing.	Il dégèle (§ 49), it thaws, it is thawing.

5. *Il y a* means *there is, or there are*, and may be followed by a singular or plural noun [§ 61 (2)].

Il y a du gibier au marché,	<i>There is game in the market.</i>
Il y a des pommes dans votre jardin,	<i>There are apples in your garden.</i>

6. In relation to the weather, the verb *faire* is used unpersonally in the same manner as the English verb *to be*.

Il fait beau temps aujourd'hui,	<i>It is fine weather to-day.</i>
Il fait chaud, il fait froid,	<i>It is warm, it is cold.</i>

RÉSUMÉ OF EXAMPLES.

Pleut-il ce matin ?	<i>Does it rain this morning</i>
Il ne pleut pas, il neige.	<i>It does not rain, it snows.</i>
Il va pleuvoir ce matin.	<i>It is going to rain this morning.</i>
Ne gèle-t-il pas ce matin ?	<i>Does it not freeze this morning?</i>
Il ne gèle pas, il fait du brouillard.	<i>It does not freeze, it is foggy.</i>
Y a-t-il du sucre chez vous ?	<i>Is there any sugar at your house ?</i>
Il y en a beaucoup chez mon frère.	<i>There is a great deal at my brother's.</i>
Y a-t-il plusieurs personnes chez moi ?	<i>Are there several persons at my house ?</i>
Il y a plus de cent personnes.	<i>There are more than one hundred persons.</i>
N'y a-t-il personne à l'église ?	<i>Is there nobody at church ?</i>
Il n'y a encore personne.	<i>There is as yet no one there.</i>
Est-il trop tôt ?	<i>Is it too soon ?</i>
Au contraire, il est trop tard.	<i>On the contrary, it is too late.</i>
Fait-il froid ou chaud aujourd'hui ?	<i>Is it cold or warm to-day ?</i>
Il fait chaud et humide.	<i>It is warm and damp.</i>
Fait-il du vent ou du brouillard ?	<i>Is it windy or foggy ?</i>
Il fait un temps bien désagréable.	<i>It is very disagreeable weather.</i>

VOCABULARY.

Assemblée, f., assembly, party.	Couvert, -e, cloudy.	Manuscrit, m., manuscript.
Bibliothèque, f., library.	Écurie, f., stable.	Souvent, often.
Brouillard, m., fog.	Épais, -se, thick.	Veau, m., veal.
Chambre, f., room.	Poin, m., hay.	Vent, m., wind.
Cinquante, fifty.	Gibier, m., game.	Volaille, f., poultry.
	Humide, damp.	

EXERCISE 59.

1. Quel temps fait-il aujourd'hui ? 2. Il fait un temps superbe. 3. Fait-il très-beau temps aujourd'hui ? 4. Il fait un temps couvert et humide. 5. Pleut-il beaucoup ce matin ? 6. Il ne pleut pas encore, mais il va pleuvoir. 7. Fait-il du vent ou du brouillard ? 8. Il ne fait pas de vent. 9. Le brouillard est très-épais. 10. Combien de personnes y a-t-il à l'assemblée ? 11. Il y a plus de deux cents (Sect. XIX.) personnes. 12. N'y a-t-il pas beaucoup de manuscrits dans votre bibliothèque ? 13. Il n'y en a pas beaucoup, il n'y en a que

cinquante-cinq. 14. Fait-il trop froid pour vous dans cette chambre ? 15. Il n'y fait ni trop froid ni trop chaud. 16. Y a-t-il beaucoup de foin dans votre écurie ? 17. Il y en a assez pour mon cheval. 18. Restez-vous à la maison quand il pleut ? 19. Quand il pleut je reste à la maison, mais quand il fait beau temps je vais chez mon cousin. 20. Y a-t-il de la viande au marché ? 21. Il y en a beaucoup, il y a aussi du gibier. 22. Il y a du veau, du mouton et de la volaille. 23. N'y a-t-il pas aussi des légumes et des fruits ? 24. Il n'y en a pas. 25. Il y en a aussi.

EXERCISE 60.

1. Are you cold this morning ? 2. I am not cold, it is warm this morning. 3. Is it foggy or windy ? 4. It is neither foggy nor windy, it rains in torrents (à verse). 5. Is it going to rain or to snow ? 6. It is going to freeze, it is very cold. 7. It is windy and foggy. 8. Is there anybody at your brother's to-day ? 9. My brother is at home, and my sister is at church. 10. Is there any meat in the market ? 11. There is meat and poultry. 12. Is it too warm or too cold for your sister in this room ? 13. It is not so warm in this room as in your brother's library. 14. Are there good English books in your sister's library ? 15. There are some good ones. 16. Are there peaches and plums in your garden ? 17. There are many. 18. Do you remain at your brother's when it snows ? 19. When it snows we remain at home. 20. Are there ladies at your mother's ? 21. Your two sisters are there to-day. 22. Have you time to go and fetch them ? 23. I have no time this morning. 24. Is your horse in the stable ? 25. It is not there, it is at my brother's. 26. Does it hail this morning ? 27. It does not hail, it freezes. 28. What weather is it this morning ? 29. It is very fine weather. 30. Is it too warm ? 31. It is neither too warm nor too cold. 32. Is it going to freeze ? 33. It is going to snow. 34. Does it snow every day ? 35. It does not snow every day, but it snows very often.

SECTION XXXIII.—PLACE OF THE ADVERB [§ 196].

1. In simple tenses, the adverb generally follows the verb, and is placed as near it as possible.

Votre commis écrit très-bien,	<i>Your clerk writes very well.</i>
Cette demoiselle lit très-mal,	<i>That young lady reads very badly.</i>

2. When a verb is in the infinitive, the two negatives *ne* and *pas*, *ne* and *rien*, should be placed before it.

Ne pas parler, ne pas lire,	<i>Not to speak, not to read.</i>
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3. The adverb *assez, enough, tolerably*, precedes generally the other adverbs. It precedes also adjectives and nouns.

Vous écrivez assez correctement,	<i>You write pretty correctly.</i>
Vous avez assez de livres,	<i>You have books enough.</i>
Cet enfant est assez attentif,	<i>That child is attentive enough.</i>

4. *Voici* means *here is; voilà, there is*.

Voici le livre que vous aimez,	<i>Here is the book which you like.</i>
Voilà le monsieur dont vous parlez,	<i>There is the gentleman of whom you speak.</i>

5. *Dans* is used for *in* or *into*, when the noun which follows it is preceded by an article, or by a possessive, demonstrative, or numeral adjective [§ 142 (2)].

Le crayon est dans le pupitre,	<i>The pencil is in the desk.</i>
Mettez cette lettre dans votre malle,	<i>Put this letter into your trunk.</i>

6. *En*, after the verbs *to be, to go, to reside*, followed by the name of a part of the earth, a country, or province, gives the preposition *to* the force of *in* or *into*.

Notre ami est en France,	<i>Our friend is in France.</i>
Vous allez en Italie,	<i>You go to Italy.</i>

7. The preposition *à* is used for the words *at* or *to, in* or *into*, before the name of a town, city, or village, preceded by the verbs mentioned above.

Il va à Paris le mois prochain,	<i>He is going to Paris next month.</i>
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8. The same preposition is used in the expressions *à la campagne, à la ville, à la chasse, à la pêche, etc.*

Nous allons à la campagne,	<i>We go into the country.</i>
Vous n'allez pas à la ville,	<i>You do not go to the city.</i>
Je vais à la chasse et à la pêche,	<i>I go hunting and fishing.</i>

9. INDICATIVE PRESENT OF THE IRREGULAR VERBS.

CONDU-RE, 4, to conduct. Je conduis, I conduct, do conduct, or am conducting.	ÉCRI-RE, 4, to write. J'écris, I write, do write, or am writing.	LI-RE, 4, to read. Je lis, I read, do read, or am reading.
Tu conduis. Il conduit. Nous conduisons. Vous conduisez. Ils conduisent.	Tu écris. Il écrit. Nous écrivons. Vous écrivez. Ils écrivent.	Tu lis. Il lit. Nous lisons. Vous lisez. Ils lisent.

RÉSUMÉ OF EXAMPLES.

Votre parent écrit-il bien ? Il écrit assez bien et assez vite.	Does your relation write well ? He writes well enough and rapidly enough.
Nous avons assez de livres. Nous sommes assez attentifs à nos leçons.	We have books enough. We are attentive enough to our les- sons.
Voilà la demoiselle dont vous parlez.	There is the young lady of whom you speak.
Votre cheval n'est-il pas dans le champ ?	Is not your horse in the field ?
Il n'y est pas, il est dans le jardin. Allez-vous en France cette année ? Nous allons à Paris et à Lyon.	It is not there, it is in the garden. Do you go to France this year ? We go to Paris and to Lyons.
Où conduisez-vous ce jeune homme ? Je le conduis en Allemagne. Demeurez-vous à la ville ? Nous demeurons à la campagne. Allez-vous souvent à la chasse ? Nous allons quelquefois à la pêche.	Where do you take this young man ? I take him to Germany. Do you live in the town ? We live in the country. Do you go often hunting ? We sometimes go fishing.

VOCABULARY.

Associé, m., partner.	Italie, f., Italy.	Suisse, f., Switzerland.
Campagne, f., country.	Pêche, f., fishing.	Terre, f., farm, estate.
Canif, m., penknife.	Prusse, f., Prussia.	Ville, f., town, city.
Chasse, f., hunting.	Rapidement, rapidly.	Vite, quickly.
Commis, m., clerk.	Rend-re, 4, to return.	Voyage, m., journey.
Fort, very.	Si, if.	

EXERCISE 61.

1. Écrivez-vous encore la même leçon ? 2. Je n'écris plus la même, j'en écris une autre. 3. Votre commis écrit-il rapidement ? 4. Il écrit fort bien, mais il n'écrit pas vite. 5. N'avez-vous pas assez d'argent pour acheter cette terre ? 6. J'ai assez d'argent, mais j'ai l'intention de faire un voyage en France. 7. Voilà votre livre, en avez-vous besoin ? 8. Je n'en ai pas besoin, j'en ai un autre. 9. Avez-vous encore besoin de mon canif ? 10. Je n'en ai plus besoin, je vais vous le rendre. 11. Notre cousin demeure-t-il à la ville ? 12. Il ne demeure plus à la ville, il demeure à la campagne. 13. Aime-t-il aller à la chasse ? 14. Il n'aime pas aller à la chasse. 15. Il va tous les jours à la pêche. 16. Notre associé est-il à Paris ou à Rouen ? 17. Il est à Marseille. 18. Où avez-vous l'intention de conduire votre fils ? 19. Je vais le conduire en Italie. 20. Demeurez-vous à Milan ou à Florence ? 21. Je ne demeure ni à Milan ni à Florence, je demeure à Turin. 22. Votre ami demeure-t-il en Suisse ? 23. Il ne demeure plus en Suisse, il demeure en Prusse. 24. Votre domestique est-il à l'église ? 25. Non, Monsieur, il est à l'école.

EXERCISE 62.

1. Does your clerk write as well as your son ? 2. He writes tolerably well, but not so well as my son. 3. Have you books enough in your library ? 4. I have not books enough, but I intend to buy some more. 5. Here is your sister's letter, will you read it ? 6. I intend to read it. 7. Does your son like to go fishing ? 8. He likes to go fishing and hunting. 9. When does he like to go fishing ? 10. When I am in the country. 11. What do you do when you are in the city ? 12. When I am in the city, I read and learn my lessons. 13. Do you intend to go to France this year ? 14. I intend to go to Germany. 15. Will you go to the city if it rains ? 16. When it rains I always remain at home [R. 1]. 17. How many friends have you in the city ? 18. I have many friends there. 19. Are there many English in France ? 20. There are many English in France and in Italy. 21. Are there more English in Germany than in Italy ? 22. There are more English in Italy than in Germany. 23. Is it fine weather in Italy ? 24. It is very fine weather there ? 25. Does it often freeze there ? 26. It freezes sometimes there, but not often. 27. Does that young lady read

as well as her sister ? 28. She reads better than her sister, but her sister reads better than I. 29. Is there any one at your house ? 30. My father is at home. 31. Is your brother-in-law absent ? 32. My brother-in-law is at your house. 33. There is no one at home to-day.

SECTION XXXIV.—THE INDEFINITE PRONOUN ON, ETC.

1. The indefinite pronoun *on* has no exact equivalent in English. It may be rendered by *one, we, they, people, etc.*, according to the context. *On* has, of course, no antecedent, and seldom refers to a particular person [§ 41 (4) (5), § 113].

On doit honorer la vertu, We should honour virtue.
On nous apporte de l'argent, Money is brought to us.

2. As may be seen in the last example, *on* is often the nominative of an active verb, which is best rendered in English by the passive [§ 113 (1)].

On dit que votre épouse est ici, They say that your wife is here.
On raconte des histoires singulières, Singular histories are related.
On récolte beaucoup de blé en France, Much wheat is harvested (grown) in France.

3. Avoir lieu answers to the English expression to take place.
Cela a lieu tous les jours, That takes place every day.

4. Au lieu de answers to the English *instead of*. The verb which follows it must, according to Sect. XX. 2, be put in the infinitive.

Au lieu d'étudier, il joue, Instead of studying he plays.

5. Devoir, to owe, is used before an infinitive, like the English verb to be, to express obligation.

Je dois lui écrire demain, I am to write to him to-morrow.
Nous devons y aller demain, We are to go there to-morrow.

6. Recevoir des nouvelles means to hear from.

Devez-vous recevoir des nouvelles de votre sœur ? Are you to hear from your sister ?

7. Entendre parler answers to the English phrase to hear of or about.

Entendez-vous souvent parler de vos amis ? Do you often hear of your friends ?

RÉSUMÉ OF EXAMPLES.

Que dit-on de nous dans la ville ? On ne parle pas de vous. Ne mange-t-on pas tous les jours ? On mange quand on a faim. On trouve beaucoup d'or en Californie. Dit-on quelque chose de nouveau ? On ne dit rien de nouveau. A-t-on reçu des nouvelles de George ? On n'a point entendu parler de lui. On n'a point reçu de ses nouvelles. Devez-vous écrire à notre ami ? Je dois lui écrire demain. Le concert doit-il avoir lieu ce soir ? Il doit avoir lieu ce matin. Je viens au lieu de mon frère. Il danse au lieu de marcher.	What do they say of us in the city ? People do not speak of you. Do not people eat every day ? People eat when they are hungry. Much gold is found in California. Do they (people) say anything new ? Nothing new is said. Has anything been heard from George ? Nothing has been heard of him. They have not heard from him. Are you to write to our friend ? I am to write to him to-morrow. Is the concert to take place this evening ? It is to take place this morning. I come instead of my brother. He dances instead of walking.
---	---

VOCABULARY.

Afrique, f., Africa.	Habits, m. pl., clothes.	Part-ir, 2, to depart, to set out, to leave.
Alger, Algiers	Heure, f., hour, time.	Prochain, -e, next.
Apport-er, 1, to bring.	Malade, sick.	Sav-oir, 3, ir., to know.
Demain, to-morrow.	Mois, m., month.	Vente, f., sale.
Diamant, m., diamond.	Or, m., gold.	Voyage, m., journey.
Four-ir, 2, to furnish.	Os, m., bone.	

EXERCISE 63.

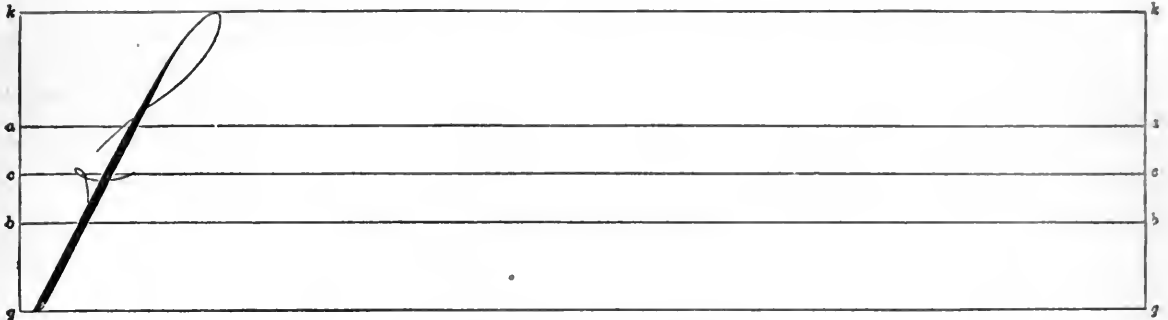
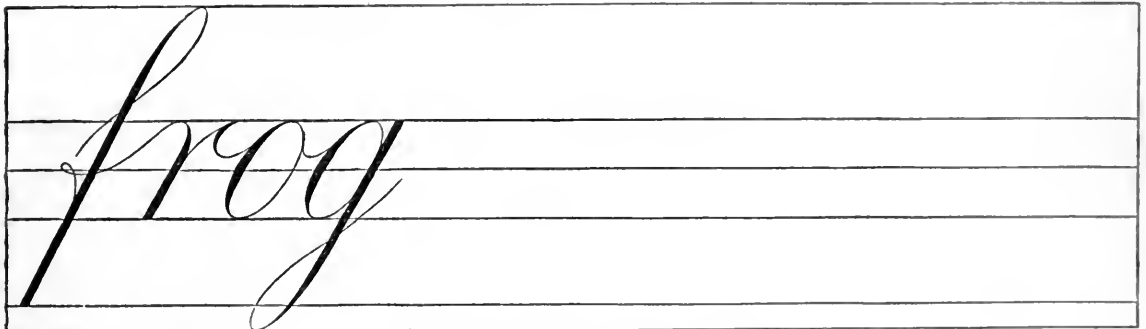
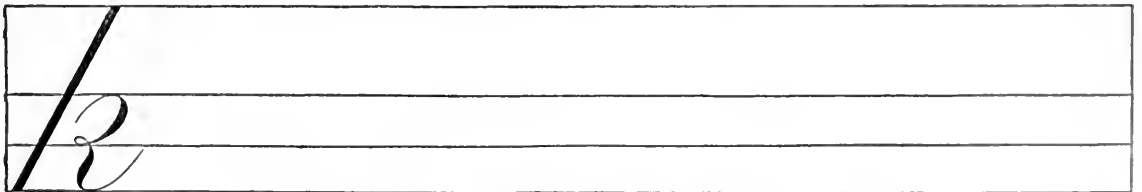
1. Vous apporte-t-on de l'argent tous les jours ? 2. On ne m'en apporte pas tous les jours. 3. Vous fournit-on des habits quand vous en avez besoin ? [Sect. XXI.] 4. On m'en fournit toutes les fois (every time) que j'en ai besoin. 5. A-t-on besoin d'argent quand on est malade ? 6. Quand on est malade, on en a grand besoin. 7. Avez-vous reçu des nouvelles de mon fils ? 8. Je n'ai point reçu de ses nouvelles. 9. Ne dit-on pas qu'il est en Afrique ? 10. On dit qu'il doit partir pour Alger. 11. Quand doit-il commencer son voyage ? 12. On dit qu'il doit le commencer le mois prochain. 13. Ce mariage a-t-il lieu

aujourd'hui ou demain? 14. On nous dit qu'il doit avoir lieu cette après-midi. 15. Il aura lieu à cinq heures et demie. 16. Avez-vous envie de venir au lieu de votre frère? 17. Mon frère doit venir au lieu de notre cousin. 18. Avez-vous l'intention de lui dire ce qu'il doit faire? 19. Il sait ce qu'il doit faire. 20. Savez-vous ce qu'on dit de nouveau? 21. On ne dit rien de nouveau. 22. Trouve-t-on beaucoup d'or en Californie? 23. On y en trouve beaucoup. 24. Y trouve-t-on aussi des diamants? 25. On n'y en trouve point, on n'y trouve que de l'or.

EXERCISE 64.

1. What do people say of me? 2. People say that you are not very attentive to your lessons. 3. Is it said that much gold is found in Africa? 4. It is said that much gold is found in California. 5. Do they bring you books every day? 6. Books

are brought to me [ll. 2] every day, but I have no time to read them. 7. What should one do (*doit on faire*) when one is sick? 8. One should send for a physician. 9. Do you send for my brother? 10. I am to send for him this morning. 11. Do you hear from your son every day? 12. I hear from him every time that your brother comes. 13. Does the sale take place to-day? 14. It takes place this afternoon. 15. At what time does it take place? 16. It takes place at half after three. 17. I have a wish to go there, but my brother is sick. 18. What am I to do? 19. You are to write to your brother, who, it is said (*dit on*), is very sick. 20. Is he to leave for Africa? 21. He is to leave for Algiers. 22. Do you come instead of your father? 23. I am to write instead of him. 24. Does the concert take place this morning? 25. It is to take place this afternoon. 26. Do you know at what hour? 27. At a quarter before five.

COPY-SLIP NO. 73.—THE LETTER *f*.COPY-SLIP NO. 74.—THE WORD *frog*.COPY-SLIP NO. 75.—ELEMENTARY STROKES FORMING THE LETTER *k*.

LESSONS IN PENMANSHIP.—XX.

THE simplest method of writing the letter *f*, and that which is most generally used in writing large-hand copies, is shown in Copy-slip No. 73. In this form, which is repeated in Copy-slip No. 74, where *f* is given in conjunction with other letters, it is commenced with a fine hair-stroke a little above the line *cc*, which is carried upwards until it reaches the line *kk*, where it is turned towards the left and brought downwards across the fine up-stroke, the pressure on the pen being gradually increased until a thick down-stroke is formed, which terminates at the line *gg*. The letter is finished with a hair-stroke carried out from the back of the letter, about the line *cc*, to the left, and then brought to the right in a curve across the down-stroke. In small-hand writing, the lower part of the letter *f* is generally

made in the form of a loop, the pressure of the pen being relaxed, and the down-stroke narrowed gradually until it is turned at the bottom in a hair-stroke, which is carried upwards and across the down-stroke about the line *cc*, or centre of the letter, in a small loop. Sometimes the loop at the upper part of the letter is omitted, the down-stroke being commenced at the line *ee* (see Copy-slip No. 10, p. 60, for the height of this line above *aa*), and thickened very gradually until it reaches its thickest part about the line *bb*, when the pressure on the pen is immediately lessened to narrow the stroke into the fine line that forms the loop below the line *bb*. Examples of the methods of making the letter *f* that have just been described will be found in future copy-slips. In Copy-slip No. 75 the learner will find the elementary strokes that form the letter *k*.

LESSONS IN ARITHMETIC.—XIX.

SQUARE AND CUBE ROOT (*continued*).

9. The square root of a fraction is obtained by taking the square root of the numerator for a numerator, and the square root of the denominator for a denominator. This follows at once from the consideration that the multiplication of fractions is effected by multiplying the numerators for a numerator, and the denominators for a denominator. When either the numerator or the denominator is not a complete square, in which case the fraction itself evidently has no exact square root, instead of finding an approximate root of both numerator and denominator in decimals, and then dividing one by the other, it will be better first to reduce the fraction to a decimal, and then to take the square root.

EXAMPLE.—To find the square root of $\frac{2}{3}$.

Reducing $\frac{2}{3}$ to a decimal, we find it to be $\cdot 285714$ (see Lesson XVI., Art. 21).

Hence we should find by the previous method the square root of $\cdot 28571428571428 \dots$ to as many decimal places as we please, by continually taking in more and more figures of the recurring periods.

Similarly, in finding the square root of $\frac{2}{5}$, we should proceed thus:— $\frac{2}{5} = \cdot 4$, and then find the square root of $\cdot 400000$, etc., to as many places as we please.

Obs.—It does not follow that because the numerator and denominator of a fraction are not complete squares, that the fraction has no square root; for the division of numerator and denominator by some common measure may reduce them to perfect squares. Thus, $\frac{28}{33}$, when numerator and denominator are divided by 7, gives $\frac{4}{3}$, the square root of which is $\frac{2}{3}$. A fraction must be reduced to its lowest terms to determine whether it be a complete square or not.

10. *Abbreviated Process of Extraction of Square Root.*

When the square root of a number is required to a considerable number of decimal places, we may shorten the process by the following

Rule for the Contraction of the Square Root Process.

Find by the ordinary method one more than half the number of figures required, and then, using the last obtained divisor as a divisor, continue the operation as in ordinary long division.

EXAMPLE.—Find the square root of 2 to 12 figures.

2) 0000, etc. (1'414213 56237	
1	
24) 100	96
281) 400	281
2824) 11900	11296
28282) 60400	56564
282841) 383600	282841
2828423) 10075900	8485269
	15906310
	14142115
	17641950
	16970538
	6714120
	5656846
	10572740
	8485269
	20874710
	19798961
	1075749

Here, having obtained by the ordinary process the first seven

figures, we get the rest by dividing as in ordinary division by the last divisor, 2828423.

11. We might extract the square root of a perfect square by splitting it into its prime factors, but unless the number is not large this would be a tedious method.

EXAMPLE.—Find the square root of 441.

Following the method given in Lesson VIII., Art. 5—

$$\begin{array}{r} 3) 441 \\ \underline{} \\ 3) 147 \\ \underline{} \\ 49 \end{array}$$

Therefore $441 = 3^2 \times 7^2$; of which the square root is 3×7 , or 21.

Obs.—Unless a number is made up of prime factors, each of which is repeated an even number of times, it is not a perfect square.

EXERCISE 39.

1. Find the square root of the following numbers:—

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. 529. 2. 5329. 3. 784. 4. 4761. 5. 7056. 6. 9801. 7. 27889. 8. 961. 9. 97 to 4 places of decimals. 10. 190 to 5 places. | <ol style="list-style-type: none"> 11. $\cdot 81796$ to 4 places. 12. 1169 64. 13. 3-172181 to 4 places. 14. 10342356. 15. $\frac{25}{121}, \frac{121}{169}, \frac{169}{225}, \frac{225}{361}$. 16. $\frac{2}{3}$ to 4 places. 17. $17\frac{1}{2}$ to 4 places. 18. 964-5192360241. 19. $\cdot 0000625$. |
|--|--|

2. Find the square root of the following numbers by the abbreviated method:—

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. 365 to 11 figures in the root. 2. 2 to 12 figures. | <ol style="list-style-type: none"> 3. 3 to 17 figures. |
|--|---|

3. Extract the square root of 2116, 21316, and 7056, by splitting them into their prime factors.

12. *Extraction of the Cube Root.*

To extract the cube root of a given number is the same thing as resolving it into three equal factors.

As in the case of the square root, we must content ourselves with giving, without explanation of the reason of its truth, the

Rule for the Extraction of the Cube Root of a given number.

Mark off the given number into periods of three figures each, by placing a point over the figure in the unit's place, and then over every third figure to the left (and to the right also, if there be any decimals). Put down for the first figure of the root the figure whose cube is the greatest cube in the first period, and subtract its cube from the first period, bringing down the next period to the right of the remainder, and thus forming a number which we shall call a dividend. Multiply the square of the part of the root already obtained by 3 to form a divisor, and then, having determined how many times this divisor is contained in the dividend without its two right-hand figures, annex this quotient to the part of the root already obtained.* Then determine three lines of figures by the following processes:—

1. Cube the last figure in the root.
2. Multiply all the figures of the root except the last by 3, and the result by the square of the last.
3. Multiply the divisor by the last figure in the root.

Set down these lines in order, under each other, advancing each successively one place to the left. Add them up, and subtract their sum from the dividend. Bring down the next period to the right of the remainder, to form a new dividend, and then proceed to form a divisor, and to find another figure of the root by exactly the same process, continuing the operation until all the periods are exhausted.

13. In decimals, the number of decimal places in the cube root will be the same as the number of points placed over the decimal part, *i.e.*, as the number of periods in the decimal part.

Obs.—If, finally, there be a remainder, then the given number has no exact cube root, but, as in the case of the square root, an approximation can be carried to any degree of nearness by adding ciphers, and finding any number of decimal places.

The rule will be best understood by following the steps of an example.

* It will be found necessary sometimes, as will be seen by the example given in Art. 15, to set down as the next figure in the root, one less than this quotient.

EXAMPLE.—Find the cube root of 78314601.

```

      78314601̄ (427
      64
      —
48) 143,14
      48
      96
      —
10088
5292) 42266,01
      343
      6174
      37044
      —
3766483
460118
    
```

Placing the points as indicated in the rule, we observe that the cube of 4 is the greatest cube in the first period 78. Subtracting 4³, or 64, from 78, we get a remainder 14, to the right of which we bring down the next period 314, to form a dividend. Multiplying the square of 4 by 3, we get for a divisor 48, which will go 2 times in 143 (the dividend without its two right-hand figures). We set down 2, therefore, to the right of 4 as the next figure in the root, and then proceed to form the three lines according to the rule.

1. 8 is the cube of 2.
2. 48 is $3 \times 4 \times 2^2$.
3. 96 is the product of 2, the last obtained figure in the root; and 48, the divisor.

Placing these three lines under each other, but advancing each successively one place towards the left, and adding, we get 10088, which we subtract from the dividend 14314, leaving a remainder 4226. To the right of this we bring down the next period 601, thus forming another dividend.

The next divisor 5292 is 3×42^2 , and is contained 7 times in 42266. Putting down, then, 7 as the next figure in the root, we form three lines as before:—

1. 343 is the cube of 7, the last figure in the root.
2. 6174 is $3 \times 42 \times 7^2$.
3. 37044 is 7×5292 .

Adding these up when properly placed, we get 3766483, which we subtract from the previous dividend 4226601, leaving a remainder 460118.

There are now no more periods left. Hence 427 is the number whose cube is the nearest cube number to the given number, and less than it. If there were no remainder, the root obtained would be the exact cube root of the given number.

14. In such an example as that worked out above, we could place a decimal point and as many periods of ciphers as we may wish after the original number, and thus, by continuing the process according to the rule, get as many decimal places as may be required as an approximation to the cube root.

In finding the cube root of a decimal, the periods must be completed by adding ciphers, if necessary.

15. When the cube root of a fraction is required, the cube root of the numerator and the cube root of the denominator will be the numerator and denominator respectively of the fraction which is the cube root of the original fraction. If the numerator and the denominator are not both perfect cubes when the fraction is reduced to its lowest terms (*vide* 9, *Obs.*), the best plan generally will be to reduce the fraction to a decimal, and then to find the cube root of that decimal. In the case of mixed numbers, they must be reduced to improper fractions, in order to see whether the resulting improper fraction has its numerator and denominator both perfect cubes. Thus, $5\frac{23}{64}$ reduced to an improper fraction gives $\frac{323}{64}$, of which the cube root is $\frac{7}{4}$, or $1\frac{3}{4}$. But if, when so reduced, the numerator and denominator are not perfect cubes, then it will be better to reduce the fractional part of the mixed number to a decimal, and placing the integral part before it, find the cube root by the above rule.

EXAMPLE.—Find the cube root of 44 $\frac{1}{2}$ to two places of decimals.

```

44 $\frac{1}{2}$  = 44.6.
      . . .
44.600000 (3.54
      27
      —
27) 17600
      125
      225
      135
      —
15875
3675) 1725000
      64
      1680
      14700
      —
1486864
238136
    
```

And so on to as many more decimal places as we may desire.

Obs.—Exactly as in the case of the square root, when one more than half the number of figures required of the root have been found by the rule, the rest may be found by simply dividing, as in ordinary division, by the last divisor.

16. *Obs.*—It will be observed that although 27, the first divisor, is really contained 6 times in 176, we only put down 5 in the root. The reason is that, on examination, we find that 6 would be too large, for it would make the sum of the three lines which we add up greater than the dividend 17600. This explains the note at page 318. We must, therefore, always be careful to observe whether the figure put down in that root will or will not make the sum of the three lines too large. The dividing the dividend without its two last figures by the divisor is not, therefore, an infallible guide to the next figure of the root.

EXERCISE 40.

Find the cube root of the following numbers:—

- | | | |
|--------------|---------------|------------------------|
| 1. 2197. | 6. 11543.176. | 11. 376. |
| 2. 91125. | 7. 20.570824. | 12. 575. |
| 3. 571787. | 8. 241804367. | 13. $2\frac{1}{4}$. |
| 4. 2515456. | 9. 37. | 14. 49 $\frac{1}{2}$. |
| 5. 10218313. | 10. 6. | 15. 399501.352125. |

Where the given number is not a complete cube, the root may be found to seven decimal figures in each case, attention being paid to *Obs.* of Art. 16.

LESSONS IN ARCHITECTURE.—I.

ARCHITECTURE is the art of planning, constructing, and adorning public or private buildings according to their intended use. The word *architecture* is derived from the Greek *αρχα* (*ar'-ko*), *I command*, and *τεκτων* (*teck'-tone*), *a workman*. This etymology indicates the operatives engaged in the building on the one hand, and the leader or chief, the man of science and practical skill, putting in action all his resources in order to execute his plan on the other. Such a division as this was, no doubt, established from the beginning of the art. According, therefore, to the literal meaning of the etymology, mankind must have, at the origin of architecture, possessed a degree of civilisation sufficient for the organisation of different kinds of industrial operations, and acquired a degree of skill in the art, which enabled some men by their experience to be the leaders or directors of others. In this way, we may suppose that the art itself, or rather the symmetry, the harmony of proportions, and good taste in structures, at first began to be developed.

Before arriving at this point, mankind must have overleapt ages. One of the first wants of society was a covering or shelter from the inclemency of the weather, whether of heat or of cold. Simple was the art employed in constructions of this kind. Grottoes or caves hollowed square to make them more habitable, and cottages constructed of branches of trees and blocks of stone—such were the primitive constructions in wood and stone which formed the rudiments of architecture. From the simplicity of early structures men passed to the study of proportions:

they then dared to attempt the grand; and, at last, reached the sublime.

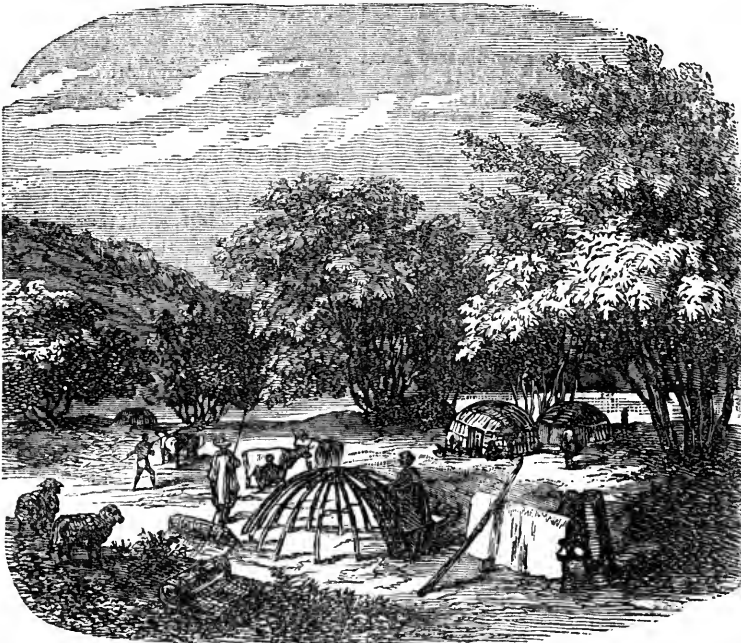
The origin of architecture cannot be assigned to any particular country. Every nation produced its own art, or style, by employing the various materials within its reach, and by giving to them such forms as their wants required. Proceeding at first from the high table-lands of Asia, in order to people the earth, the early fathers of our race could have but little idea of architecture, or of a well-established system of construction. As wandering and pastoral tribes, like the Hottentots of the present day, they lived in tents or wretched huts, which had no pretensions to architecture. It was not until they became more settled that they sought the means of rendering their buildings more durable, by employing in their construction wood or stone, and bricks baked in the sun.

From the differences in the materials, and from the variety of tastes and feelings, arise the varied appearances which the monuments of different nations present, and which constitute their peculiar style of architecture. Thus the Egyptian, born in the hot climate of Africa, in a country destitute of wood fit for building, and near the mountains of the valley of the Nile, containing large blocks of freestone and granite, created for himself a vigorous style of buildings, which completely sheltered him from the burning rays of the sun. These buildings were formed of colossal masses, which were easily transported along the waters of that famous river. The Greek, inhabiting a milder climate, surrounded by forests and quarries, gave a lighter form to his edifices, and employed wood in their construction, which harmonised well with the marble—a material of which the fineness admitted of a greater delicacy of structure and arrangement. The Chinese, surrounded by rivers bordered with bamboo, had only a meagre and tortuous species of architecture, as ephemeral in its duration as it was fragile in its origin and construction. The very different character exhibited in local architecture enable us to judge of a country by its monuments, inasmuch as the buildings themselves are the expression of the various wants of the people who constructed them. It is easy to understand how their different arrangements and structures are but the reflection of the religion or the manners of the people. The general style of the monuments of a country is a durable image of the different phases of its civilisation. In these, we see it in its primitive, refined, or degraded state, as civilisation arose, approached to perfection, or decayed.

Nations naturally established great divisions in their architecture. They first built their private dwellings, then their public buildings, and these, in their numerous subdivisions, constituted civil architecture. Religion caused them to build temples and other edifices, attaching to them ideas of duty and moral obligation: thus arose sacred architecture. The fortification of their frontiers, their towns, and their conquered countries, gave birth to military architecture. In this hasty sketch, we see how extensive is the series of buildings which cover the face of the globe, some of which belong to the first ages of its history, and others of which are being re-discovered in our own day. The

study of these will be duly appreciated by the historian, the philosopher, the archaeologist, and the artist, who, each with his own particular view, knows how to find a great lesson in these silent witnesses of past civilisation, as well as in those existing in full vigour around us.

Architecture is founded upon three great principles, which ought to be immutable: 1, the *useful*, without which states and private individuals would be led into superfluous and ruinous expenses; 2, the *true*, because it ought to express in all its varied forms the great principles of construction upon which it rests; 3, the *beautiful*, which is the end of all the arts depending upon design, and no less of architecture the most useful. On these principles, every style of architecture has the same value; and an artist should not curb his genius by confining himself to the study of one particular style. It is only the man of talent, to whom the construction of an edifice is entrusted, who can combine the different arrangements and forms, harmonise the various parts, and particularly express by plans,



THE HUT OF THE HOTTENTOT: AN EXAMPLE OF THE PRIMITIVE ATTEMPTS OF MAN TO CONSTRUCT A DWELLING.

skillfully worked out, the disposition of the whole or of every part of the building. Upon these arrangements and plans rests the reputation of an architect, and science demands of him a well-grounded assurance of the good construction and durability of his work.

Architecture is not an imitative art, like her sister arts, sculpture and painting. We see nothing in nature like our buildings as a whole; or rather nothing which could serve to guide us in its applications, or in the harmony of its lines. In this art, man has done everything himself. He has employed matter; he has invented forms and proportions to produce in the minds of his fellow-creatures ideas correlative of order, harmony, grandeur, richness, and

durability. He has been enabled, by the force of art, to give, as it were, thought to matter, without being indebted for his ideas to any of the external forms of nature. Like the poet and the musician, the architect can transport the spectator into an ideal world, by creating forms and effects formerly unknown; but, very different from them in results, he renders his creations palpable, and gives them durability. Moreover, the *useful*, the *true*, and the *beautiful*, must be ever present to his view; and, however fruitful his imagination may be, he cannot emancipate it from science, the eternal basis of all the productions of his art.

The architect should therefore spend his youth in the study of his art, and of the splendid examples left on the face of the old world by ancient civilisation. In conjunction with these studies he should make himself master of the *exact sciences*, in order that he may execute his plans with precision, and study the nature of their construction. He should also become familiar with the *physical sciences*, in order that he may understand the nature of the materials which he must some day employ, and be able to calculate their effects. In short, he should devote himself to practical experience, and to the working part of architecture, in order to render himself capable of executing public or private buildings, and to make himself responsible for the stability of edifices entrusted to him.

ANIMAL PHYSIOLOGY.—X.

THE ORGAN OF TASTE (concluded).

In treating of the objects which excite the sense of taste, we must draw attention to the distinction between taste proper, and the alimentary sensation of relish. That these sensations are different, will appear from the consideration that many things which are very appetising, and in the eating of which there is great pleasure, have but little distinctive taste. Butter and animal flesh are good instances of this. The tip of the tongue applied to these would give but little indication of the presence of sapid bodies; but the succeeding parts of the organ and the mouth declare them very good. On the other hand, sweet and bitter principles are detected at once by the tip of the tongue, though they be entirely indifferent to the sense of relish. Alum is thus sweet to the sense of taste, but disgusting to the sense which we have called alimentary. The sense of taste proper, or the appreciation of what is sweet, bitter, sour, etc., is more connected with the intellect than the sense of what is savoury; and hence it is less dependent on the state of the body, and it leaves behind it a multitude of distinct ideas which can be held in the memory. Thus a person when suffering from sea-sickness can well discriminate between sugar and quinine; but he would be a very indifferent judge of the flavour of a beef-steak at such a time. The multitude of flavours which can be distinguished is truly remarkable; for not only does the apricot, plum, cherry, and apple each have a characteristic taste,

though they all belong to the same order of plants, but a hundred varieties of apples all challenge recognition from this sense. The grape produces a thousand wines, each with a bouquet of its own, even though alcohol and water are the main constituents of them all, and that which causes the difference is so small in quantity, that the chemist cannot separate it. Some sensations described as tastes, are but little removed from those of touch; thus, the taste of nutgalls, called an astringent taste, and the fiery taste of alcohol, are probably caused by mechanical action on the outer skin. In the first case, the forcible contraction of the parts occasions a roughness; and spirit will produce a burning sensation on any delicate part of the body.

We have now to apply our experimental knowledge of the sensation derived through the tongue and mouth to the inquiry—How far do brutes participate in these sensations? In order to answer this question we must observe the gestures and exhibitions of animation of animals while feeding on those substances whose tastes we are ourselves acquainted with. Observation seems to lead to the conclusion which we should naturally have arrived at from reasoning on the question. The conclusion is this, that the sensation which we have called the alimentary feeling,

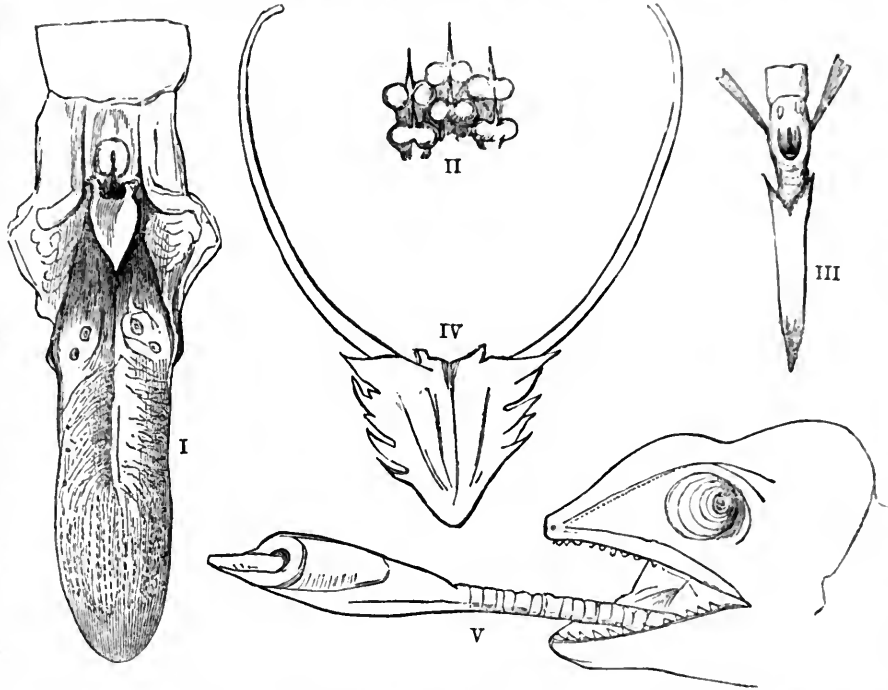
and which is of a more animal character, is enjoyed in a greater degree in the brute than in man; while the true gustatory sense, being more connected with the exercise of the mental powers of comparing and distinguishing, is certainly weaker in the lower animals.

Brutes may be roughly divided into two great divisions, the carnivora, or flesh-eaters, and the herbivora, or vegetable-eaters. The type of the first class is the tiger, or, to give a more familiar example, the cat; while the other is represented by the ox. In each of these, the whole body seems to have been constructed in relation to the food. The tiger has jagged back teeth, and pointed side fangs which lock deeply into one another, but have no grinding surface. The jaws that wield these are short, strong, and can play only to and from one another. It can therefore grip and hold, but cannot chew. The stomach is small and intestines short, because flesh is very nutritious, and needs but little digestion. The fore limbs can move freely in all directions, and are furnished with claws to strike and seize. The ox has long jaws, rough but flat hind tooth, and a close-fitting row of front ones in the front of the lower jaw, playing on a pad in the upper, and the lower jaw can swing sideways and so grind the food. He can therefore clip and chew, but cannot grip.

This comparison might be carried into almost every detail of structure. We cannot, then, in speaking of the sense of taste in animals, speak of the class as a whole, because the objects of the sense are so different in the two divisions of the class. It must not be sup-

posed that this division of brutes is sharply drawn; for between the two types of tiger and ox, animals of every grade of intermediate structure are found. Moreover, the division is not a good one for the purposes of zoological classification; for though both the tiger and the Tasmanian devil eat flesh, and the kangaroo eats grass like the ox, yet even the tiger is more like the ox, and the Tasmanian devil more like the kangaroo, than are those animals when cross-coupled, as in the first sentence. Further, some brutes made on the flesh-eating type, eat all kinds of vegetables, as the bear does; and others built on the plan of herb-eaters, will eat flesh, as the pig will. In fact, the division is a false one when we are treating of the classification and structure of animals, but is nevertheless a useful one when we are writing of their powers and functions. In other words, it is a good *physiological* but a bad *anatomical* division. We have entered so far into the question, not only because it bears on our special subject, but also because it explains the term "physiology," with which these lessons are headed.

Of carnivorous animals, it may be stated that the alimentary sense, which is associated not only with the tongue, but with the throat and palate, is keen and pleasurable in the extreme,



I. TONGUE OF A CAT. II. FILIFORM PAPILLE OF A LEOPARD. III. TONGUE OF A FIELDFARE. IV. TONGUE OF AN OSTRICH. V. TONGUE OF A CHAMELEON.

while the other branch of the sense of taste is feeble. That which we call ravenous hunger in a dog or lion, is not the uneasy feeling of privation, which we associate with excessive hunger, but is an all-engrossing desire to gratify the sense of taste, and this is altogether distinct from a dainty appreciation of flavour.

These animals can endure privation from food for considerable periods without manifesting any signs of starvation; but the smell, sight, and, most of all, the partial taste of flesh, excite them to eager, and even ferocious craving. Hence the popular notion of the dangerous nature of wild beasts which have once tasted blood is a true one. On the other hand, when the food is once obtained, it is torn to pieces, flung to the back of the mouth, and swallowed with a rapidity which altogether forbids the idea that these animals possess to any extent the faculty of discrimination in their tastes.

This view of the question is also borne out by an inspection of the tongue. In the illustration, the reader will find a representation of a cat's tongue. This tongue is long, and has but few round papillæ; but it is covered with a dense pile of long, thin, pointed, overlapping projections (filiform papillæ), which are directed backwards, and towards the mid line. The circumvallate papillæ, again, are but four in number, two on each side. It is this pile of pointed papillæ which makes the cat's tongue feel rough when she licks. The covering of these papillæ is so dense, hard, and thick, when compared with that of our own, that we are justified in thinking them mechanical only in function; and yet they cover the whole tongue almost to the exclusion of the other kinds.

In the larger members of the cat family, these pointed papillæ are quite like hard thorns or spines; and with them the lion, tiger, and leopard can rasp away the last adhering fragments of flesh and ligament from the bones. A patch of these papillæ from the leopard's tongue are represented in the engraving. They are two-lobed and rounded, and have from their back part a single sharp spine running directly backward, and they are set in a very regular pattern, alternating in each row. On the summit of the leopard's tongue a number of papillæ were found without spines, as though worn off, or perhaps not developed, lest the palate should be injured by them.

In illustration of these remarks we may give an incident. A gentleman had reared a tame leopard from a cub, and having always fed it on bread, etc., the animal was very docile, and showed no sign of savageness. It was often caressed by its master, and returned the blandishments after its manner. While thus engaged, it one day took its master's hand into its mouth, and began to lick it gently, but owing to the roughness of the tongue it caused some blood to flow. The gentleman, no doubt feeling some pain, tried to withdraw his hand, but, to his surprise, the beast for the first time in its life began to growl. With great presence of mind the gentleman relented from his effort to release his hand, rang the bell, asked his servant for his loaded pistol, and then shot his now dangerous favourite through the head.

In herbivorous animals, while the sense is far less keen, so far as the alimentary sensation is concerned, we have no reason to suppose that the distinguishing gustatory sense is in any degree stronger.

The main mass of the food of the ruminants is insipid. Freshness is the strongest term that can be used to express its desirability. A large bulk is required for but a little nutriment. Thus we find the ox occupies a considerable number of its wakeful hours in grazing and chewing, and it feeds along the pasture, tearing up the grass with but little discrimination. It is true that a cow will avoid noxious or disagreeable plants when they grow in clumps; for a field, otherwise closely cropped, still presents long stalks of the common buttercup. It would seem, however, that this avoidance is rather due to instinct than to disgust. Many plants have very powerful, bitter, sour, and astringent principles, and they are intimately mingled with the grass; yet, as we seldom see a cow eject the food from its mouth, we cannot suppose it to have any very delicate sense of taste. From the fact that oxen ruminate, we might suppose that they enjoy the sense of taste while chewing the cud. So doubtless they do in a minor degree; but the act by which the food is returned to the mouth is probably quite involuntary; and the lazy, dreamy way in which an ox ruminates contrasts strongly with the avidity with which a carnivorous animal feeds.

The tongue of a ruminant is very long and flexible. It is often twisted round the herbage to tear it up, or break it off; and the qualities which fit it for this use are manifested in the highest degree in the tongue of the camelopard. This animal can extend by the length of this member its already great powers of reaching high, and thus hook down the branches of the palm. Well might this animal suggest to Lamarck that its whole organism had been modified by a constant endeavour to reach higher and higher.

The position of the large walled-round papillæ is very various in different animals. The reader will have observed their position in the chimpanzee, in one long line of about twelve in number down the middle of the tongue, with a few scattered ones on each side. In the pig, otter, and seal they have the V-shaped arrangement which they have in man, but are fewer in number. In the sheep they form a thick, raised ridge on each side at the back of the tongue.

One of the most singular uses to which the tongue is put in this class is manifested by the ant-eaters, whose long slimy tongues are used to thrust into ants' nests, so that when they are retracted into their long tubular mouths the ants are carried with them, adhering to the mucus.

If this article had been headed "The Tongue," instead of "The Organ of Taste," we should have a long task before us to describe the various shapes of the organ in toads and reptiles, and also in snails and insects. The organ to which the word tongue has been applied has a wonderful diversity of form, and many interesting peculiarities; but in most cases its main office is to seize or to masticate the food, and the function of taste is subordinate to this.

In birds the tongue is almost as diversified in form as the beak; but it is usually cased in horn at its fore part, and there are only a few papillæ above the air-hole. In parrots it is fleshy; and these birds seem to have more of the sense of taste than most birds, for they will turn a lump of sugar or a nut about in their beaks for some time to test its qualities before eating it. It is certainly singular that birds, whose proper food is fruit, should be so little endowed with a sense to appreciate its delightful and delicate flavour; nevertheless, it seems as though the tongue were only applied to test the softness, and therefore the ripeness of the fruit. The tongue drawn to represent that of the fieldfare, may be taken as the typical tongue of a bird. The small triangular tongue of the ostrich, supported on its slender arch of bone, is given because of its singular shape and shortness. The length of the tongue has but little relation to the length of the beak. Thus both the pelican and the toucan have enormous beaks; but the former has a tongue as short as that of the ostrich, while that of the latter is very long. The tongue of the woodpecker is a living harpoon.

In some reptiles there is evidence of a sense of taste, but it is doubtless inferior to that of higher animals. The tongue of the chameleon, given in the engraving, is of curious shape; and the mechanism by which it can be darted upon a luckless fly is elaborate and interesting; but its description would be out of place here. In the toad and frog the tongue grows as the tail drops off. It sprouts from the inside of the lower jaw, and grows backward, so that its bi-lobed end lies free in the mouth, and can be flipped forward out of that cavity. This is also rather an organ of prehension than of taste. The forked tongue of the snake is familiar to every one. Its reiterated protrusion and vibration has led the vulgar to consider this action as a threat, and to believe that it is the sting of the animal. It, however, has no such function. It may have some power of tasting, but it is more probable that it is an organ of touch; for this creature, limbless and covered with hard scales, is greatly in need of a means of feeling outward objects.

Fishes' tongues have seldom any soft parts, and cannot therefore be organs of taste. They are not unfrequently furnished with teeth. In some fish a cushion of soft substance, well supplied with blood-vessels, is found on the roof of the mouth.

All the higher orders of mollusca have an organ to which the name of tongue has been given, and some authors have proposed to group together the head-walkers, belly-walkers, and wing-footed classes under one sub-division, calling them *odontophora*, or animals which have a tooth-bearing tongue. This organ in snails (gasteropods) bears transverse rows of teeth arranged in complicated and beautiful patterns, and is sometimes so long as to be called the lingual ribbon. As it is often used to file away

shells before devouring the animal contained within, its function must be considered as other than that of taste.

The bee licks up its honey with a very complex tongue; but as this member is composed entirely of a horny substance and stiff hairs, it cannot be used to taste the sweet compound elaborated by the flowers. An internal cavity to hold food during the time necessary to its digestion is so generally present in animals, that it almost serves as a character whereby to cut them off from the vegetable kingdom. A prompting to fill this cavity is of course always associated with the organ; but whether that prompting is automatic, instinctive, or rational, it is difficult to say. A sense that may be pleasurable or painful seems to imply some power of reasoning to make it useful. A sense which is neither pleasurable nor painful may stir but a blind instinct. There is, however, a lower impulse to action than even this, in which both intelligence and sense may not be at all involved. When the contact of food causes the sea anemone to close its arms around it, and force them into its mouth, it is probable that sense is no link in the chain of causes of this act, but the whole process of ingestion is parallel to that part of the action of swallowing which takes place in us after the senses have done their work, and the throat seizes the morsel of food and carries it down to the stomach by an involuntary act. Automatic and consensual acts are often as violent as those prompted by desire and reason, so that eagerness in feeding is no infallible evidence of taste in the lower animals. We abstain, therefore, from describing those various and interesting organs which lie in such a relation to the entrance of the alimentary canal of snails, flies, bees, etc., as to have been called tongues, as though they were organs of sense.

LESSONS IN GERMAN.—XX.

SECTION XXXVII.—REFLECTIVE VERBS.

REFLECTIVE verbs (§ 86. 1, 2, etc.) are those that represent the subject as acting upon itself, as:—Er besinnt sich, he thinks himself, etc.

Verbs of this class are much more numerous than in English, and are variously translated, as:—Er macht sich über mich lustig, he makes himself merry over me (i.e., he ridiculous me). Er klagt sich über seinen Verlust, he mourns over (or on account of) his loss. Er freut sich über sein Glück, he rejoices at his prosperity. Er widersetzt sich den Befehlen des Tyrannen, he opposes (himself to) the commands of the tyrant. Das Buch hat sich gefunden, the book has been found (active form, the book has made its appearance). Der Himmel bedeckt sich mit Wolken, the sky is covered with clouds. Soll der Sireel sich vor unsern Augen vollenden? shall the outrage be accomplished before our eyes? Er hält sich in Berlin auf, he (holds himself up) stops in Berlin. Er hat sich bei der Arbeit zu lange aufgehalten, he has (kept himself) remained too long at the work. (See §§ 86, 87.)

Sich aufpassen über signifies to find fault with, to sneer at, to criticise, to blame, as:—Er hält sich immer über Kleinigkeiten auf, he is always finding fault about trifles (stopping over trifles). Er hält sich über Ihren Brief auf, he criticises your letter. Er hält sich über die ganze Gesellschaft auf, he sneers at the whole company.

VOCABULARY.

Alter, n. ago.	Darben, to suffer, want.	Zeitenschäftlich, passionately.
An'tigen, to appropriate.	Dunst, m. exhalation.	Wie'rswewe, f. ocean-billow.
Atmosphäre, f. atmosphere.	Empören, to rebel, to make insurrection.	München, n. Munich.
Aufhalten, to sojourn, lodge.	Entstehen, to arise.	Muskel, m. muscle.
Ausdehnen, to extend, expand.	Gegen, against.	Natur, f. nature.
Auszeichnen, to mark, to distinguish (one's self).	Gewohnen, to accustom.	Nebel, m. mist, fog.
Bedürfnis, n. want, necessity.	Gewohnheit, f. habit, custom.	Nennen, to name, to call, to denominate.
Befehlen, to reward.	Gewölbe, n. arch, vault.	Dit, often.
Befähigt, continually	Gläubig, believing.	Östreichisch, Austrian.
Bewegen, to move.	Inten't, while.	Palast, m. palace.
Dampf, m. steam, vapour.	Karl, m. Charles.	Prachtvoll, splendid, gorgeous.
	Kraft, f. force, power.	Raum, m. room, space.
	Kün, daring.	Regen, m. rain.
	Lagert, to encamp.	

Regierung, f. government.	Taucher, m. diver.	Vertrauen, to confide in, to trust.
Reihe, f. row, range.	Toben, to rage, to roar.	Waffen, f. arms, weapons.
Sammeln, to gather, collect.	Uebel, evil.	Wagen, to venture, risk.
Schätzen, to hurt, injure.	Ueben, to exercise.	Wind, m. wind.
Seibst, self.	Unermesslich, immeasurable.	Zeigen, to show, exhibit.
Slave, m. Slavonian.	Un'gemach, n. affliction.	Zusammenziehen, to contract, to draw together.
Strudel, m. whirlpool.	Unzähl'ig, innumerable.	
Stürzen, to plunge.	Verbinden, to unite, combine.	

RÉSUMÉ OF EXAMPLES.

Der Kaiser hielt sich letzten Winter in der Hauptstadt auf.	The emperor remained in the capital last winter.
Der Spötter hält sich über Andere auf.	The derider sneers (sinds fault with) at others.
Das Volk empört' sich gegen den König.	The people rebel (rise) against the king.
Die Füchse graben sich Höhlen.	The foxes dig themselves holes.
Der tap'tere Soldat' erweibt' sich Ruhm und Ehre.	The valiant soldier acquires fame and honour.
Der Geizige freut sich über nichts, obgleich' er sehr reich ist.	The avaricious (man) does not enjoy anything, although he is very rich.
Er sitzt und hört dem Rauschen der Gewässer zu.	He sits and listens to the roaring of the waters.

EXERCISE 70.

1. Alle Dünste und Dämpfe, welche beständig von der Erde aufsteigen, sammeln sich in der Atmosphäre, und wenn sie sich verbinden, entsteht daraus Regen, Schnee, Nebel, und jede andere Veränderung in der Luft. 2. Derjenige, der sich in der Jugend an Arbeit gewöhnt, braucht im Alter nicht zu darben. 3. Die Ludwigstrasse in München zeichnet sich durch eine Reihe prachtvoller Paläste aus. 4. Diejenigen Personen, welche sich selbst loben, machen sich sehr oft lächerlich. 5. Die Ehre Karls des Großen mußten sich in den Waffen, im Reiten und im Schwimmen üben. 6. Der süßne Taucher wagt es (Seet. XXXV. 4), sich in den lebenden Strudel zu stürzen. 7. Der Neidische schadet sich selbst mehr, als andern. 8. Friedrich der Große hielt sich ein zu Potsdam, im Schlosse Sanssouci, auf. 9. Das Gute befehlt sich selbst. 10. Der Gläubige zeigt sich im Ungemach wie ein Fels im Meere, wenn die Meeresebenen um ihn toben. 11. Das große, blaue Gewölbe, welches wir Himmel nennen, ist ein unermeßlicher Raum, in welchem die Erde, die Sonne, der Mond und unzählige Sterne sich bewegen. 12. Die Kraft, mit welcher die Muskeln sich zusammenziehen und ausdehnen, ist sehr groß. 13. Viele Menschen eignen sich sehr Gewohnheiten so leitenhaftig an, daß sie dieselben für Bedürfnisse der Natur halten. 14. Ein Hund an der Hand seiner guten Eltern fürchtet sich nicht,—so der Mensch, der Vertrauen zu Gott hat. 15. Die Armee zog sich zusammen, und bewegte sich dem Fluße zu. 16. Der Feind lagerte sich um die Stadt. 17. Er zeichnete sich vor den andern durch sein tapferes Betragen aus. 18. Er fürchtete sich vor Nientanen. 19. Er hält sich über die Worte meines Nachbarn auf.

EXERCISE 71.

1. The youth mourns at the loss of his parents. 2. Mother was pleased when the letter from my sister was read to her. 3. She consoled herself with the thought that she would arrive soon. 4. Will you sojourn long in Italy? No, it is not my intention. 5. An honest man fears nothing. 6. The Slavonians have rebelled against the Austria's government. 7. The English troops distinguished themselves at the battle of Waterloo by their bravery. 8. He who rejoices at the downfall of another deserves not the approbation of the virtuous. 9. He who is vexed when another is praised in his presence, is a man who does not deserve to be loved and honoured. 10. He who rejoices when his neighbour is loved is a good-natured man.

SECTION XXXVIII.—REFLECTIVE VERBS—(continued).

Many verbs in German, as in other languages, especially when used as reflectives, acquire in certain phrases a figurative sense which deserves to be noted. Thus from scheiden, to send, we have the reflective sich scheiden, to send or throw one's self into, i.e., to adapt or conform to, as:—Der Mensch muß sich in die Zeit, in seine Umstände scheiden, man must adapt himself to the times, to his circumstances. Es schiedt sich nicht, das zu thun, it is not proper to do that. So from fragen, to ask, we have sich fragen, to be question-

able, as:—Es fragt sich, ob er da war, it is questionable whether he was there. Sich zutragen, sich handeln, etc., are of the same character, as:—Es trägt sich zuweilen zu, daß unhaltender Regen die ganze Ernte vertirt, it happens sometimes that continued rain destroys the entire harvest. Es handelt sich nicht um Kleinigkeiten, it is not a question (an affair) of trifles. (See also § 86. 6.)

VOCABULARY.

Abschlagen, to refuse.	Ernsthaft, earnest, serious.
Achten, to respect.	Fortern, to demand, accept.
Annehmen, to adopt, accept.	fragen, to ask. (See above.)
Begebenheit, f. occurrence.	Fremdling, m. stranger, foreigner.
Begegnen, to meet, happen, befall.	Froh, joyful, gladly.
Bemühen, to fatigue, weary.	Gehören, to belong, to be fit.
Betrachtung, f. consideration, view.	Geschehen, to happen, take place.
Bemühtsein, n. conscientiousness.	Heiligen, to hallow.
Einladung, f. invitation.	Pflicht, f. duty, obligation.

Rathen, to counsel.
Scheinen, to appear.
Scherzhaf, facetious, sportive.
Seite, f. page.
Sonntag, m. Sunday.
Ungehorsam, disobedient.
Vernehmen, to increase.
Vermögen, n. wealth.
Widmen, to devote.
Wirklich, really.
Wissenschaft, f. science.
Zusehens, visibly.

RÉSUMÉ OF EXAMPLES.

Es trifft sich zuweilen, daß unter einem unrscheinbaren Kleide die schönsten Talente verborgen sind.	It sometimes happens that under an unsightly garb the most splendid talents are concealed.
Es trägt sich häufig zu, daß die Männer, die sich um das Vaterland am meisten verdient gemacht haben, heimatlos umherirren.	It often happens that the men who have rendered themselves most deserving of their (the) native country wander about homeless.
Meinem Neffen ist ein großes Unglück begegnet.	A great misfortune has happened to my nephew.
Er erzählte mir dieses, als er mir heute von un'gefähr auf der Straße begegnete.	He related this to me as he accidentally met me to-day in the street.

EXERCISE 72.

1. Es fragt sich, ob wir morgen schönes Wetter haben werden. 2. Es gehört sich, den Sonntag zu heiligen. 3. Es gehört sich, ältere Leute zu achten. 4. Man arbeitet viel froher, wenn man das Bewußtsein hat, etwas Gutes zu thun. 5. Es schickt sich nicht, die Einladung abzuschlagen. 6. Der wirklich kluge Mann wirt, so viel (Sect. XXXIV. 4) es ihm möglich ist, sich bemühen, sich in die Zeit zu schicken. 7. Es macht große Freude, das Gute zu fördern. 8. Es schickt sich, daß ein jeder Fremdling die guten, aber nicht die üblen Sitten eines Volkes annimmt. 9. Das Vermögen dieses Maximes vermehrt sich zusehends (§ 101). 10. Es schickt sich nicht für Kinder, ungehorsam zu sein. 11. Es fragt sich, ob dieser Mann seine Pflicht gethan hat. 12. Es trägt sich zuweilen zu, daß die Betrachtungen bei einer scherzhaften Begebenheit sehr ernsthaft sind. 13. Es trägt sich häufig zu, daß kleine Veranlassungen große Ereignisse herbeiführen. 14. Wer ist (§ 71. 1) Ihnen heute Morgen begegnet? 15. Mein Freund, der Capitän, ist mir begegnet. 16. Ist ihm auf der letzten Reise nichts Unangenehmes begegnet? 17. Ja, es ist ihm ein großes Unglück begegnet. 18. Was ist Ihnen geschehen? 19. Es ist mir nichts geschehen. 20. Es geschieht ihm diese Strafe recht.

EXERCISE 73.

1. It is proper that the children should respect their parents. 2. It becomes not a wise man to follow the multitude. 3. Most young people wish to appear great in the world. 4. You should under all circumstances say the truth. 5. It is questionable whether we shall accept your invitation. 6. It is questionable whether you are right or wrong. 7. It happens sometimes that the best man fails. 8. The government asks obedience from its subjects. 9. The inhabitants of London increase enormously every year. 10. My brother devoted himself more to science than to pleasure. 11. Do you know to what extent your friend has counselled you? 12. He has counselled you to do that of which he spoke yesterday.

SECTION XXXIX.—PECULIAR IDIOMS.

Raffen is often employed in the sense of *causing or ordering*, like the English verbs "have" and "get," as:—Er läßt seine Kleider in Paris machen (Sect. XXXIII. 1), he gets his clothes

made in Paris. Sie lassen ein Haus bauen, they are having a house built.

1. Holen (Sect. XXV.) signifies to go for. The phrase holen lassen signifies "to cause to go for;" that is, "to send for," as:—Ich lasse Äpfel holen, I send for apples. Ich habe sie schon holen lassen (Sect. XXIV. 7), I have already sent for them.

VOCABULARY.

Bahnhof, m. railway-station.	Besten, to fail.	Post, f. post-office.
Diener, m. servant.	Koffer, m. trunk.	Ruhe, f. rest, repose.
Einladen, to invite.	Lassen, to let, to cause.	Ruhen, to rest.
Ereigniß, n. event.	Major, m. major.	Tot, dead.
		Weg, m. way.

RÉSUMÉ OF EXAMPLES.

Der Taucher holte den goldenen Becher des Königs aus dem Strudel.	The diver brought the king's golden goblet from the whirlpool.
Die Köchin holt Gemüse und Fleisch von dem Markte.	The cook is fetching vegetables and meat from the market.
Das Gericht läßt den Verbrecher enthaupten.	The court causes the criminal to be beheaded.
Dieser Mann läßt den Freund im Stiche.	This man leaves his friend in the lurch.

EXERCISE 74.

1. Was holt jenes Dienstmädchen? 2. Sie holt Wasser von dem Brunnen, Holz aus dem Walde und Fleisch vom Markte. 3. Hat sie schon meinen Koffer von dem Bahnhofe geholt? 4. Ja, gleich nach dem Aufstehen (Sect. XXI. 3) hat sie ihn geholt. 5. Wir heißen den kranken Manne einen Arzt holen. 6. Er ließ mich den Brief abschreiben, und ihn dann auf die Post tragen. 7. Ich lasse es an nichts fehlen (§ 146. 1 d.) um Ihren Sohn auf einen bessern Weg zu bringen. 8. Lassen wir uns durch dieses Ereigniß nicht täuschen. 9. Man sollte den Töthen ihre Ruhe lassen. 10. Er ließ mich warten, obgleich ich in Eile war. 11. Warum ließt Ihr Euren kleinen Bruder nicht kommen? 12. Weil er den ganzen Nachmittag in der Schule war. 13. Lassen sie Ihre Kinder Französisch lernen? 14. Nein, weil ich die englische Sprache für nützlicher halte. (Sect. LXVIII. 2.) 15. Der Major ließ seinen Diener mir den Weg nach dem Dorfe zeigen. 16. Der Herr, nach welchem Sie fragen, ließ den Hauptmann auf das Land fahren. 17. Für wen lassen Sie die Bücher holen? 18. Ich lasse sie für meine jüngste Schwester holen, um sie italienisch zu lehren. 19. Er ließ mich einladen, in der nächsten Woche mit ihm zu reisen.

EXERCISE 75.

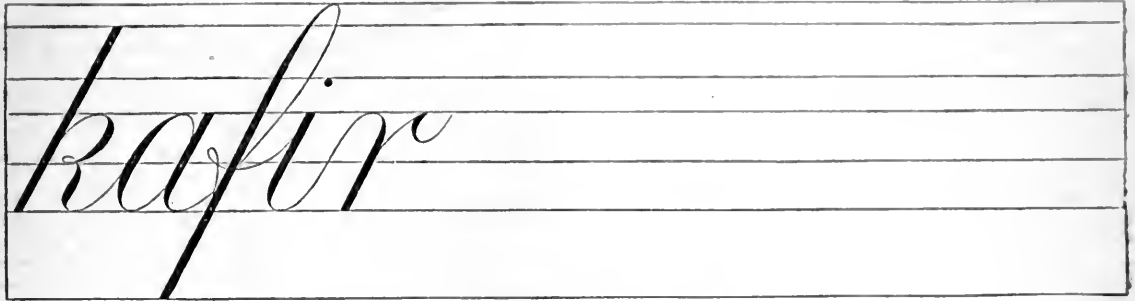
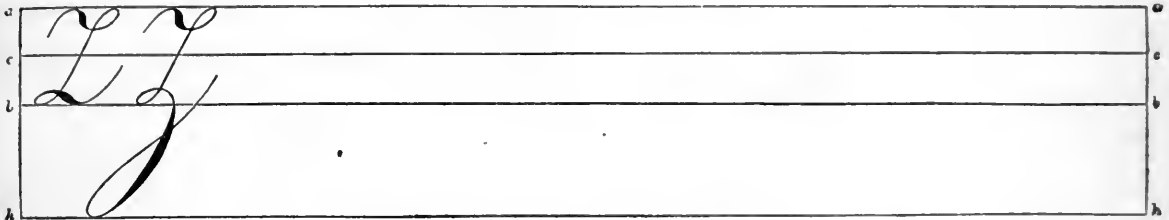
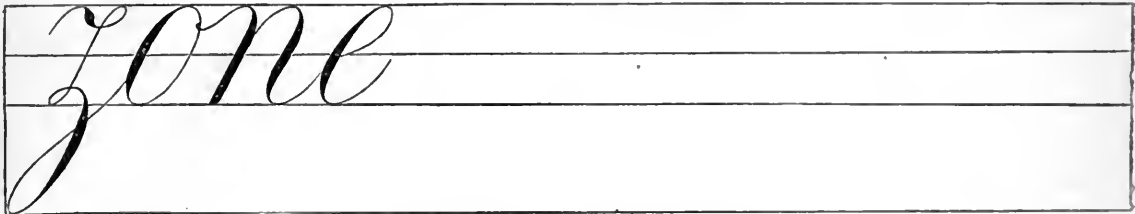
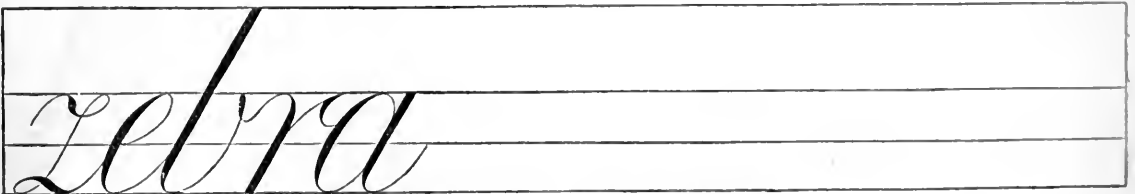
1. Which of those physicians will you send for? 2. I shall send for neither. 3. Let me be quiet, for I am not well. 4. Only cowardly soldiers leave their commander-in-chief in the lurch. 5. Why did you not let your little sister come? 6. She could not, for she was at school the whole morning. 7. He has sent for a dentist to have a tooth extracted. 8. For what have you sent your servant? 9. I have sent her for paper and ink. 10. Let us act humanely. 11. Pray let us go to school. 12. Let us not follow the examples of the wicked.

LESSONS IN PENMANSHIP.—XXI.

In our last lesson in Penmanship, in Copy-slip No. 57 (page 317), were given the elementary strokes of which the letter k is composed; and in Copy-slip No. 76, on the opposite page, the learner will find this letter in its complete form. In writing the letter k, a straight-stroke is first made, and then a stroke of peculiar form is added to it, which somewhat resembles a brace ~, and which may be considered to be a modified form of the top-and-bottom-turn, made by turning the pen in to the left just before reaching the line c c, and then, after forming a very small loop, out towards the right, and finishing as in the ordinary bottom-turn, as shown in Copy-slips Nos. 75 and 76. In Copy-slip No. 77, in the word kaffir, the letter k is shown in conjunction with a letter that follows it. There is no necessity for giving an example of the method of joining it to any letter that precedes it, since, as it begins with a straight-stroke, the method of connecting letters with others into whose composition the straight-stroke enters, may be seen from Copy-slips Nos. 59 and 60 (page 261). It may be remarked, for the benefit and satisfaction of such of our readers who may not have met with the word before, that the "Kaffirs" are a fine and

intelligent, but ferocious race of savages that are found in Southern Africa, and who, at times, have given considerable trouble to our settlers and British troops in Cape Colony. The word "Kafir" is also spelt "Kafir" and "Caffre." Copy-slip No. 77 will also be found useful by the self-teacher, in showing

brought downwards in a slanting direction towards the left. On reaching the line *bb*, it is turned once more in a loop over the fine down-stroke, and again carried along in a serpentine form from left to right. In the second form the letter is commenced in the same manner, but the down-stroke on reaching

COPY-SLIP NO. 76.—THE LETTER *k*.COPY-SLIP NO. 77.—THE WORD *kafir*.COPY-SLIP NO. 78.—THE LETTER *z*.COPY-SLIP NO. 79.—THE WORD *zone*.COPY-SLIP NO. 80.—THE WORD *zebra*.

him how the letter *f* is connected with letters that precede and follow it when it stands in the middle of a word.

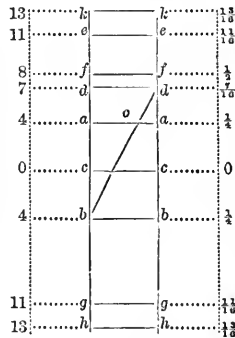
The letter *z* is formed in two ways, as shown in Copy-slip No. 78. The first form consists chiefly of hair-strokes in the shape of the italic printed letter *z*. It is commenced with a hair-line a little below the line *aa*, which is carried along in a serpentine form from left to right. The pen is then turned to the left in a loop over the first part of the stroke, and the line is

the line *bb* is turned in a larger loop towards the right, and brought downwards towards and as far as the line *hh*, the letter being finished with a loop, resembling, in a great measure, the loop of the letter *j*. In Copy-slips Nos. 79 and 80, examples are given of the letter *z* in combination with other letters.

We will now say a few words in recapitulation of the instruction in the art of writing, and the directions for forming the small letters of the writing alphabet that have been given in this and

the preceding lessons on Penmanship. In our first lesson, we endeavoured to explain to students who are seeking to teach themselves how to write, or trying to improve their handwriting, the proper position of the body, the hand, and the pen; and in subsequent lessons we showed how each letter was formed of one or more simple elementary strokes and their modifications, the proportions of each letter being regulated by horizontal lines placed at certain distances from each other; thus creating a system which has never before been attempted in teaching writing, and which possesses the merit of enabling the self-teacher to test by actual measurement how much he knows of the regular proportions of the letters in relation to each other, when he casts aside his leading-strings—as the lines within and on which copies are written may be appropriately termed—and endeavours to write on a blank sheet of paper, with no other guide to the form, connection, and proportion of the letters than that which is furnished by memory, of the copies he has written in lines for practice, and the instructions which have been given in our lessons.

The early copy-slips, numbered from 1 to 6, were traversed by fine diagonal lines running from right to left, in a downward direction. These lines served to show the proper slope or inclination of the letters for writing. They are inclined to the horizontal lines crossing the paper from side to side, at an angle of 60 degrees. This inclination is shown in the annexed diagram by the diagonal line running upwards from the point *b*, in the left-hand column of letters, from left to right, and crossing the perpendicular line on the right at a point between *a* and *d*, in the right-hand column of letters.



The horizontal lines that cross the copy-slips from side to side, and which are shown at one view in the accompanying diagram, are designed, as it has been said, to fix the proper proportions of the letters in height and depth. Starting from the centre line *cc*, the line *aa* above it, and the line *bb* below it, show the common level of the letters that are written within these lines, and do not extend beyond them either above or below. The letters that are contained within the lines *aa*, *bb*, are *a*, *c*, *e*, *i*, *m*, *n*, *o*, *r*, *s*, *u*, *v*, *w*, *x*, or exactly half the alphabet. Of the remaining thirteen, six—namely, *b*, *d*, *h*, *k*, *l*, *t*—extend above the upper common level *aa*; five—namely, *g*, *j*, *y*, *z*—extend below the lower common level *bb*, while the remaining two, *p*, *f*, extend both above *aa* and below *bb*. Of the last-named thirteen letters, *t* is included between the lines *dd*, *bb*; *b*, *d*, *h*, *k*, *l*, between the lines *ee*, *bb*; *q*, between the lines *aa*, *gg*; *g*, *j*, *y*, *z*, between the lines *aa*, *hh*; *f*, between the lines *kk*, *gg*; and *p*, between the lines *ff*, *gg*. The student is advised to rule a piece of paper in this manner, and write the alphabet upon it. He will then have all the letters together at one view, in their relative proportions. The distances of the lines from the central line *cc*, on either side of it, are shown by the numbers annexed to the diagram. Those on the left-hand side represent the distances in sixteenths of an inch; those on the right-hand side, in fractional parts of an inch. These are the proper proportions for large-hand writing; but in small-hand, the space between the lines *aa*, *bb* is considerably reduced, while the loops and tails of the letters that extend above *aa*, and below *bb*, are greatly extended in proportion, as will be seen from our future copy-slips in small-hand.

The width of the letters contained within the lines *aa*, *bb*, and indeed the width of all letters used in large text, except *i*, *m*, and *w*, should be exactly one-half of that part of the diagonal line that is intercepted between them. In the annexed diagram, the proper width of a letter in large-hand is shown by the line intercepted between *a* in the left-hand column of letters, and *o*, the point in which the line *aa* is crossed by the diagonal. It measures exactly seven-twenty-fourths of an inch in width.

The elementary forms of which the small letters of the writing alphabet are composed, in large-hand writing, are ten in number, namely:—

1. The "bottom-turn," which in its simple or modified form

enters into the composition of nine letters, namely, *a*, *b*, *d*, *i*, *l*, *q*, *t*, *u*, and *w*. Of these *i* and *u* are formed of the bottom-turn, without any modification; while *t* and *l* consist of the bottom-turn slightly modified.

2. The "top-turn," which enters into the formation of three letters of the alphabet, namely, *m*, *n*, and *r*. This elementary stroke, unlike the bottom-turn, does not form a complete letter without some other elementary stroke being joined to it.

3. The "top-and-bottom-turn," which enters into the composition of six letters of the alphabet, namely, *h*, *m*, *n*, *p*, *v*, and *y*.

4. The "straight-stroke," which enters into the formation of three letters of the alphabet, namely, *h*, *k*, and *p*.

5. The letter *o*, which is a complete letter in itself without any addition, and which, as an elementary stroke, enters into the composition of four letters of the alphabet, namely, *a*, *g*, *d*, *q*; and in a modified form into the formation of four additional letters, namely, *c*, *e*, *s*, and *x*.

6. The elementary looped form turned at the bottom, which enters into the composition of three letters, namely, *g*, *j*, and *y*; and in a modified form into the composition of *z*.

7. The elementary stroke, that completes the formation of three letters, namely, *b*, *v*, and *w*, in combination with the bottom-turn or top-and-bottom-turn.

8. The elementary stroke that is added to the top-turn to form the letter *r*.

9. The elementary looped form turned at the top, which enters into the composition of the letter *f*, which is finished below the line *bb*, with the straight-stroke. In small-hand writing, this form is used instead of the straight down-stroke for those portions of the letters *b*, *h*, and *l*, which extend above the line *aa*.

10. The elementary stroke, that may be called a modification of the top-and-bottom-turn, added to the "straight-stroke," to form the letter *k*.

The following table shows at a glance the formation of all the letters of the alphabet in reference to the numbers attached to the recapitulation of elementary forms that has just been given:—

<i>a</i> . . . 5.1	<i>h</i> . . . 4.3	<i>o</i> . . . 5	<i>v</i> . . . 3.7
<i>b</i> . . . 1.7	<i>i</i> . . . 1	<i>p</i> . . . 4.3	<i>w</i> . . . 1.1.7
<i>c</i> . . . 5	<i>j</i> . . . 6	<i>q</i> . . . 5.1	<i>x</i> . . . 5.5
<i>d</i> . . . 5.1	<i>k</i> . . . 4.10	<i>r</i> . . . 2.8	<i>y</i> . . . 3.6
<i>e</i> . . . 5	<i>l</i> . . . 1	<i>s</i> . . . 5	<i>z</i> . . . 6
<i>f</i> . . . 9.4	<i>m</i> . . . 2.2.3	<i>t</i> . . . 1	
<i>g</i> . . . 5.6	<i>n</i> . . . 2.3	<i>u</i> . . . 1.1	

LESSONS IN ENGLISH.—XI.

DERIVATION: PREFIXES (continued).

Meter, *metro*, with the signification of "mother," of Greek origin (*μητηρ*, pronounced meet-ear, a mother), enters as the first two syllables into the word *metropolis* (*πολις*, pronounced pol'-is, a city), a mother city, the capital of a country, the chief city of a province.

"By consent of all churches, the precedence in each province was assigned to the bishop of the *metropolis*, who was called the first bishop, the *metropolitan*."—Barrow.

Micro, of Greek origin (*μικρος*, pronounced mi-kros, little), is seen in *microcosm* (Greek, *κοσμος*, pronounced kos-mos, the world), that is, a little world.

"Because in the little frame of man's body there is a representation of the universal, and (by allusion) a kind of participation of all the parts there, therefore was man called *microcosmos*, or the little world."—*Raleigh*, "History of the World."

Micro appears also in *microscope* (Greek, *σκοπεω*, pronounced skop'-e-o, I look at, see).

"The works of art do not bear a nice *microscopical* inspection; but the more helps are used, and the more nicely you pry into natural productions, the more do you discover of the fine mechanism of nature."—*Berkeley*, "Sirius."

Mid, of Saxon origin (compare middle), *halfway*, makes a part of several English words, as *midland*, *midnight*, *midday*, *midship*, *midsummer*; the meaning of which is very plain. *Midriff* (*rif*, *rib*, Saxon, *division*) is the diaphragm, the skin or membrane which separates the heart and lungs from the lower belly.

Mid, though belonging to the Saxon, is an Indo-Germanic word. It appears in the Greek, in μέσος (*mes-os*), *middle*; μέτα (*met-ta*), *in the midst of, among*; in the Latin, in *medius, middle*; *medium, the middle, the half, the means, or medium*; in the German *mitte, mit, with*; in the Sanscrit, *madhya*.

The term *midwife* is given, by Richardson, as "w^{id}-wife, a woman hired for need or reward." But how does the need distinguish the midwife? Are not all servants hired for need or reward? And do not all professions receive a need or reward?

The proper meaning of *mid-wife* is evidently, from our preceding remarks, *medium-wife*, a woman who, from having been married herself, which the word *wife* denotes, becomes useful as a *medium* or means of assisting other married women at child-birth.

"Nor need I claim the Muses' midwifery,
To bring to light so worthless poetry."—*Dr. Hall*.

Mille, of Latin origin (*mille, a thousand*), appears in *millennium* and its derivations. *Millennium* (Latin, *annus, a year*) properly signifies a period of a thousand years.

"When at your second coming you appear,
(For I foretell the millenary year)
The sharpened share shall vex the soil no more,
But Earth unbidden shall produce her store."
Dryden, "Palmer and Arcite."

Mis, of Saxon origin, found in the verb to *miss*, and in the adverb *amiss*, denoting something wrong, forms a prefix to many words, as *misalled, misapply, misbecome, misconceive, misjudge, dislike, misrepresent. Mischief* (French, *achever, to accomplish*) is a bad or wicked deed; the second syllable is not the same as our word *chief*, that is, *head*. What we now call *mischievous* was formerly pronounced, according to the vulgar error, *mis-chie'vous*.

"And every one threw forth reproaches rife,
Of his mischievous deeds, and said that hee
Was the disturber of all civil life,
The enemy of peace, and author of all strife."
Spenser, "Faerie Queene."

Misgive is used in the derivative sense of yielding, weakly yielding, and as yielding weakly, so improperly, the notion of impropriety lying in the *mis*.

"Great joy he promised to his thoughts, and new
Solace in her return, so long delayed;
Yet oft his heart, divine of something ill,
Misgave him."
Milton, "Paradise Lost."

Mod, of Latin origin (*modus, manner, limit*), appears in *modify* (Latin, *facio, I make*), to state with some restriction or qualification; to alter slightly; also in *modest, moderate, com-modious, commodity, etc.*

Molli, of Latin origin (*mollis, soft*), appears in *mollify*, to make soft, to appease, render gentle; *mollifier, mollification, mollifiable, etc.*

"While the vocal flute,
Or numbered verse, by female voice endeared,
Crowns his delight and mollifies the scene."—*Shenstone*.

Mono, mon, of Greek origin (*μνος, pronounced mon'-os, alone*), gives rise to *monachos, a monk, one who lives alone; monachism, the society of monks; monas, a monad, a single object, a unit; monarch* (Greek, *αρχη, pronounced ar'-ke, government*), one who rules alone; *monogamy* (Greek, *γαμος, pronounced gam'-os, marriage*); *monopolise* (Greek, *πωλεω, pronounced po'-le-o, I sell*), to have the sole power of selling; *monotheism* (Greek, *θεος, pronounced tho'-os, God*), the belief in one God; *monosyllable, a word of one syllable.*

"Conjunction, preposition, adverb join
To stamp new vigour on the nervous line;
In monosyllables his thunders roll,
Ho, she, it, and we, ye, they, fright the soul."
Churchill, "Rosciad."

Mort, of Latin origin (*mors, death, genitive mortis*), forms the basis of *mortal* and *immortal*. *Mortgage* is a dead gage or pledge; that is to say, something so pledged, as what are called deeds or writings, so that it cannot be used for raising money.

"*Mortuum vadium*, a dead pledge, mortgage, is when a man borrows of another a specific sum,—e.g., £200, and grants him an estate in fee, on condition that if he, the mortgager, shall repay the mortgagee the said sum of £200 on a certain day mentioned in the deed, then the

mortgager may re-enter on the estate granted in pledge."—*Blackstone, "Commentaries."*

Mortmain (Latin, *mortuâ manu, in a dead hand*) is explained thus:—

"All purchases made by corporate bodies were said to be purchases in *mortmain*; for this reason, those purchases were usually made by ecclesiastical bodies, the members of which being professed (in orders), were reckoned dead persons in law; land, therefore, holden by them might, with great propriety, be said to be held in *mortuâ manu*."—*Blackstone, "Commentaries."*

Multi, of Latin origin (*multus, much*), appears in *multifarious*, of many sorts; *multiform*, of many shapes; *multiply* (Latin, *plura, a fold*), to take many folds, etc.

"The beautiful lake
The pines wide-branching, falls of water clear,
The multifarious glow on Flora's lap
Lose all attraction."
Glover, "Leonidas."

Neo, of Greek origin (*νεος, pronounced ne'-os, new*), doubtless the same as our *new*, which thus appears to be Indo-Germanic. *Neo* forms the first syllable in *neology*, or new-science, new-doctrine—terms that might be used as fittingly as the Greek word *neology*. *Neo* is found also in *neophyte* (Greek, *φύτας, pronounced fu'-tos, born*), a new-born person, a recent convert.

Non, of Latin origin, *not*, stands before words of historical importance, as, *non-conformist, non-juror*.

"By that Act (the Five Mile Act), passed in the Parliament held at Oxford, October 9, 1635, and entitled, 'An Act for restraining Non-conformists (to the Established Church) from inhabiting Corporations,' the non-conforming ministers were prohibited, upon a penalty of forty pounds for every offence, to come, unless only in passing upon the road, within five miles of any city, corporation, etc."—*Locke*.

Non-juror is a term usually applied to those persons who refused to take the oaths of allegiance to William III. at the Revolution.

"The nonjuring prelates were Sancroft, Turner, Lake, Ken, White, Lloyd, Thomas, and Frampton."—*Sm. Lett, "History of England."*

Ob, of Latin origin (as a preposition, *on account of*), has the general meaning of *towards*, and hence *at, near*, and varies with the word with which it is connected, the meaning of which it sometimes merely strengthens. In *object* (Latin, *jacio, I throw*), to throw before or against, it conveys the idea of obstruction, an idea which it expresses more fully in *obstruction* (Latin, *struo, I build*), which, according to its constituents, signifies a building or blocking up. In *obliterate* (Latin, *litura, an erasure*), to blot out, it has an augmentive force. Passing into the first letter of its principal, *ob* becomes *oc*, as in *occasion* (Latin, *cado, I fall*), a suitable fall, a fall before you so as to suit your purpose, something seasonable and convenient, by which you may profit. *Ob* passes also into *of*, as in *offer* (Latin, *fero, I bear*). This *of* must not be confounded with *of* or *off* signifying *from*, and found in *off-scouring* and *offspring*.

"Our prayer hath
No power to pass; and thou hast made us fall,
As refuse and off-scouring to them all."—*Donne*.

"Whence it follows that these were nations not descending from us, but born with us; not our off-spring, but our brethren."—*South*.

Octo, also *octa*, of Latin origin (*octo, eight*), appears in *octagon, eight-angled; octosyllable, of eight syllables; octotench* (Greek, *τευχη, pronounced tu'-ke, a fold or volume*), the first eight books of the Old Testament.

LESSONS IN DRAWING.—XI.

No one, we presume, will question our statement when we say, that in giving these instructions in drawing, there are two great and important considerations to fulfil, both of which are indispensable and cannot be treated independently of each other: the one is to lay down data or rules for practical use, the other is to direct the pupil in what way he may ascertain for himself the principles upon which rules are founded, as well as to guide him in his method of observation. The root of all knowledge of any real value, is found in the capability of giving a satisfactory answer to the simple questions, *why* and *wherefore*. One man, who takes for granted all facts as they are given to him, may gain a great deal of information upon many subjects; another, who stops to inquire into the truth or foundation of those facts—that is, to satisfy himself thoroughly respecting the *why* and

the *wherefore*—will be the better educated man of the two, and his information, though not so extensive as the other, will be found in every way to be more serviceable to himself and to those who employ him. The latter can boast of possessing a few coins of the true metal; the larger stock of the former is merely electro-plate. After the above remarks, we hope our pupils will be anxious to accompany us into a little inquiry respecting the laws which regulate the disposition of shadows as they occur under various circumstances. The extent of the shadow is ruled by the position of the source of light. On any

Figs. 76, 77, and 78 are intended to show the position of the shadow of an object in three cases. In Fig. 76, the sun is parallel with our position, or with the picture plane, and is on our right hand, casting the shadow of the post at *a b*, which is parallel with the horizontal line and picture plane. In Fig. 77, when the sun is in front of the picture, or behind us, the shadow is cast in a retiring position. In Fig. 78, when the sun is behind the picture or before us, the shadow is cast in advance of the object, or, in other words, approaches us. We intend to give only a single geometrical example,

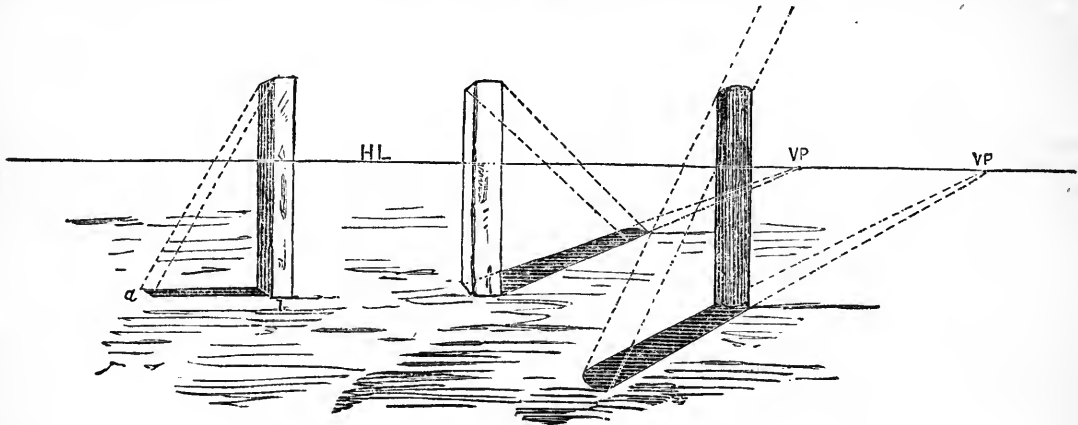


Fig. 76.

Fig. 77.

Fig. 78.

day at noon, when the sun is high in the heavens, the shadows of our own figures are shorter than in the morning or evening, when the sun is lower: this, then, suggests the consideration, how are we to regulate or decide upon the extent of the shadow of an object in a picture according to the sun's inclination. This may be said to be the statement of the question relating to all shadows under whatever conditions they may be found. We propose now to take it up with reference to a few cases only, as it will be more thoroughly answered in the lessons on Geometrical Perspective. Sometimes the position of the sun may be

and that a very simple one, of the first of these positions, and leave the pupil at present to take for granted much that might be said, not only on this, but on the others also, as they belong more especially to geometrical perspective. The position we have chosen is the *parallel* position, when the sun's rays are in the picture. Let A, B (Fig. 79) represent two walls, forming a right angle, one of which, A, is parallel to the picture plane, and the other, B, at a right angle, or perpendicular with the picture plane; there is also a doorway in the wall B. Let the sun's rays be supposed to have an inclination of 45° . The

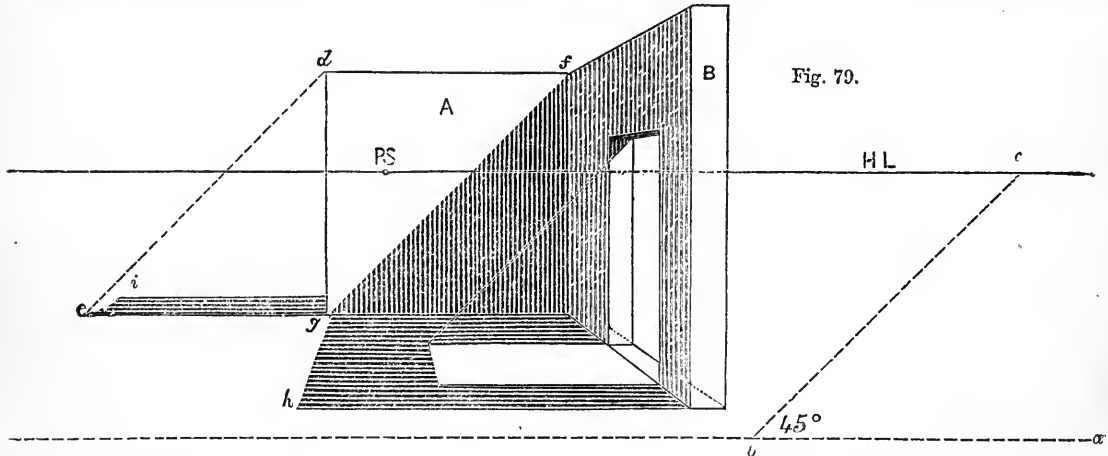


Fig. 79.

behind us, at other times before us, and again it may be, as it is technically termed, "in the picture;" that is, the sun is either on our right hand or on our left, meaning by that neither before us, nor behind us: consequently the rays are parallel with the picture. Sometimes the source of light is a lamp or candle, and although the rules for constructing the shadows under this light are very much the same as those we employ for shadows resulting from the effects of sunlight, yet there is this characteristic difference: the sun's rays are always considered to be parallel on account of its remote distance from the earth, whilst the light from a lamp or candle radiates above, below, and on all sides, and consequently the rays are not parallel.

angle *a b c* (45°) may be made anywhere on the ground line, as it is only so placed for the purpose of drawing the dotted lines, *d e, f g*, etc., parallel to *a b*, to ensure the given inclination of the sun's rays, by which the extent of the shadows are determined. Our purpose then in introducing this problem is to prove that the edges of the shadows of objects in a horizontal position have the same *vanishing point* as the lines of the object itself have when in parallel perspective. It will be seen that the shadow, *g h*, of the upper edge of the wall, B, as well as the wall itself, are directed towards the *point of sight*, also the shadow of the top of the doorway, and *e i*, of the end of the wall A, are subject to the same rule. We should like to go

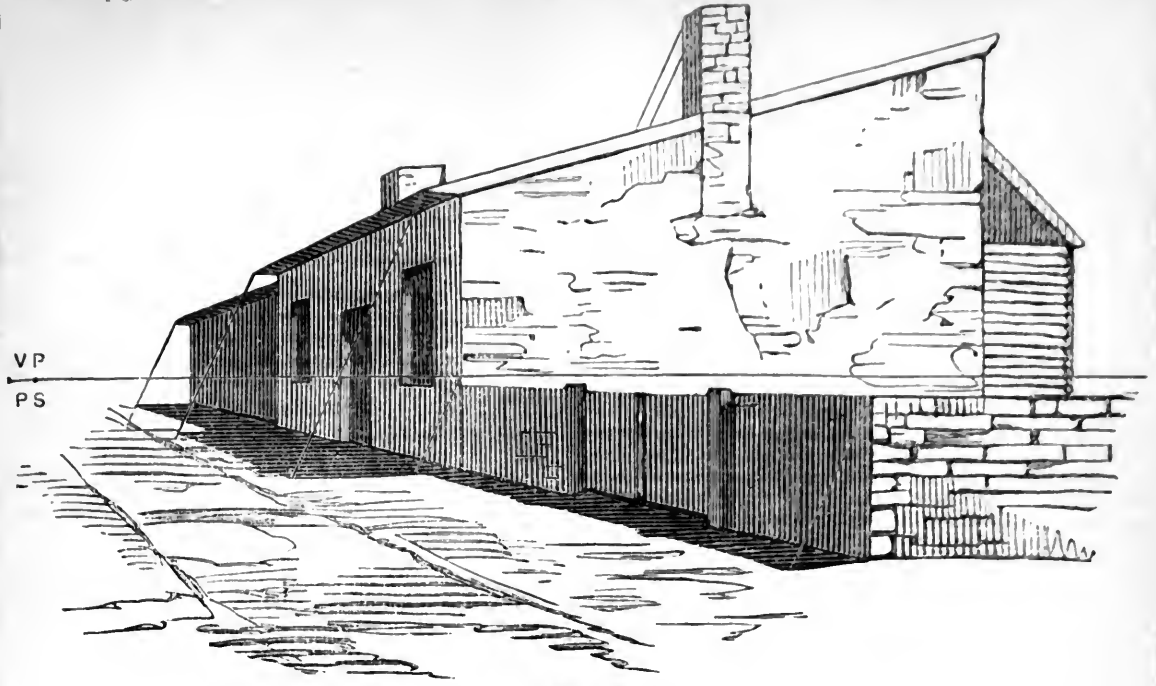


Fig. 80.

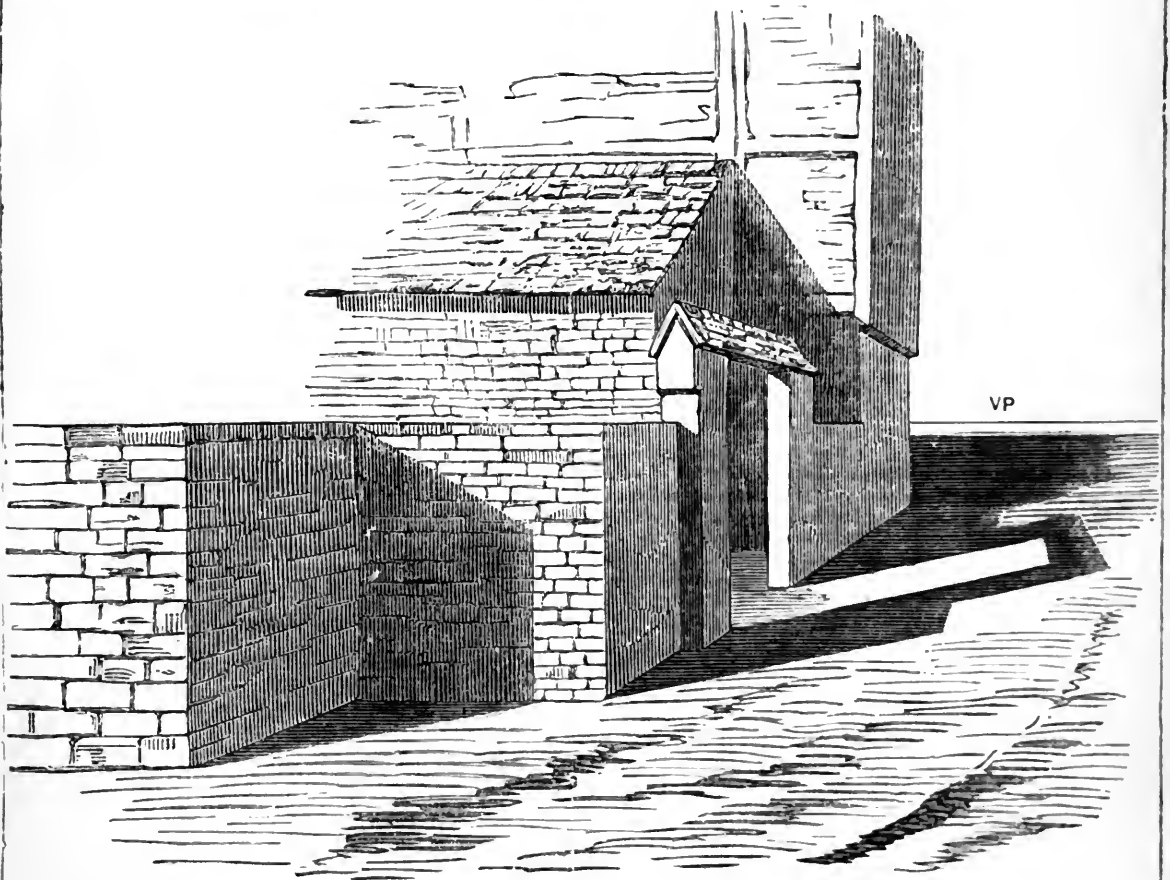


Fig. 81.

further into this very interesting inquiry, but refrain, from a desire not to present too many difficulties at present. Fig. 80 is an example of the rule set forth by Fig. 79. It will be observed that the dotted lines representing the sun's inclination, determine the extent of the cast shadow of the buildings on the ground; and according to the heights of the buildings, so is the extent of their shadows: the shadow of the chimney is on the roof, which being above the eye cannot be seen. Let us again remind the pupil that the tone of the cast shadow on the ground is darker than the broad shadow on the walls. Observe when the shadow of a perpendicular object is cast horizontally on the ground, and is found to be equal in length to the height of that object, then the inclination of the sun's rays is at an angle of 45°. Therefore, to determine the extent of a shadow caused by the sun's inclination at 45°, we have simply to make the object and its shadow of the same length; should the sun's rays be at any other angle, the method, as shown in the problem Fig. 79, of first constructing the angle, must be adopted. The dotted horizontal retiring lines from the shadows in Fig. 77 and Fig. 78, meet on the H L, or line of sight, at the vanishing point of the sun's direction; whilst the inclined dotted lines from the top of the post to the extremity of the shadow, are drawn from the vanishing point of the sun's elevation, in one case above, in the other below, the line of sight. We merely mention this, and purposely decline giving any further rules at present for the construction of shadows, asking the pupil patiently to wait until he is a little more advanced, for fuller and more direct information, with a promise on our part that he shall not be left without proof and further instruction upon these interesting points. In the case of Fig. 81, the sun is behind us to the left, and therefore in front of the picture; cast shadows are thrown upon the projecting walls and on the ground: this hint will remind the pupil of their difference of tone. In working a shadow cast on the ground, we recommend the practice of drawing the lines of the shadow (that is, the shading) horizontally, so that the retiring shadows will then appear horizontal on a like surface: if the lines of the work were drawn in the direction of the vanishing point to which the shadow retires, the shadow would then appear to be inclined to the horizon, similar to the roof of a house, or to a board placed upon an edge and leaning against a wall. Cast shadows on perpendicular planes, such as upright walls, should be worked perpendicularly. As a general rule, we may decide that the working of a shadow should always be with especial reference to the position or inclination of the object upon which it is cast, whether it be perpendicular, horizontal, or inclined, so that the lines of the shading, though representing the shadow, should also represent the character of the ground, object, or plane upon which the shadow is cast.

LESSONS IN LATIN.—XI.

SUBSTANTIVES of the fourth declension have in the nominative two case-endings, one in *us*, the other in *u*. The nouns which end in *us* are for the most part masculine; those which end in *u* are neuter. The *u* belongs to the stem. With this *u* are blended the case-endings of the genitive and ablative singular, and the nominative and accusative plural; thus *u* and *is* become *ūs* in the genitive singular; *u* and *e* become *ū* in the ablative singular; *u* and *es* become *ūs* in the nominative and accusative plural. The fourth conjugation, then, is only a contracted form of the third; contracted, I say, that is shortened, as when *u* and *s* are melted together to form *ūs*, the case-ending of the genitive singular.

FOURTH DECLENSION.

Sign *ūs* in the Genitive Singular.

Cases.	Singular.		CASE-ENDINGS.		Plural.	
	m. and f.	n.	Cases.	m. and f.	n.	
N.	ūs	ū	N.	ūs	ū	
G.	ūs	ūs	G.	ūum	ūum	
D.	ūs or ū	ū	D.	ībūs	ībūs	
Ac.	ūm	ū	Ac.	ūs	ūs	
V.	ūs	ū	V.	ūs	ūs	
Ab.	ū	ū	Ab.	ībūs	ībūs	

The following words have in the dative and ablative plural *ūbus* instead of *ībūs*; namely, *acus, f., a needle*; *arcus, m., a bow*; *artus, m., a limb*; *partus, m., a birth or offspring*; *lacus, m., a*

lake or inland sea; *quercus, f., an oak*; *specus, m., a cave or grotto*; *tribus, f., a tribe*; *pecu, n., cattle*; *veru, n., a spit*.

As *u* belongs to the stem, *ūbus* is the regular form in the dative and ablative plural; but the *u* has been set aside by the connecting vowel *i*, as in *fruct-i-bus*.

EXAMPLE.—*Fructus, m., fruit*; *cornu, n., a horn*.

Cases.	Singular.	Plural.	Singular.	Plural.
N.	fructūs, fruit.	fructūs, fruits.	cornū, a horn.	cornū, horns.
G.	fructūs, of fruit.	fructūum, of fruits	cornū, of a horn.	cornūum, of horns
D.	fructū, to fruit.	fructibus, to fruits.	cornū, to a horn.	cornibus, to horns
Ac.	fructū, fruit.	fructūs, fruits.	cornū, a horn.	cornū, horns.
V.	fructūs, O fruit!	fructūs! O fruits!	cornū, O horn!	cornū, O horns!
Ab.	fructū, by fruit.	fructibus, by fruits	cornū, by a horn.	cornibus, by horns

Domus, f., a house, partakes of the second as well as the fourth declension: thus, from the second, it has the ablative singular in *o*, as *domo*, and one form of the genitive plural in *orum*, as *domorum*; from the fourth declension, it has most of its other cases. It is declined thus:—

Domus, ūs, f., a house.

Cases.	Singular.	Plural.
N.	domus.	N. domūs.
G.	domūs.	G. domuum or domorum.
D.	domui.	D. domibus.
Ac.	domum.	Ac. domos (rarely domūs).
V.	domus.	V. domus.
Ab.	domo.	Ab. domibus.

Domus has also *domi*, genitive singular; but *domi* is not used except in the sense of *at home*; with *domi*, you may connect other words, as, *domi tuæ, at thy house*; *domi alienæ, at another's house*.

VOCABULARY.

<i>Amicus, -a, -um, bitter.</i>	<i>Lusus, -ūs, m., play.</i>	<i>Sagitta, -ūs, f., an arrow.</i>
<i>Bestia, -æ, f., a beast.</i>	<i>Paro, 1, I make ready, I procure.</i>	<i>Sapiens, sapientis, an adjective, wise; as a noun, a sage.</i>
<i>Evito, 1, I avoid.</i>	<i>Præditus, -a, -um, endowed with.</i>	<i>Suaviter, sweetly.</i>
<i>Frango, 3, I break, I overcome.</i>	<i>Puerilis, -e, boyish, childlike.</i>	<i>Succumbo, 3, I lie under, I yield to (with the dative).</i>
<i>Genus, -ris, n., a race.</i>	<i>Quam, how.</i>	<i>Vehementer, greatly.</i>
<i>Gratus, -a, -um, pleasant, thankful.</i>	<i>Quantus, -a, -um, how great.</i>	<i>Vis, f., strength, power.</i>
<i>Indulgeo, 2, I indulge in (with the dative).</i>	<i>Sensus, -ūs, m., feeling or a sense.</i>	<i>Voluptas, -atis, f., pleasure.</i>
<i>Libenter, adv. willingly.</i>		
<i>Luctus, -ūs, m., grief.</i>		

EXERCISE 35.—ENGLISH-LATIN.

1. *Lusus gratus est pueris.*
2. *Varia sunt genera lūsūs.*
3. *Pueri libenter indulgent lūsui.*
4. *Nonne pueris gratus est lusus?*
5. *Lusus est mihi gratus.*
6. *Tibi est lusus vehementer gratus.*
7. *Viri graves evitant lusus pueriles.*
8. *O lusus, quam suaviter animos puerorum delectas!*
9. *Reges non delectantur lusu puerili.*
10. *Sensus sunt acres.*
11. *Acres mihi sunt sensus.*
12. *Vis sensuum est magna.*
13. *Estne sensuum vis magna.*
14. *Vir fortis non succumbit sensibus doloris.*
15. *Acres sensus habent bestie.*
16. *O sensus, quantas voluptates hominibus paratis!*
17. *Animalia prædita sunt sensibus.*

EXERCISE 36.—ENGLISH-LATIN.

1. The feeling of pain is bitter.
2. Is not the feeling of pain bitter to thee?
3. The feeling of pain is bitter to all men and to all animals.
4. The power of grief is great.
5. The sage is not overcome by the power of the senses.
6. A brave (fortis) man yields not to grief.
7. Do brave men yield to the power of the senses?
8. O grief, how dost thou overcome the minds of men!
9. Boys willingly yield to play.
10. (There) are many kinds of play.
11. Plays (games) of all kinds are pleasant to boys and girls.
12. Boyish plays delight not men.
13. Men are not delighted by boyish plays.
14. Boys and men yield to pleasure.
15. How greatly is grief avoided by children.
16. Boys delight in bows and arrows.
17. Girls delight in needles.

There are no adjectives which follow the fourth declension, as there are none which follow the fifth declension. Adjectives follow exclusively the first, the second, and the third declensions. Yet nouns of the fourth and of the fifth declensions are sometimes united with adjectives. In declining nouns and adjectives so united, you must take care to preserve the proper forms of both, and not allow the one to influence the other. To aid you in making the necessary distinctions, I supply instances for practice.

NOUNS AND ADJECTIVES OF VARIOUS DECLENSIONS.

EXAMPLE.—*Maturus fructus, m., ripe fruit*; *frequens cæcus,*

m., a full assembly; *matura ficus, f.*, a ripe fig; *debile genu, n.*, a weak knee.

<i>Cases.</i>		<i>Singular.</i>
N.	<i>maturus fructus.</i>	<i>frequens cœtus.</i>
G.	<i>maturi fructus.</i>	<i>frequentis cœtus.</i>
D.	<i>maturus fructui.</i>	<i>frequenti cœtui.</i>
Ac.	<i>maturum fructum.</i>	<i>frequentem cœtum.</i>
V.	<i>mature fructus.</i>	<i>frequens cœtus.</i>
Ab.	<i>mature fructu.</i>	<i>frequentu cœtus.</i>
<i>Cases.</i>		<i>Plural.</i>
N.	<i>maturi fructus.</i>	<i>frequentes cœtus.</i>
G.	<i>maturorum fructuum.</i>	<i>frequentum cœtum.</i>
D.	<i>maturis fructibus.</i>	<i>frequentibus cœtibus.</i>
Ac.	<i>maturus fructus.</i>	<i>frequentes cœtus.</i>
V.	<i>maturi fructus.</i>	<i>frequentes cœtus.</i>
Ab.	<i>maturis fructibus.</i>	<i>frequentibus cœtibus.</i>
<i>Cases.</i>		<i>Singular.</i>
N.	<i>matura ficus.</i>	<i>debile genu.</i>
G.	<i>maturæ ficus.</i>	<i>debilis genu.</i>
D.	<i>maturæ fici.</i>	<i>debili genu.</i>
Ac.	<i>maturam ficum.</i>	<i>debile genu.</i>
V.	<i>matura ficus.</i>	<i>debilo genu.</i>
Ab.	<i>maturâ fici.</i>	<i>debili genu.</i>
<i>Cases.</i>		<i>Plural.</i>
N.	<i>maturæ ficus.</i>	<i>debilia genua.</i>
G.	<i>maturarum ficuum.</i>	<i>debiliu genuum.</i>
D.	<i>maturis fici.</i>	<i>debilibus genibus.</i>
Ac.	<i>maturas ficus.</i>	<i>debilia genua.</i>
V.	<i>maturæ ficus.</i>	<i>debilia genua.</i>
Ab.	<i>maturis fici.</i>	<i>debilibus genibus.</i>

Here observe, that the regular form of the dative and ablative plural would be *ficibus* or *ficubus*, but only *ficiis* is found in good Latin authors, which shows that *ficus*, like *domus*, is a noun which partakes of the second as well as the fourth declension.

VOCABULARY.

<i>Antecedo, 3, I go before.</i>	<i>Indico, 1, I point out.</i>	<i>Supplex, supplicis, as an adjective, entreating; as a noun, a suppliant.</i>
<i>Extimesco, 3, I fear.</i>	<i>Multus, -a, -um, much or many.</i>	<i>Terribilis, -e, terrible.</i>
<i>Flecto, 3, I bend.</i>	<i>Permôveo, 2, I move greatly.</i>	<i>Tonitru (indeclinable in sing. num.), n., or Tonitrus, -us, m., thunder.</i>
<i>Frémitus, -us, m., a roaring.</i>	<i>Procumbo, 3, I fall down.</i>	<i>Vacillo, 1, I move to and fro, I vacillate.</i>
<i>Fulmen, -inis, n., lightning.</i>	<i>Resôno, 1, I resound, I echo.</i>	<i>Validus, -a, -um, strong.</i>
<i>Genu (indeclinable in sing. num.), n., a knee.</i>	<i>Robur, -ôris, n., strength; also an oak.</i>	<i>Vigor, -ôris, m., vigour.</i>
<i>Horribilis, -e, frightful, horrible.</i>		

EXERCISE 37.—LATIN-ENGLISH.

1. *Tonitrus* *terribilis* *animos* *hominum* *permôvet*. 2. *Nonne* *tonitrus* *sonus* *est* *terribilis*? 3. *Tonitrus* *fremitus* *horribilis* *est*. 4. *Horribilis* *est* *tonitrus*. 5. *Fulmen* *antecedit* *tonitrum*. 6. *Multi* *homines* *extimescunt* *tonitru*. 7. *Tonitrus* *extimescitur* *a* *multis* *hominibus*. 8. *O* *tonitrus*, *quam* *horribilis* *est* *fremitus* *tuus*! 9. *Domus* *resonat* *tonitru*. 10. *Genus* *virorum* *sunt* *valida*. 11. *Vigor* *genuum* *indicat* *robur* *corpôris*. 12. *Magna* *vis* *est* *genibus*. 13. *Supplices* *procumbunt* *in* *(on)* *genua*. 14. *O* *genua*, *quam* *valde* *vacillatis*! 15. *In* *genibus* *est* *magna* *vis*.

EXERCISE 38.—ENGLISH-LATIN.

1. The man's knee is strong. 2. Strong knees have vigour. 3. Are thy knees strong? 4. The woods resound with the horrible sound of thunder. 5. The sound of thunder greatly moves the animals. 6. Thunder is feared by strong beasts. 7. I have weak knees. 8. Has your father weak knees? 9. No, my father has strong knees. 10. I am greatly moved by much lightning. 11. The roaring of thunder greatly moves the suppliants. 12. The suppliant points out the beautiful house.

Summus, highest; *medius*, middle; *imus*, lowest; *reliquus*, remaining; *ultimus*, extremus, last, etc. These adjectives agree in number, case, and gender with their nouns, though in English they appear to have the force of nouns, and consequently to require the construction of nouns. Thus, the Latins say, *summus mons*, that is, the highest mountain; meaning, the top of the mountain, the highest part of the mountain, the mountain, that is, where it is highest. I subjoin some instances, with forms for practice.

Instances:—*Ima quercus*, the bottom of the oak; *reliquum opus*, the remainder of the work; *primum limen*, the edge of the threshold; *extremum bellum*, the end of the war; *inœnus ver*, the beginning of spring; *media æstas*, the middle of summer; *summa aqua*, the surface of the water; *intima philosophia*, the

recesses of philosophy; *reliqua Ægyptus*, the rest of Ægypt. Decline each of these instances according to their proper models; thus:—

<i>Cases.</i>		<i>Singular.</i>	
N.	<i>summus mons.</i>	<i>media æstas.</i>	<i>reliquum opus.</i>
G.	<i>summi montis.</i>	<i>mediæ æstatis.</i>	<i>reliqui operis.</i>
D.	<i>summo monti.</i>	<i>mediæ æstati.</i>	<i>reliquo operi.</i>
Ac.	<i>summum montem.</i>	<i>mediam æstatem.</i>	<i>reliquum opus.</i>
V.	<i>summe mons.</i>	<i>media æstas.</i>	<i>reliquum opus.</i>
Ab.	<i>summo monte.</i>	<i>mediæ æstate.</i>	<i>reliquo opere.</i>
<i>Cases.</i>		<i>Plural.</i>	
N.	<i>summi montes.</i>	<i>mediæ æstates.</i>	<i>reliqua opera.</i>
G.	<i>summorum montium.</i>	<i>mediarum æstatum.</i>	<i>reliquorum operum.</i>
D.	<i>summis montibus.</i>	<i>mediis æstatibus.</i>	<i>reliquis operibus.</i>
Ac.	<i>summos montes.</i>	<i>medias æstates.</i>	<i>reliqua opera.</i>
V.	<i>summi montes.</i>	<i>mediæ æstates.</i>	<i>reliqua opera.</i>
Ab.	<i>summis montibus.</i>	<i>mediis æstatibus.</i>	<i>reliquis operibus.</i>

So in English, instead of "the middle of summer," we say, after the Latin manner, mid-summer, that is, middle summer; also, mid-day; mid-night; mid-way, etc.

The student is required to find out English words derived from the Latin words just used; and the Latin words that are the sources of derivation of the English words which follow:—

<i>Acute.</i>	<i>Generic.</i>	<i>Sensual.</i>
<i>Alienate.</i>	<i>Grateful.</i>	<i>Sweet.</i>
<i>Antecedent.</i>	<i>Nature.</i>	<i>Vacillation.</i>
<i>Archery.</i>	<i>Parturition.</i>	<i>Variouly.</i>
<i>Domestic.</i>	<i>Peculiar.</i>	<i>Voluptuary.</i>
<i>Fructify.</i>	<i>Puerile.</i>	

With these English words other English words are connected, so that when you know the import of these, you easily learn the import of the connected or related terms. Thus from the adjective *acute* comes the adverb *acutely* and the noun *acuteness*; with the verb *alienate* is connected the noun *alien*; *voluptuary* has corresponding forms in *voluptuous* and *voluptuousness*; *grateful* also has *gratitude* and *gratefully*.

Find the Latin terms which occur in the instructions in the third declension, from which are derived these English words, namely:—

<i>Acriâ.</i>	<i>Guttural.</i>	<i>Sweet.</i>
<i>Audacious.</i>	<i>Hostile.</i>	<i>Terrify (the ly repro-</i>
<i>Aviary.</i>	<i>Legal.</i>	<i>sents the Latin facio,</i>
<i>Cardinal.</i>	<i>Luminous.</i>	<i>I do or cause).</i>
<i>Civic.</i>	<i>Marine.</i>	<i>To err.</i>
<i>Corpulent.</i>	<i>Maternal.</i>	<i>To judge.</i>
<i>Decorous.</i>	<i>Military.</i>	<i>To reign.</i>
<i>Floral.</i>	<i>Mortal.</i>	<i>Virtue.</i>
<i>Gregarious.</i>	<i>Nominal.</i>	

Commit to memory these lines, which comprise the feminine nouns of the fourth declension:—

Feminine: these nouns in us: *tribus, acus, porticus.*
Domus, nurus, socrus, anus: idus, quercus, ficus, manus.

KEY TO EXERCISES IN LESSONS IN LATIN.—X.

EXERCISE 33.—LATIN-ENGLISH.

1. A soldier ought to fight with a brave mind. 2. Men have mortal bodies, immortal minds. 3. Have not men mortal bodies? 4. I am delighted with the sweet voice of birds. 5. Art thou delighted with the sweet voice of birds? 6. Boys should apply to learning with an eager mind. 7. Why, O boys, do you not apply to knowledge with an earnest mind? 8. The praise of scholars consists in good characters and severe industry. 9. With earnest industry my father applies to literature. 10. Piety is the basis of all the virtues. 11. Thy virtues, O mother, delight me. 12. Brave men are not overcome by severe pains. 13. We do not yield to daring enemies. 14. Every voice (sound) is well heard by thy mother. 15. Thy voices (words), O sister, are sweet to me.

EXERCISE 34.—ENGLISH-LATIN.

1. *Fortes viri* *hostibus* *non* *cedunt*. 2. *Audax agmen* *non* *facile* *vincitur*. 3. *Alacri animo* *in* *litteras* *incumbit* *meus* *filius*. 4. *Sorores* *tue* *amantæ* *litteras*? 5. *Avium* *vocibus* *delectantur*. 6. *Aves* *hostium* *suaves* *habent* *voce*. 7. *Bene* *in* *litteras* *incumbunt* *discipuli* *mei*. 8. *A* *Julio* *Cæsare* *vincitur* *audax* *agmen*. 9. *Hominum* *corpora* *mortalia* *sunt*, *immortales* *animi*. 10. *Matris* *pietas* *filium* *delectat*. 11. *Filia* *patris* *virtute* *delectatur*. 12. *Industrii* *et* *bonis* *moribus* *puerorum* *constat* *virtus*. 13. *Matris* *meæ* *epistola* *ab* *omnibus* *auditur*.

ESSAYS ON LIFE AND DUTY.—III.

TRUTH.

THE love of truth is one of the main elements in all honourable characters. To preserve a keen and delicate edge of feeling in the moral sense in this respect is to conserve the happiness as well as the excellency of character. Where there is little self-respect there can be little real blessedness, and the consciousness of habitual untruthfulness cannot co-exist with any moral satisfaction in ourselves. To be true, as it ranks us amongst the noblest, so it ranks us with the happiest of men. To be false is not only to be despised, but to despise ourselves.

Scarcely any psychologists will doubt the existence in all men of that moral sense which is able to discern the true when presented to it, nor will their investigations have been carried on without the discerning of another faculty closely connected with it, and that is a sensation of pleasure in the perception of it.

Truth is meant to meet not only the eye which perceives, but the instinct which admires and approves. In other words, truth meets not only a mental perceptivity in us, but has a moral affinity with us.

In all human relationships we see how valuable is the possession of a love of truth, and how difficult it is to preserve at all times a strict adherence to its behests.

Unquestionably it is our duty always to be obedient to the truth without dread of consequences. Inasmuch as likes and dislikes may meet us in the way, we shall often have to conquer ourselves. Passion and prejudice may stand on one side, and truth on the other, and the solicitations of the former may be so strong as to make it very hard work to comply with the commands of the latter. Moreover, to act according to truth brings with it sometimes disadvantage—loss, for instance, of pecuniary profit, or of flattering reputation; but in the end these gains if secured would be counterbalanced by the after-loss of our character, and we should have risked and ruined that upon which our ultimate success as well as our ultimate happiness alike depend.

Lying is of many kinds and degrees, but all lies are hateful and injurious. There is the *suppressio veri*, or the hiding of truth, the keeping back that which, if the jury knew it, or if our neighbour knew it, would altogether alter the value of the bargain and the complexion of the whole matter; consequently, though in such cases we remain silent, we may yet all the time be denying the truth by the reservation which keeps back that which is essential to its claims. There is also the speaking falsely for the sake of supposed good ends, a doctrine which has been of old defended by some casuists, but which has not one word to be said in its favour, inasmuch as it leaves open to every man's judgment the decision of what in the end will be best; a decision which, apart from all other considerations, is only too likely to fall in with his own selfish desires and inclinations. There is no more immoral doctrine than this, as it cuts at the very root of an immutable morality. There is also one more form of falsehood which demands exposure, and that is the acted untruth, where the lips indeed are silent, but where the look and the manner give assent to the falsehood. We must ever remember that there is a speech of the glance and the gesture as well as of the lips and the voice, and that it is as base to deceive with the one as with the other.

It is proper, however, to draw a distinction which does seem to exist between the two English words *truth* and *veracity*. Truth is always truth, whether we know it to be so or not; whereas veracity seems to relate to the connection between what a man says and what he honestly believes to be true. Thus a veracious man may sometimes err from the truth. He may have been misinformed or mistaken; he is veracious in respect to his own consciousness of what was done, whilst in regard to the actual truth of things he is wrong. It is not true that the sun moves round the earth; but astronomers of the Ptolemaic school, who declared it did, were still veracious men. They spoke that which they believed to be true.

Fidelity to truth has much to do with the stability and prosperity of nations. The just payment of bonds, the righteous adjustment of claims, and the earnest adhesion to a course of conduct marked by persistent rectitude, constitute one of the surest guarantees of progress. Empires suffer most severely from all fraudulent breaches of trust towards others in the great community of nations. That which is true of peoples is true of indivi-

duals. Whatever material gains may be secured by fraud and falsehood, the dishonour which is an inseparable part of the harvest is more than a counterbalance for all the success. Falsehood brings with it in many ways its own punishment. It has been well said that "Liars should have good memories"—so sure are they in after days to speak accidentally the truth, and thus not only to reveal the real fact, but also to uncover themselves to the shame and derision of mankind.

Fidelity to truth is one of those virtues which cannot suddenly be either learned or practised. Savage and uncivilised people, who have been habituated to falsehood, take many long years of moral education before they lose the lying habits of their nature. It must therefore commend itself to us as one of the first duties of life to inculcate the love and admiration of truth upon the young, that they may be early drilled in its exercise, and accustomed to its yoke. In the end it is easy, but in the beginning it is hard enough to fulfil the injunction, "Lie not at all."

All pretences and shams are actual untruths; but it is impossible in this article to follow into fullest details all the ramifications of falsehood. Enough has been said to show that there are many forms of falsehood, and not one of them even allowable or excusable.

Truth is as beautiful as it is powerful, and constitutes one of the richest adornments, as it is indeed one of the strongest bulwarks of character.

LESSONS IN FRENCH.—XXI.

SECTION XXXV.—REFLECTIVE VERBS [§ 43 (6), § 56].

1. A VERB is called reflective or pronominal, when it is conjugated with two pronouns of the same person, *i. e.*, the usual nominative pronoun and the pronouns *me, te, se, etc.* [§ 56]. In these verbs the subject is represented as acting upon itself.

Je m'applique à l'étude, I apply (myself) to study.
Je me propose de voyager, I propose (to myself) to travel, *i. e.*, it is my intention to travel.

In these verbs, the second pronoun is, in fact, only the objective pronoun direct or indirect, which, according to Sect. XXVI., 1, 2, is placed before the verb.

2. The reflective form of the verb, which is much more frequently used in French than in English, often answers to the passive form so common in the latter language.

Cela se voit tous les jours, { That is seen every day—literally,
{ That sees itself every day.
Cette marchandise se vend facile- { That merchandise is easily sold.
ment, { That merchandise sells itself easily.
Cela se fait ainsi, { That is done thus.
{ That does itself so.

3. The verb *se porter*, literally, *to carry one's self*, is used idiomatically for *to do* or *to be*, in speaking of health.

Comment vous portez-vous? How do you do?
Je me porte très-bien, I am very well.

4. *S'asseoir* [4, *ir.*; see § 62], *to sit down*, is also a reflective verb.

Votre frère s'assied, Your brother sits down.

5. *Se promener* means *to walk, to ride, etc.*, for pleasure or health.

Je me promène tous les jours, I take a walk every day.
Je me promène à cheval, I take a ride.

6. *Marcher, aller à cheval, aller en voiture*, signify *to walk* or *to ride*, when we wish to express simply the manner of progressing.

Marchez-vous beaucoup tous les jours? Do you walk much every day?

Je vais à cheval et en voiture, I ride on horseback and in a carriage.

7. CONJUGATION OF THE PRESENT OF THE INDICATIVE OF THE REFLECTIVE VERBS.

SE PORT-ER, 1, to be or do.	SE PROMEN-ER, 1, to walk or ride.	S'ASSE-oir, 3, ir., to sit down.
Sing.	Sing.	Sing.
Je me porte, I am or do.	Je me promène, I take a walk or ride.	Je m'assieds, I sit down or am sitting down.
Tu te portes.	Tu te promènes [§ 49].	Tu t'assieds.
Il se porte.	Il se promène.	Il s'assied.
Plur.	Plur.	Plur.
Nous nous portons.	Nous nous promenons.	Nous nous asseyons.
Vous vous portez.	Vous vous promenez.	Vous vous asseyez.
Ils se portent.	Ils se promènent.	Ils s'assient.

8. The reflexive pronouns in the imperative of reflexive verbs follow Rule 4 of Sect. XXVI., and Rules 3, 4 of Sect. XXVII., and also § 100 (2) (3).

Asseyons-nous; asseyez-vous, Let us sit down; sit down.
 Ne nous asseyons pas, Let us not sit down.

RÉSUMÉ OF EXAMPLES.

À quoi vous appliquez-vous? To what do you apply yourself?
 Je m'occupe de mes affaires. I occupy myself with my affairs.
 Je m'adresse à mes amis. I apply to my friends.
 Vous adressez-vous à votre père? Do you apply to your father?
 Je m'adresse à lui [§ 100 (4)]. I apply to him.
 Comment se porte Monsieur votre père? How is your father?
 Il se porte passablement bien. He is tolerably well.
 Pourquoi ne vous asseyez-vous pas? Why do you not sit down?
 Je m'assieds quand je suis fatigué. I sit down when I am tired.
 Je n'ai pas le temps de m'asseoir. I have no time to sit down.
 Vous promenez-vous tous les jours? Do you take a walk every day?
 Je me promène en voiture aujourd'hui. I take a ride to-day (in a carriage).
 Vos amis se promènent-ils à cheval? Do your friends take a ride to-day?
 N'aimez-vous pas à marcher? Do you not like walking?
 J'aime beaucoup aller à cheval. I like riding much.
 Aimez-vous à vous promener? Do you like walking (for pleasure)?
 Asseyons-nous, s'il vous plaît. Let us sit down, if you please.
 Ne nous asseyons pas? Do we not sit down?
 Ne nous asseyons pas, il est trop tard. Let us not sit down, it is too late.
 Combien ce drap se vend-il le yard? How much is that cloth sold a yard?
 Il se vend vingt-cinq francs le mètre. It is sold at twenty-five francs the metre.
 Comment cela s'appelle-t-il? How is that called? What is the name of that?
 Comment vous appelez- [§ 49 (4)] vous? What is your name? How do you call yourself?

VOCABULARY.

Banquier, m., banker.	Magnifique, magnificent.	Pied, m., foot.
Cheval, m., horse.	Matin, m., morning.	Port-er, to carry, wear.
Comment, how.	Mieux, better.	Quelquefois, sometimes.
Drap, m., cloth.	Obligé, -e, obliged.	Quitt-er, 1, to leave.
Fatigué, -e, weary, tired.	Part-ir, 2, to set out.	Voiture, f., carriage.

EXERCISE 65.

1. Comment se Monsieur s'appelle-t-il? 2. Je ne sais comment il s'appelle. 3. Cette dame ne s'appelle-t-elle pas L.? 4. Non, Madame, elle s'appelle M. 5. Monsieur votre père se porte-t-il bien ce matin? 6. Il se porte beaucoup mieux. 7. Fait-il beau temps aujourd'hui? 8. Il fait un temps magnifique, n'allez-vous pas vous promener? 9. Nous n'avons ni cheval ni voiture. 10. Ne pouvez-vous marcher? 11. Je suis trop fatigué pour marcher. 12. N'allez-vous pas à cheval tous les matins? 13. Je me promène tous les matins. 14. Comment vous promenez-vous? 15. Quelquefois à pied et quelquefois en voiture. 16. À qui vous adressez-vous quand vous avez besoin d'argent? 17. Je m'adresse à mon banquier? 18. Ne voulez-vous pas vous assooir? 19. Nous vous sommes bien obligés. 20. Ce drap se vend-il fort bien? 21. Il se vend fort cher. 22. Ne devez-vous pas aller à la campagne, s'il fait beau temps? 23. Votre frère doit-il quitter la ville aujourd'hui? 24. Il doit partir demain matin.

EXERCISE 66.

1. Does your sister walk every day? 2. She takes a walk every morning. 3. She likes riding on horseback and in a carriage. 4. What is that little girl called? 5. She is called L. 6. Is not that gentleman called L.? 7. No, Sir, he is called G., and his cousin is called H. 8. How is your brother? 9. My brother is very well, but my sister is not well. 10. How are your two daughters? 11. They are tolerably well to-day. 12. Will you not sit down, gentlemen? 13. We are much obliged to you, Madam, we have not time. 14. Does that book sell well? 15. It sells very well. 16. How is that silk sold an ell (*l'aune*)? 17. It is sold at six francs an ell. 18. Is it fine weather to-day? 19. It is very fine weather, will you not take a walk? 20. I have no time to walk. 21. To whom does your brother apply? 22. He applies to his brother. 23. Is his brother at home? 24. No, Sir, he is at Paris. 25. When does

* The English *a* or *an* before a measure is rendered into French by the article *le* or *la*, etc.

he intend to go to France? 26. He intends to go to France in one month. 27. Is your sister to leave to-morrow morning? 28. She is to leave to-day if (*s'il*) it is fine weather. 29. What do people say of this? 30. Nothing is said about it [Sect. XXXIV.].

SECTION XXXVI.—REFLECTIVE PRONOUNS.

1. The reflexive pronoun is often used to express possession, instead of the possessive adjective. In such cases the article takes the place of this adjective before the noun [§ 77 (9)].

Vous chauffez-vous les pieds? Do you warm your feet?
 Je me chauffe les mains et les pieds, I warm my hands and feet.

2. *Se souvenir* [2, ir; see § 62], *se rappeler* [§ 49 (4)], correspond to the English verb to remember. *Se rappeler* takes a direct object, that is, no preposition intervenes between the verb and its object, if the same be a noun or a pronoun.

Vous rappelez-vous ces demoiselles? Do you remember those young ladies?
 Je ne me les rappelle pas, I do not remember them.

3. Custom seems, however, to sanction the use of the preposition *de* between the verb *se rappeler* and an infinitive.

Nous ne nous rappelons pas d'en avoir été privés (COMBILLAC), We do not remember having been deprived of it.

4. *Se souvenir* takes the preposition *de* before a noun or pronoun, as well as before an infinitive.

Vous souvenez-vous de cette affaire? Do you remember that affair?
 Je ne m'en souviens pas, I do not remember it.
 Je me souviens de lui avoir écrit, I remember having written to him.

5. *Se coucher* corresponds to the English verbs to retire, to go to bed.

Je me couche de bonne heure, I retire early.

6. *Se lever* [§ 49 (6)] means to rise, to get up.

Je me lève au point du jour, I rise at the break of day.

RÉSUMÉ OF EXAMPLES.

Vous coupez-vous les ongles? Do you cut your nails?
 Je me coupe les ongles et les cheveux, I cut my nails and hair.
 Vous coupez-vous les doigts? Do you cut your fingers?
 Je me coupe souvent les doigts, quand je taille ma plume. I often cut my fingers, when I mend my pen.
 Vous rappelez- [§ 49 (4)] vous les malheurs du frère de votre ami? Do you remember the misfortunes of your friend's brother?
 Je me rappelle ses malheurs. I remember his misfortunes.
 Je me les rappelle distinctement. I recollect them distinctly.
 Je me rappelle de l'avoir vu. I remember having seen him.
 Vous souvenez-vous de cela? Do you remember that?
 Je ne m'en souviens pas du tout. I do not remember it at all.
 À quelle heure vous couchez-vous? At what hour do you retire?
 Nous nous couchons tous les jours au coucher du soleil. We go to bed every day at sunset.
 Nous nous levons de meilleure heure que vous—au lever du soleil. We rise earlier than you—at sunrise.
 Il se lève à cinq heures du matin, et il se couche à dix heures et demie du soir. He rises at five o'clock in the morning, and goes to bed at half after ten in the evening.

VOCABULARY.

Associé, m., partner.	De meilleure heure, earlier.	Ferruquier, m., hair-dresser.
Bois, m., wood.	Doigt, m., finger.	Poêle, m., stove.
Boucher, m., butcher.	Fer, m., iron.	Pouce, m., thumb.
Se brûler, 1, ref., to burn one's self.	Feu, m., fire.	Promesse, f., promise.
Charpentier, m., carpenter.	Main, f., hand.	Se souvenir, to remember (see Venir, § 62).
Se chauffer, 1, ref., to warm one's self.	S'occuper, 1, to occupy one's self.	Travailler, 1, to work.
	Parfaitement, perfectly.	

EXERCISE 67.

1. Le ferruquier se coupe-t-il le pouce? 2. Non, Monsieur, il se coupe les cheveux. 3. Le charpentier ne se coupe-t-il pas la main? 4. Il ne se coupe pas la main, il coupe le bois. 5. Ne vous rappelez-vous pas cette dame? 6. Je me rappelle cette dame et ces messieurs. 7. De quoi vous occupez-vous? 8. Nous nous occupons de nos affaires. 9. Vous souvenez-vous des fusils qu'a votre père? 10. Je ne m'en souviens point du tout. 11. Cette petite fille ne se brûle-t-elle pas? 12. Elle ne se brûle pas, il n'y a pas de feu dans le poêle. 13. Pourquoi le boncher ne se chauffe-t-il pas? 14. Parcequ'il n'a pas froid. 15. Ces enfants se lèvent-ils de meilleure heure que moi? 16. Ils se couchent de bonne heure, et ils se lèvent tous les matins à

six heures. 17. Votre associé ne veut-il pas s'asseoir ? 18. Il n'a pas le temps de s'asseoir. 19. Vous souvenez-vous de vos proses ? 20. Je m'en souviens parfaitement. 21. Ne vous chauffez-vous pas quand vous avez froid ? 22. Je ne me chauffe presque jamais. 23. Ne se couche-t-on pas quand on a sommeil ? 24. On se couche quand on a sommeil, et on mange quand on a faim.

EXERCISE 68.

1. Do you rise early when you are well ? 2. When I am well I rise every morning at five o'clock. 3. Do you remember your cousin L. ? 4. I remember him perfectly well. 5. Do you go to bed early ? 6. We go to bed at ten o'clock. 7. Does not the tailor burn his fingers ? 8. He does not burn his fingers, his iron is not warm. 9. Does the carpenter cut his thumb ? 10. He cuts neither his thumb nor his hand. 11. Why do you not warm yourself ? 12. I do not warm myself, because I am not cold. 13. Is it not very cold to-day ? 14. It is not cold to-day, it rains. 15. Does your hairdresser rise at sunrise ? 16. The carpenter rises at sunrise and goes to bed at sunset. 17. Do you rise earlier than I ? 18. We rise every morning at the break of day. 19. Do you cut your hair often ? 20. I cut my hair and my nails every month. 21. Do you remember that gentleman ? 22. I remember him very well. 23. I do not remember him. 24. Do you cut your fingers when you mend a pen ? 25. I cut my hand when I work. 26. Do you remember what you learn ? 27. I do not remember all that (*tout ce que*) I learn. 28. Do you know if your father is well ? 29. He is very well to-day. 30. Is not your mother well ? 31. She is not very well.

SECTION XXXVII.—USES OF SOME REFLECTIVE VERBS.

1. The verb tromper, conjugated actively, corresponds to the English verb to deceive.

Il trompe tout le monde, He deceives everybody.

2. Conjugated reflectively, se tromper means to be mistaken ; literally, to deceive one's self.

On se trompe bien souvent, One is often mistaken.

3. Ennuyer [§ 49 (2)], used actively, means to weary the mind, to tease, to bore.

Cet homme ennue ses auditeurs, That man wearies his hearers.
Vous nous ennuyez par vos demandes, You tease or weary us by your questions.

4. S'ennuyer has no exact equivalent in English. It signifies generally to be, or to become mentally weary of any thing or place ; to be dull (weary).

Nous nous ennuyons ici, We are weary of being here.
Vous ennuyez-vous à la campagne ? Are you weary of being in the country ?

5. Je m'ennuie means, in fact, I am mentally weary, I want change, amusement, occupation, etc.

Je m'ennuie partout, I find no amusement anywhere.

6. S'amuser answers to the English expressions to amuse one's self, to take pleasure in, to spend one's time in, to find amusement in, to enjoy one's self.

Nous nous amusons à la campagne ? We enjoy ourselves in the country.
Vous vous amusez à des bagatelles, You spend your time in trifles.

RÉSUMÉ DE EXEMPLES.

On se trompe souvent soi-même en cherchant à tromper les autres. We often deceive ourselves while seeking to deceive others.
Votre commis ne se trompe-t-il pas ? Is not your clerk mistaken ?
Il se trompe bien rarement. He is very rarely mistaken.
Ne vous trompez-vous pas fréquemment ? Are you not frequently mistaken ?
Tout le monde est sujet à se tromper. Every one is apt to be mistaken.
Commerçant trompe tout le monde. That merchant deceives everybody.
Sa conversation nous ennue. His conversation wearies us.
Vous ennuyez vos amis par vos plaintes. You weary your friends by your complaints.
Est-ce que je ne vous ennue pas ? Do I not weary you ?
Vous ennuyez-vous chez nous ? Are you weary of remaining with us ?
Je m'ennuie à la ville et je m'amuse à la campagne. I become weary of the city and find amusement in the country.
À quoi vous amusez-vous ? In what do you amuse yourself ?
Je m'amuse à lire l'allemand. I amuse myself in reading German.

VOCABULARY.

Apprend-re, 4, ir., to learn.	Demeur-er, 1, to dwell.	Quand, when.
Banquier, m., banker.	Entend-re, 4, to hear.	Rec-voir, 3, to receive.
Campagne, f., country.	Ennuyer, 1, to tire.	Rev-enir, 2, ir., to come back.
Certainement, certainly.	Langue, f., language.	Récit, m., story.
Cient, m., client, customer.	Malade, sick.	Tort, m., wrong, injury.
	Mémoire, m., bill.	Tromp-er, 1, to deceive.
	Préf-er-er, 1, to prefer.	

EXERCISE 69.

1. Aimez-vous à demeurer à la campagne ? 2. Je préfère la campagne à la ville. 3. Vous ennuyez-vous souvent à la campagne ? 4. Quand je m'ennuie à la campagne, je reviens à la ville. 5. Reçoit-on des nouvelles du Général L. ? 6. On n'entend pas parler de lui. 7. Vous trompez-vous quelquefois ? 8. Tout le monde se trompe quelquefois. 9. Le banquier trompe-t-il ses clients ? 10. Il ne trompe ni ses clients ni ses amis, il ne trompe personne. 11. Ne vous trompez-vous pas dans ce mémoire ? 12. Je ne me trompe pas. 13. Vous amusez-vous à lire ou à écrire ? 14. Je m'amuse à apprendre l'allemand et le français. 15. Avez-vous tort d'apprendre les langues ? 16. J'ai raison de les apprendre. 17. Vous ennuyez-vous souvent ? 18. Je m'ennuie quand je n'ai rien à faire. 19. À quoi vous amusez-vous quand vous êtes à la campagne ? 20. Nous nous promenons le matin, et nous travaillons le reste de la journée.

EXERCISE 70.

1. Are you not mistaken ? 2. I am not mistaken. 3. Is not the banker mistaken ? 4. He is not mistaken, but his clerk is certainly mistaken. 5. Does he not deceive you ? 6. He does not deceive me, he deceives nobody. 7. Are you not wrong to deceive your father ? 8. I do not intend to deceive him. 9. Does not the merchant make a mistake ? 10. He makes a mistake in the bill which he writes. 11. Do you like the country or the city ? 12. I prefer the city ; I soon become weary of the country. 13. Does not that child weary you by his questions ? 14. Does not that long story weary you ? 15. It does not weary me, it amuses me. 16. Do you amuse yourself when you are in the country ? 17. I amuse myself ; I learn French and Italian. 18. Are you not weary of remaining at your uncle's ? 19. I am never weary of remaining there. 20. Is your brother often mistaken ? 21. Everybody is sometimes mistaken. 22. Does his conversation weary you ? 23. On the contrary, it amuses me. 24. Has anything been heard from your brother ? 25. Nothing has been heard of him [Seet. XXXIV.]. 26. Is your sister well ? 27. No, Sir, she is sick.

RECREATIVE NATURAL HISTORY.

THE MOLE.

Is this a well-known animal ? A countryman will smile at the question ; he knows full well the mole-hills which obstruct his scythe in badly-kept meadows, and has often seen the dark culprit gibbeted on the top of a cleft stick. But how many people in London have seen a mole ? There is no Registrar-General who will answer this question, and we therefore promise never again to propose such a query. Is the mole clever or stupid ? What do the majority of our readers say ? Some declare that "the little gentleman in velvet" is a decided genius, and his less enthusiastic friends claim for him a considerable degree of respect.

The creature has the repute of being a most skilful engineer, in which he is a self-taught and natural genius ; yet so modest that his finest works are hidden from observation. He never has any money, yet always wears a beautiful coat, for which no thanks are due to any tailor in Great Britain. The mole is, though small, a great eater, hard work giving him a capital appetite ; yet he generally contrives to provide very good dinners at all seasons of the year. The tectotalers speak of him with respect, though none of his children belong to the "Band of Hope," nor has he ever worn the temperance medal. His love for water-drinking amounts to a passion, but this is perhaps not to be accounted among his eminent merits. He meddles little with politics, yet politicians have made use of him, and he once, at least, though without intending it, shattered all the schemes of a famous warrior and statesman. Some men very much dislike him and all his family, but he bears them no malice, and asks only to be let alone. Some charge him with possessing

a fiery temper, and much pugnacity of spirit, but even these people admit that he is a good husband and devoted father.

Such are some of the qualities ascribed to the mole, and we will now take the liberty of looking a little into his mode of life, and that we may see whether the truth has been told about him. But first, a word or two respecting his names, which are three in Great Britain, *mole*, *want*, and *mouldiewarp*. The second of these seems to have been derived from the old Danish *wand*, and the third from two Saxon words signifying a "thrower up of mould." Learned men, of course, call our little friend *talpa*, and he is thus designated in natural history.

Is the mole a true-born Briton? We venture to answer "Yes." There is a Cornish legend, telling how the first mole came into existence, and we must not venture entirely to pass over this wonderful history. The story must be well known to some readers, but these may not object to a repetition, which will bring the tradition to the knowledge of others. Be it then known to all, that many ages ago there lived in Cornwall a beautiful damsel named Gwenda. She was fair, as became a Briton, tall, and gifted with a pair of blue eyes of the soft, loving, and poetic type. Every unmarried gentleman in Cornwall wished "to make her happy," of course. But Gwenda was so proud of her beauty that she scorned all advances, and for a long time loved her own sweet self only. But at last the hour of her fate came; she fell in love with a famous knight, by name Sir Aymeric. Will our readers believe the astounding statement, that the gentleman did not return the love? Perhaps he was looking out for "a good match," and preferred a long purse to beauty; perhaps he wanted a learned lady, who would study with him in winter evenings the poems of the bards and the philosophy of the Druids; perhaps he wanted a musical lady, who would sing soothing ballads to the knight when out of temper through indigestion, or worried with politics; perhaps—but we give up guessing. The simple fact was, that the unwilling Sir Aymeric did not return the love of Gwenda. She, however, determined to conquer his obdurate heart. Her sole trust was, not in her sense, her education, or goodness, but in her beauty. A great feast was to be given on a certain day by the Prince of Cornwall, at Tintagel, to which Gwenda, her mother, and Sir Aymeric were invited. The damsel procured the "most lovely" dress which Cornish taste could design, and, thus armed for heart conquest, took a last look at her mirror before leaving for the feast. She uttered one exulting exclamation of certain triumph, her mother heard, and "hoped" her beautiful daughter might succeed. "I am sure to conquer" was the bold and self-confident answer of the haughty lady. What followed? A piercing scream was heard; the startled mother looked round, and lo! Gwenda had vanished. They "sought for her high and they sought for her low," but Gwenda was never seen again. All Cornwall was in a panic; other fair ladies might disappear in the same unaccountable manner; it was really a serious matter for mothers, damsels, and lovers. Was no clue ever discovered? One day, while the old gardener was at work, he picked up a richly jewelled ring, which he knew had belonged to the long-lost Gwenda, and which she had worn on the night of her disappearance. The ring was discovered close to a hillock from which the gardener often saw a mole emerge, and then run up and down the garden path with a strangely melancholy cry. A "wise woman" was called in; she watched for the appearance of the mole, and then declared, in mystic words, that Alice had been turned into that very mole, as a punishment for her pride, by the mighty spirits of Fairy Land. Such was the origin of the first mole in Cornwall, and this became the mother of all the moles in England. The legend does not inform us where the first gentleman mole came from, and we must leave this matter in a teasing obscurity.

Let us now consider the mole's works and ways. Has the reader ever seen one of this animal's castles? If not, he knows little of the creature's engineering skill. Its fortress resembles some of those ancient camps found in various parts of England, where a central stronghold is surrounded by two or three circles of earthwork. The innermost home of the mole may be called his citadel; round this runs the first circular gallery, bored through the earth by the active engineer. The central house is connected with this first gallery by three roads running from the citadel. Round the first circle stretches a second, and to this four or five roads run from the first gallery. From the second circular work seven or eight tunnels extend far under ground, opening up a large hunting domain to the subterranean

Nimrod. Readers will thus see that all the roads are connected with the central house, and form one combined system of animal engineering. One "highway" runs straight from the fortress to the extremity of the hunting ground, and in this the traps are set by the experienced mole-catchers. Most of these galleries are just large enough to allow the animal to pass, and the speed with which he can gallop through such close tunnels is amazing. Experiments were made on this point by a French gentleman, named Le Court, who devoted many years to the study of the mole's habits. He often frightened the creature when feeding by sending the blast of a trumpet into its dining-room. Of course the horrified quadruped set off at full speed towards its citadel, and those who observed the experiments declare that the pace was equal to the swift trot of a horse. How could the speed be ascertained when the animal was hidden? Le Court and his helpers, having ascertained the direction of the "highway," inserted bits of straw into the long passage while the mole was out feeding, and at the top of each straw was a small paper flag. As the startled creature dashed along the gallery each straw was of course forced aside, and the corresponding motions of the paper banners indicated the pace of the little racer.

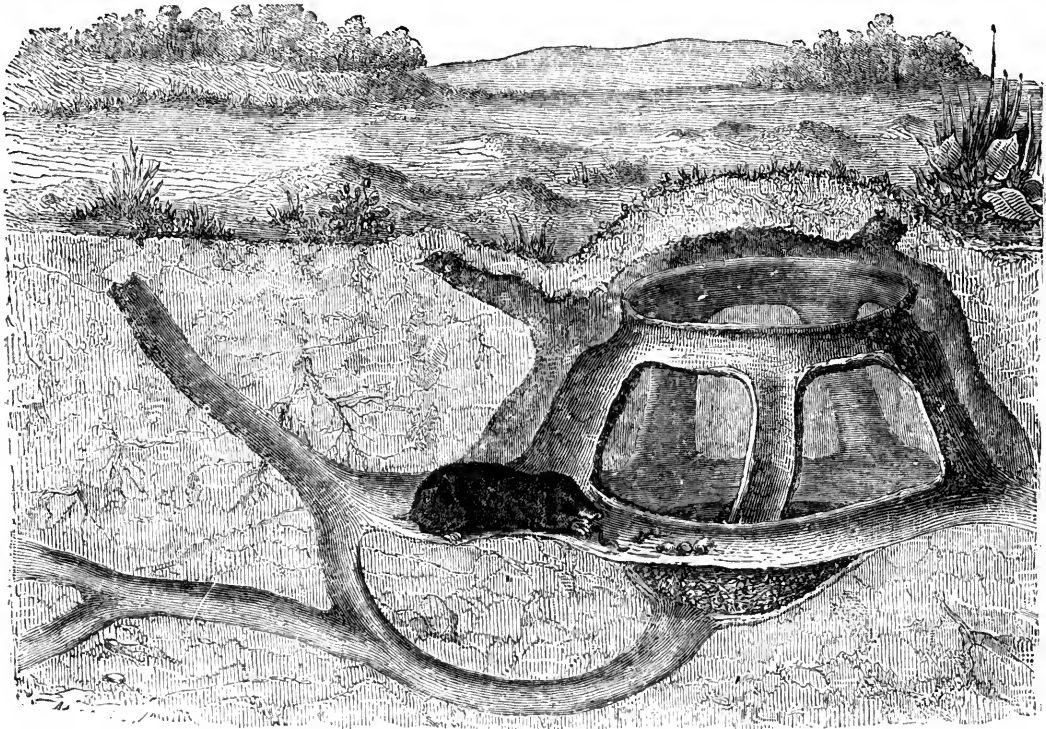
The mole, we may well suppose, has a nursery, which he does not place in the citadel, but at a distance, where a special apartment is formed for the education of his five or six babies. When the infants are able to run about there is plenty of playground, the nest being usually at a spot where three or four roads cross. Most readers will now admit the mole to be an engineer; but they may ask, where are his tools? He always goes about with a patent pickaxe, a shovel, and a boring machine, so beautifully made that the most famous engineers have never been able to equal them. These tools are all combined in one piece, and the reader may see them whenever he takes up a mole. Look at the two fore feet, how like hands they are; see how they are turned sideways, so that as the earth is scooped out it is all flung behind, not to impede the animal's work in front. Notice, in the next place, what an admirable miner's dress the mole wears, and how suited it is to his work! As the passages through which he moves are but just the size of his body, rapid motion would be hindered if the earth stuck to the fur. But no soil can cling to a coat which has the softness and smoothness of the finest velvet, combined with a peculiar surface, repelling the most adhesive mould. The mode in which the fur is inserted in the skin is worthy of notice. Each hair grows from the skin in such a direction that the fur will lie even and close, whether rubbed forwards or backwards, without irritating the mole. But while the fur is thus soft and yielding, the skin itself is hard, and so tough that a very sharp knife is needed to cut through it. A tender skin would have been liable to constant injury by friction against rough ground. See, then, how well the little creature is fitted for his work as an underground engineer. A hand or foot adapted for boring, scooping, and shovelling back the earth; while the fur and skin are beautifully fitted for subterranean operations.

Has the mole eyes? How do our readers answer the question? The ancient Greeks, Romans, and many moderns, have replied by a "No." Let the reader examine for himself. He will find two little, black, shining points deeply fixed in the head, and almost hidden by the fur. These are the eyes. But can the creature really see by these minute organs? The same question occurred to Le Court, and he answered in the proper way by an experiment. Some moles were placed in disused water-pipes, open at the end. If none of the observers stirred, the animals soon made their escape, but if even a finger was put before the opening, they instantly retreated. This seemed to prove the existence of vision. How, then, could such a naturalist as Aristotle deny the possession of sight to the animal? The explanation is easy. There is a species of mole in the South of Europe which has the eyelids quite closed, and which is of course blind. The ancients were probably acquainted with this mole only, and many of the moderns carelessly applied the observations of the old writers to all kinds of moles. Shakespeare describes the animal as "blind," following the notions of his age. But what can a subterranean worker want eyes for? Perhaps one use may be to give notice to the animal of its approach to the surface, the first gleam of light warning the mole back to deeper recesses. Sometimes, too, our underground labourer does leave his dark caves for a moonlight hunt, his

object being to catch and eat as many fat snails as he can find. It is during these nightly rambles that the mole is sometimes snapped up by a hungry owl, in want of a supper for herself and ravenous family. The owl and owlets have, probably, little cause for rejoicing; a severe fit of indigestion must surely be their fate after swallowing the tough skin of the mole.

This animal is a great eater; in what food does he most delight? Earth-worms form the daintiest dinners of the hungry little fellow. But he is a bit of an epicure, objecting to eat the worms until they have been skinned. He is said to perform this operation for himself in the neatest manner. Those who are acquainted with the structure of the earth-worm will not be surprised at the mole's objection to the skin. Even a hungry man would object to a mutton chop with 120 bits of gristle in it. The earth-worm has that number of gristly rings in its body, and the epicure mole is therefore quite justified in separating them with the skin. Of course it is very bad for the worm, but then it is very good for the mole.

How so? Surely his name would not make a good party cry; he could never aid in blinding the eyes of voters, nor is he valuable enough for a bribe. Will the reader be kind enough to imagine himself present at a dinner party of Jacobite gentlemen in the reign of Queen Anne? What toast is that which excites such uproarious applause? They all drink it; every glass is emptied at the words, "Here's to the little gentleman in velvet." What can be meant? One of the party explains that "the little gentleman" refers to the mole which raised the hill against which the horse of William III. stumbled, breaking the royal rider's collar-bone, and thus causing the death of the king. The delighted Jacobites expressed their frantic joy by thus toasting the unknown and unconscious mole. What if the very animal which raised that hillock had been discovered? Surely he would have been feasted on the fattest earth-worms off silver plates while living, would have been embalmed when dead, and preserved as a precious mummy in a golden shrine with rushlights burning round it day and night.



SECTIONAL VIEW OF A MOLE'S NEST AND THE SUBTERRANEAN GALLERIES AND TUNNELS SURROUNDING IT.

We have called this quadruped a teetotaler, for in respect to water, the little fellow may well be called "a thirsty soul." So incessant is the desire to drink, that it actually constructs a series of tanks for collecting and holding water, unless a stream or pond be near.

A mole has what may be called "a bit of a temper," and will fight most desperate battles with its own kind. Especially does this occur when one happens to bore into the gallery of another. The two pugnacious engineers meet; there is no room for passing; perhaps neither will go back; all the dignity of mole nature forbids that; and there is nothing left but "a set to." This is no joking matter to either of the warriors, for the mole's bite is like that of a bull-dog, as any reader may test for himself whenever he catches one of our black little friends alive.

Our mole has the character of being an affectionate husband; in truth, many of his most furious battles are fought in defence of wife and babies. He will often die rather than desert his spouse. The lady mole is sometimes caught in traps, and the devoted husband has been known to perish rather than abandon her. What a nice text this would be for a sermon addressed to certain bipeds!

Politicians have sometimes used the mole in their partisan

Here some may turn from politics to more prosy matters, by asking whether the mole does not do a great deal of mischief. The farmers certainly bring heavy charges against him, but these accusations may be reduced to two—eating or injuring the roots of crops, and disfiguring the meadows by the numerous "hills" which the busy animal throws up. This last result would be in reality a benefit if the agriculturist would level the hillocks, and thus distribute a surface-dressing of rich soil over his land. The reader will see how small are the evils produced by the mole.

A war of extermination has, however, long been waged against our active engineer. In this contest mole-catchers are the field-marshal, the artillery consisting of cleverly devised traps, which only moles of first-rate talent are able to avoid. Great has been the slaughter of the quadrupeds; one "catcher" summed up his own slain at 40,000 moles, and even their enthusiastic historian, Le Court, captured 6,000 in five months. The mole has, we think, made a good fight for life, or not a single one of his race would be now alive. He seems still determined to keep up the "battle of life," and has not given the slightest hint of surrender, or even of emigration. We cannot help honouring such pluck, and wish him all the success he deserves.

LESSONS IN GEOMETRY.—XI.

PROBLEM XXVIII.—To draw a triangle of which the base, the sum of its remaining sides, and one of the angles at the base are given.

Let the straight line *A* represent the length of the base of the required triangle, *n* the sum of its remaining sides, and the angle *c* one of the angles at its base. Draw any straight line, *x y*, of indefinite length, and at any point, *D*, in it, make the angle *y D e* equal to the given angle *c*. Then set off *D F* equal to *A* along *D Y*, and *D G* equal to *n* along *D E*, and join *G F*. At the point *F* in the straight line *G F* make the angle *G F H* equal to the angle *D G F*, producing *F H*, if necessary, until it meets the side *D G* of the triangle *D G F* in the point *H*.

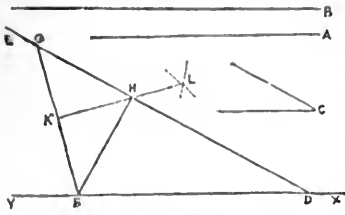


Fig. 38.

The triangle *H F D* is the triangle required, for its base, *D F*, is equal to the given straight line *A*, one of its angles *F D H* is equal to the given angle *c*, and the length of its remaining sides, *D H*, *H F*, taken together, is equal to *n*, for since the angle *H F G* is equal to the angle *H G F*, *H F* is equal to *H G*, and *D G*, or *D H* + *H G*, was made equal to *n*.

The position of the point *H* in the straight line *D G* may also be found by bisecting *F G* in *K*, and drawing *K L* perpendicular to *F G*, and cutting *D G* in *H*.

PROBLEM XXIX.—To draw a triangle having its angles equal to the angles of a given triangle and its perimeter, or the sum of its three sides, equal to a given straight line.

Let the straight line *A B* represent the length of the perimeter, or sum of the three sides of the required triangle, and *C D E* the given triangle to whose angles the angles of the required triangle must be equal. At the extremity *A* of the straight line *A B* make the angle *B A F* equal to the angle *E D C* of the triangle *C D E*, and at its extremity *B*, make the angle *A B G* equal to the angle *C E D*. Bisect the angles *B A F*, *A B G* by the straight lines *A H*, *B K*, and let these straight lines be produced far enough to intersect in the point *L*. From the point *L* draw *L M* parallel to *A F*, meeting *A B* in *M*, and *L N* parallel to *B G*, meeting *A B* in *N*. The triangle *L M N* thus formed is the triangle required, for it is manifest that its angles at *L*, *M*, and *N*, are equal to the angles at *C*, *D*, and *E* of the triangle *C D E*, for the angle *L M N*, by Theorem 2 (page 156), is equal to the angle *B A F*, which was made equal to the angle *C D E*, and the angle *L N M*, by the same Theorem, is equal to the angle *A B G*, which was made equal to the angle *C E D*; and if there be two triangles each one of which has two angles

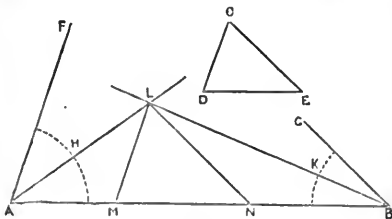


Fig. 39.

which are equal to two angles of the other, the remaining angle of the one must be equal to the remaining angle of the other, since the three angles of every triangle, whether great or small, are together equal to 180 degrees; and as in the triangle *L M N* there are two angles *L M N*, *L N M*, equal to the angles *C D E*, *C E D* of the triangle *C D E*, the remaining angle *M L N* of the triangle *L M N* must be equal to the remaining angle *D C E* of the triangle *C D E*. Now the side *M L* is equal to *M A*, because the angle *M L A* is equal to the angle *M A L*, *M L A* being equal to *L A F* or *H A F*, because they are alternate angles, and *H A F* being by the construction equal to *M A H*. For the same reason the side *N L* of the triangle *L M N* is equal to *N B*. Therefore the perimeter of the triangle *L M N*, or the sum of its sides *L M*, *M N*, *N L*, is equal to the given straight line *A B*.

PROBLEM XXX.—To describe a square that shall be equal in superficial area to the sum of the squares described on two given straight lines.

Let *A* and *B* be the two given straight lines; it is required to

describe a square that shall be equal in superficial area to the squares described on these lines. First draw two straight lines of indefinite length, *p q*, *r s*, intersecting each other at right angles in the point *c*. On *c p* and *c s* set off *c d*, *c e*, each equal to *A*, and on *c r*, *c q* set off *c f*, *c g*, each equal to *B*. Complete the squares *c d h e*, *c f k g*, by Problem XVIII. (page 255) and join *g e*. Upon *g e* construct the square *g e l m*, also by Problem XVIII. The square *g e l m* is equal in superficial area to the squares *c d h e*, *c f k g*, described on the given straight lines *A* and *B* respectively.

Now at first sight it is difficult for any one who is endeavouring by self-tuition to acquire a knowledge of practical geometry, whether for an agreeable change from other pursuits and a useful mental exercise, or to aid him in the pursuance of his calling—and there are many callings, such as those of the carpenter, mason, gardener, wheelwright, etc., in which a knowledge of geometry is indispensable, if he who chooses any one of them as the avocation by which he must earn his daily bread wishes to rise among his fellows, and so deservedly command the reward of his industry and intelligence—it may, we say, seem at first difficult to perceive that the large square *g e l m* is exactly equal in superficial area to the two smaller squares *c d h e*, *c f k g*, taken together. We will, therefore, first give him the means of proving to his satisfaction, by the aid of his compasses and parallel ruler, that it is so, and then endeavour, as in former cases, to deduce from a consideration of Fig. 40 several geometrical facts that may be gleaned from this problem, without the necessity of treating them in separate problems.

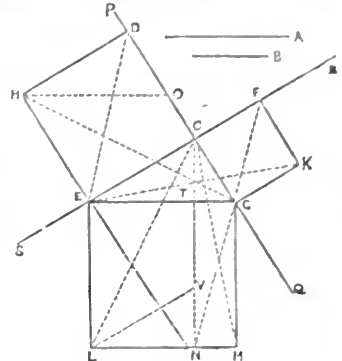


Fig. 40.

And first, for proof positive from ocular demonstration that the area of the large square *g e l m* is equal to the joint area of the smaller squares *c f k g*, *c d h e*. An inspection of the annexed figure, which is drawn on rather a smaller scale than Fig. 40, but in precisely the same proportions, will show the truth of the assertion. The two larger squares are divided into their component parts in the following manner. Through *c* draw *c t* parallel to *g m* or *e l*, meeting *e g* in *t*, in order to fix the point *t*. Then through *t* draw *t u* parallel to *c e*, and *t v* parallel to *c g*. Along *t u* set off *t o* equal to *c g*, and through *o* draw *o x* parallel to *t v* or *c g*, meeting *l m* in *x*, and through *v* draw *v w*, parallel to *t u* or *c e*, meeting *o x* in *w*. Next, for the necessary division of the square *c d h e*, through *c* draw *c z*, parallel to *e g*, and produce *l e*, to meet the straight line *d h* in the point *y*. If this figure be drawn on a piece of paper, and the squares *c f k g*, *c d h e* be cut out and divided, and the pieces put together on the square *g e l m*, so that the pieces numbered 1, 2, 3, 4, 5, in the smaller squares, be placed on the divisions similarly numbered in the large square, it will be found that the area of the large square is exactly equal to the joint area of the smaller squares.

It will be noticed that the straight lines *p q*, *r s* in Fig. 40 were drawn at right angles to each other, and that the straight lines *c g*, *c e*, that were set off along *c q*, *c s* are at right angles to each other necessarily. This is the point in the construction on which the solution of the problem depends, whatever may be the length of *A* and *B*, and to effect it we have only to draw a line equal to *A*, and at right angles to one end make a line equal to *B*, and join the extremities of the

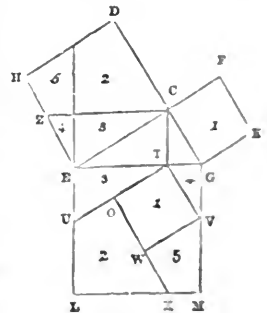


Fig. 41.

lines which have been thus put together at right angles. The triangle formed in this manner, as the triangle $C E G$ in Fig. 40, is a right-angled triangle; and as in the case of this triangle it has been shown practically that the square $C E L M$ described on $C E$, the side which subtends the right angle $E C G$, is equal in superficial area to the squares $C F K G$, $C D H E$, described on the sides $C G$, $C E$, which contain the right angle $E C G$, so it is true that in any and every right-angled triangle the square described on the side which subtends the right angle is equal to the squares of the sides by which the right angle is contained.

But there are yet other facts that may be gathered from an examination of Fig. 40, and a consideration of the dotted lines that are drawn in the figure. First, through the point C the straight line $C N$ is drawn parallel to $G M$ or $E L$, intersecting the straight line $E G$ in the point T , and dividing the square $C E L M$ into the unequal rectangles (see Definition 27, page 53) $T E L N$, $T G M N$. Of these the rectangle $T E L N$ is equal to the square $C D H E$, and the rectangle $T N M G$ equal to the square $C G K F$, as we will proceed to show.

The reader will remember that in Problem XXIV (page 308) it was shown that triangles on the same base and between the same parallels are equal to one another, and that triangles on equal bases and between the same parallels are also equal to one another. Now in the trapezoid (see Definition 31, page 53) $C D H E$, of which the sides $G D$, $H E$ are parallel, there are two triangles, $D H E$, $G H E$. These triangles stand upon the same base $H E$, and between the same parallels $G D$, $H E$, and are therefore equal to one another. But the dotted line $D E$ is a diagonal of the square $C D H E$, and divides it into two equal parts; therefore the triangle $D H E$ is equal to the triangle $C D E$, or, in other words, the square $C D H E$ is double of the triangle $D H E$, and as the triangle $D H E$ is equal to the triangle $G H E$, the square $C D H E$ is also double of the triangle $G H E$; and this brings us to the fact, that when a square and a triangle happen to be on the same base, and between the same parallels, the area of the square is double the area of the triangle.

Now let us turn to the trapezoid $C E L N$, of which the sides $C N$, $E L$ are parallel, and which contains the rectangle, or rectangular parallelogram $E L N T$ within its limits. In this there are also two triangles, $C E L$, $E L N$, standing on the same base, $E L$, and between the same parallels, the parallel sides $E L$, $C N$, of the trapezoid $C E L N$, and these triangles are consequently equal to one another. Now the rectangle $E L N T$ is divided into two equal parts by the diagonal $E N$, and the triangle $E L N$ is therefore equal to the triangle $E T N$, or in other words, the rectangle $E L N T$ is double of the triangle $E L N$, and as the triangle $E L N$ is equal to the triangle $C E L$, the rectangle $E L N T$ is double of the triangle $C E L$. And this teaches us that when a rectangle or right-angled parallelogram and a triangle are upon the same base, and between the same parallels, the area of the rectangle is double the area of the triangle.

And as it is true that when a square and a triangle, or a rectangle and a triangle, are upon the same base and between the same parallels, the area of the square or rectangle, as the case may be, is double that of the triangle, so it is equally true that when a square and a parallelogram, or a rectangle and a parallelogram, are upon the same base and between the same parallels, the areas of the square and rectangle, or the areas of the rectangle and the parallelogram, thus situated, are equal to one another, as may be seen by drawing the straight line $H O$ through H , parallel to $E G$, when we have the square $C D H E$, and the parallelogram $O H E G$ on the same base $E H$, and between the same parallels $H E$, $G D$, equal to one another; and by drawing the straight line $L V$ through L , parallel to $E C$, when we get the rectangle $E L N T$ and the parallelogram $C E L V$ equal to one another.

Parallelograms also on the same base and between the same parallels are equal to one another, and when a parallelogram and a triangle are on the same base, the area of the parallelogram is double the area of the triangle; and more than this, as triangles on equal bases and between the same parallels are equal to one another, so also rectangles and parallelograms on equal bases and between the same parallels are equal to one another.

But to proceed to show that the rectangle $E L N T$ is equal to the square $C D H E$, let us look at the triangle $G H E$, which was proved to be equal to half the square $C D H E$, and the triangle $C E L$, which was proved to be equal to half of the rectangle $E L N T$, and compare their sides and angles. On inspecting

them we find that the side $E L$ of the triangle $C E L$ is equal to the side $E G$ of the triangle $G H E$, each being also a side of the square $C E L M$, and that the side $C E$ of the triangle $C E L$ is equal to the side $E H$ of the triangle $G H E$, each of them being also a side of the square $C D H E$; and the angle $C E L$, contained by the sides $C E$, $E L$ of the triangle $C E L$, is equal to the angle $G E H$ contained by the sides $G E$, $E H$ of the triangle $G H E$, for each of these angles is composed of a right angle and the angle $C E G$, which is common to both, the angle $C E L$ being composed of the right angle $L E G$ and the angle $G E C$, while the angle $G E H$ is composed of the angle $G E C$ and the right angle $C E H$. Here, then, we have two triangles, each having two sides of the one, namely, $G E$, $E H$, equal to two sides of the other, $L E$, $E C$, and the angles contained by these sides equal, namely, the angle $G E H$ to the angle $C E L$; and this being true, it is plain that their bases or third sides are also equal, namely, $H G$ to $C L$; and the areas of the triangles are equal, as we may prove practically by cutting out the triangle $C E L$, and turning it, as on a pivot, round the point E , until it rests on the triangle $G H E$. But the square $C D H E$ has been shown to be double of the triangle $G H E$, and the rectangle $E L N T$ has been shown to be double of the triangle $C E L$, and as things which are double of equal things must be equal to one another, the rectangle $E L N T$ must be equal to the square $C D H E$. In the same way it may be shown that the rectangle $G T N M$ is equal to the square $C F K G$, and the learner is recommended to work out the proof of this as a useful exercise.

READING AND ELOCUTION.—XI.

ANALYSIS OF THE VOICE (continued).

VII.—RIGHT EMPHASIS.

EMPHASIS distinguishes the most significant or expressive words of a sentence.

It properly includes several functions of voice, in addition to the element of force. An emphatic word is not unfrequently distinguished by the peculiar "time," "pitch," "stress," and "inflection" of its accented sound. But all these properties are partially merged, to the ear, in the great comparative force of the sound. Hence it is customary to regard emphasis as merely special force. This view of the subject would not be practically incorrect, if it were understood as conveying the idea of a special force superadded to all the other characteristics of tone and emotion, in the word to which it applies.

Emphasis is either "absolute" or "relative." The former occurs in the utterance of a single thought or feeling, of great energy; the latter, in the correspondence or contrast of two or more ideas.

"Absolute" emphasis is either "impassioned" or "distinctive." The former expresses strong emotion, as:—

False wizard, AVAUNT! *

But the latter designates objects to the attention, or distinguishes them to the understanding, as:—

The fall of man is the main subject of Milton's great poem.

"Relative" emphasis occurs in words which express comparison, correspondence, or contrast, as:—

Cowards die many times; the brave but once.

Rules on Emphasis.

Rule 1.—Exclamations and interjections usually require "impassioned" emphasis, or the strongest force of utterance, as in the following examples:—

Woe! to the traitor, WOE!

UP! comrades, UP!

AWAKE! ARISE! or be for EVER FALLEN!

Ye icefalls!

Motionless torrents! silent cataracts!

Who made you glorious as the gates of heaven,

Beneath the keen full moon?—

God! GOD! the torrents, like a shout of nations,

Utter: the ice-plain bursts, and answers, God!

The silent snow-mass, loosening, thunders, GOD!

* Three degrees of emphasis are usually thus denoted in type: the first by Italic letters; the second, by small capitals; and the third, by large capitals. Thus, "You shall DIE, BASE DOG! and that before you cloud has passed over the sun!"—Sometimes a fourth, by Italic capitals, thus:—NEVER, NEVER, NEVER!

Rule 2.—Every new incident in a narration, every new object in a description, and every new subject in a didactic passage, requires "distinctive" emphasis, or a force of utterance sufficient to render it striking or prominent.

Examples.

Their frail bark was, in a moment, *overset*, and a watery grave seemed to be the inevitable doom of the whole party.

The eye rested with delight on the long, low range of beautifully tinted clouds, which skirted the horizon.

The power of faith was the subject of the preacher's discourse.

Rule 3.—All correspondent, and all antithetic, or contrasted words, require a force sufficient to distinguish them from all the other words in a sentence, and to make them stand out prominently. When the comparison or contrast is of equal force in its constituent parts, the emphasis is exactly balanced, in the words to which it is applied: when one of the objects compared or contrasted is meant to preponderate over the other, the emphasis is stronger on the word by which the preponderance is expressed.

Examples.

The gospel is preached equally to the rich and to the poor.

Custom is the plague of wise men, and the idol of fools.

The man is more knave than fool.

Exercises in "Relative" Emphasis.

VIRTUE || is better than riches.

Study || not so much to show knowledge, as to acquire it.

They went out from us, but they were not of us.

He | that cannot bear a jest, should not make one.

It is not so easy to hide one's faults, as to mend them.

I | that denied thee gold, will give my heart.

You have done that | you should be sorry for.

Why beholdest thou the mote || that is in thy brother's eye, but considerest not the beam || that is in thine own eye?

As it is the part of justice || never to do violence, so it is the part of modesty || never to commit offence.

A friend || cannot be known || in prosperity, and an enemy || cannot be hidden || in adversity.

Emphatic clauses (those in which every word is emphatic) are sometimes pronounced on a lower, sometimes on a higher key, but always with an intense force.

Examples.

Heaven and earth will witness—

IF | ROME | MUST | FALL—that we || are innocent.

This state had then not one ship—NO, NOT | ONE | WALL.

But youth, it seems, is not my only crime: I have been accused || of acting a THEATRICAL part.

As to the present ministry, I cannot give them my confidence. Pardon me, gentlemen: Confidence is a plant of SLOW growth.

General Remark.—Young readers are commonly deficient in emphasis, and hence feeble and unimpressive, in their style of reading. Students should exert much vigilance on this point. At the same time, an overdone emphasis is one of the surest indications of defective judgment and bad taste. Faults which result from study are always the most offensive.

Exercise.—The Duty of a True Christian.

The true Christian must show that he is in earnest about religion. In the management of his worldly affairs, he must let it clearly be seen, that he is not influenced by a worldly mind; that his heart is not upon earth; that he pursues his worldly calling from a principle of DUTY, not from a sordid love of gain; and that, in truth, his treasures are in HEAVEN. He must, therefore, not only "provide things honest in the sight of all men;" not only avoid everything which is fraudulent and unjust in his dealings with others; not only openly protest against those iniquitous practices which the custom of trade too frequently countenances and approves;—but, also, he must "let his moderation be known unto all men." He must not push his gains with seeming eagerness, even to the utmost LAWFUL extent. He must exercise forbearance. He must be content with moderate profits. He must sometimes even forego advantages, which, in themselves, he might innocently take, lest he should seem to give any ground for suspecting that his heart is secretly set upon these things.

Thus, also, with respect to worldly pleasures: he must endeavour to convince men that the pleasures which religion furnishes, are far greater than those which the world can yield. While, therefore, he conscientiously keeps from joining in those trifling, and, too often, profane amusements, in which unwedged men profess to seek their happiness, he must yet labour to show, that, in keeping from those things, he is, in respect to real happiness, no loser, but even a GAINER by

religion. He must avoid everything which may look like *inconsistency* and *gloom*. He must cultivate a *cheerfulness* of spirit. He must endeavour to show, in his whole deportment, the contentment and tranquility which naturally flow from heavenly affections, from a mind at peace with God, and from a hope full of IMMORTALITY.

The spirit which Christianity enjoins and produces is so widely different from the spirit of the world, and so immensely superior to it, that, as it cannot fall of being noticed, so it cannot fall of being admired, even by those who are strangers to its power. Do you ask in what particulars this spirit shows itself? I answer, in the exercises of humility, of meekness, of gentleness; in a patient bearing of injuries; in a readiness to forgive offences; in a uniform endeavour to overcome evil with good; in self-denial and disinterestedness; in universal kindness and courtesy; in slowness to wrath; in an unwillingness to hear or to speak evil of others; in a forwardness to defend, to advise, and to assist them; in loving our enemies; in blessing them that curse us; in doing good to them that hate us. These are genuine fruits of true Christianity.

The Christian must "let his light shine before men, by discharging in a faithful, a diligent, and a consistent manner, the personal and particular duties of his station.

As a member of society, he must be distinguished by a blameless and an inoffensive conduct; by a simplicity and an ingenuousness of character, free from every degree of guile; by uprightness and fidelity in all his engagements.

As a neighbour, he must be kind, friendly, and accommodating. His discourse must be mild and instructive. He must labour to prevent quarrels, to reconcile those who differ, to comfort the afflicted. In short, he must be "ready for every good work;" and all his dealings with others must show the HEAVENLY PRINCIPLE which dwells and works in his HEART.

Exercise.—The Benefits of a Popular Government.

The real glory and prosperity of a nation does not consist in the hereditary rank or titled privileges of a very small class in the community; in the great wealth of the few, and in the great poverty of the many; in the splendid palaces of nobles, and the wretched huts of a numerous and half-furnished peasantry. No! such a state of things may give pleasure to proud, ambitious, and selfish minds, but there is nothing here on which the eye of a patriot can rest with unmingled satisfaction. In his deliberate judgment—

"Ill fares the land, to hastening ills a prey,
Where wealth accumulates, and men decay;
Princes and lords may flourish or may fade;
A BREATH can make them, as a breath has made;
But a BOLD PEASANTRY, their country's pride,
When once DESTROYED, can NEVER be supplied."

It is an intelligent, virtuous, free, and extensive population, able by their talents and industry to obtain a competent support, which constitutes the strength and prosperity of a nation.

It is not the least advantage of a popular government, that it brings into operation a greater amount of talent than any other. It is acknowledged by every one, that the occurrence of great events awakens the dormant energies of the human mind, and calls forth the most splendid and powerful abilities. It was the momentous question, whether your country should be free and independent, and the declaration that it was, which gave to you orators, statesmen, and generals, whose names all future ages will delight to honour.

The characters of men are generally moulded by the circumstances in which they are placed. They seldom put forth their strength, without some powerfully exciting motives. But what motives can they have to qualify themselves for stations, from which they are for ever excluded on account of PLEBEIAN EXTRACTION? How can they be expected to prepare themselves for the service of their country, when they know that their services would be REJECTED, because, unfortunately, they dissent from the established religion, and have the honesty to avow it?

But in a country like OZES, where the most obscure individuals in society may, by their talents, virtues, and public services, rise to the most honourable distinctions, and attain to the highest offices which the people can give, the most effectual inducements are presented. It is indeed true, that only a few who run in the race for political honour, can obtain the prize. But, although many come short, yet the exertions and the progress which they make, are not lost either on themselves or society. The staidness of their talents and characters for some other important station may have perished; at least the cultivation of their minds, and the effort to acquire an honourable reputation, may render them active and useful members of the community. These are some of the benefits peculiar to a POPULAR government; benefits which we have long enjoyed.

LESSONS IN MUSIC.—VI.

FOR Exercise 15, in the following page, the pupil will pitch his own key-note as indicated in the title. If, however, he has not got a tuning-fork, let him take one at a rather low pitch. A stroke beneath two or more notes shows that they are to be sung to one syllable of the words, or "slurred." The comma after a note gives

it a quarter of an aliquot; the dot and comma, three quarters. Be careful in singing this correctly. Exercise yourself in singing the two notes, first with a dot only, and then with a dot and comma between them. The tune is Mr. Burnet's copyright. It may be found harmonised for four voices in "People's Service of Song." All the early exercises in this course are given in two-part harmony, because we are persuaded that, by two-part harmony, the ear is best taught to understand that which is more complex. These exercises should be sung by "equal voices;" that is, by two male voices, or by two female or children's voices. It will not sound quite so well if the air (or upper part) being sung by a female voice, the lower part is sung by a male, for the male and female voice are naturally an octave apart, and the intervals cannot be so "close" and sweet.

When you have traced and sol-faed this tune from the modulator perfectly, your next step will be to "figure" it; that is, sing

it to the words "one, two, three, four, five, six, seven, eight; one, two, three, four, five, six, seven," etc. As you know these words very familiarly, your attention will not be distracted by them (as it might be by other words), while you try to strike the intervals correctly, without that help to the memory which the sol-fa syllables give. You may afterwards sing the words; but remember that this tune must be sung *with spirit* (abrupt decision), or not at all. A curve over or under two or more notes, indicates a slur. In previous exercises we have had a black note (crotchet) to correspond with an aliquot or pulse of the measure. In this tune we have used an open note (a minim) for the aliquot. We prefer using the crotchet as the standard aliquot; but, as it is not always so used, we have made this change to indicate that fact. It makes no difference to the music. There are still four pulses to the measure, and they move at the rate indicated by the metronome.

EXERCISE 15.—GRIFFIN. KEY F. METRONOME, *Minim* = 58.

(Music by H. Burnet, Esq., of Manchester. Words by Longfellow.)

s : d¹ | s . m : d r : m | m : r s : d¹ | s . m : d . r s₁ : t₁ | d : —
 Life is re - - al, life is ear - nest, And the grave is not its goal,
 m : m | m . d : d t₁ : d | d : t₁ t₁ : l₁ | m₁ : f₁ s₁ : s₁ . f₁ | m₁ : —

r . d : r . m | f . m : f . s l . , s : l . t | d¹ : t . l s : d¹ | s . m : d . r s₁ : t₁ | d : —
 Dust thou art, to dust re - turn - est, Was not spo - ken of the soul.
 t₁ . l₁ : t₁ . d | r . d : r . m f . , m : f . r | d : d d : l₁ | m₁ . f₁ s₁ : s₁ | d : —

2 Not enjoyment and not sorrow
 Is our destined end or way,
 But to act that each to-morrow
 Finds us further than to-day.

3 Art is long, and time is fleeting,
 And our hearts, though stout and brave,
 Still, like muffled drums, are beating
 Funeral marches to the grave.

4 Trust no future, howe'er pleasant;
 Let the dead past bury its dead;
 ACT, act in the LIVING PRESENT,
 Heart within, and God o'er head.

5 Let us, then, be up and doing,
 With a heart for any fate;
 Still achieving, still pursuing,
 Learn to labour and to wait.

The proper management of the voice in singing is of great importance, and will require a few suggestions from us. First, notice that a sound of the voice in singing is distinctly held and continues the same from the beginning to the end. It is thus distinguished from the speaking voice, each sound of which has a change in it called an "inflection." A sound of the singing voice is commonly called a "note"—though the word note is more properly limited to the mark upon paper—the sign of a sound. With a violin you can produce either a "note" or an "inflection." Press your finger steadily on the upper part of a string, while you draw the bow, and that will give you a clear and beautiful note. But if, instead of that, you move your finger up or down the string, while you draw the bow, that will give you an inflection. You perceive, therefore, that a note ought to have nothing of the inflection about it—no "scraping" up or down as some sing—but it should be clear, steady, and distinct.

To produce a good note, the singer should be in an easy posture, with his head upright and his shoulders back, so as to allow the muscles of the chest and the larynx (that little box in the throat which we can feel with our fingers) to have free movement. His mouth should be moderately open. His tongue should lie down, just touching the roots of the lower

teeth; and his lips should have the position most easily explained by referring to that of a gentle smile, but really expressing no smile, and giving no emotional expression. Some teachers require a small cork of the thickness of a little finger, or the little finger itself, to be placed between the back teeth during the earlier exercises. We have a friend who, to improve his voice for speaking, used to read aloud for half an hour before breakfast every morning with a large cork between his front teeth. Of course this did not cultivate his enunciation—his words were curiously pronounced—but it strengthened the larynx and lungs, and prevented his over-exertion of the throat, so that he could speak in public with the greatest ease, and without the slightest fatigue of voice, as we have had ample proof, nearly a whole day long.

The pupil who would learn to sing without fatigue, should practise, for a few minutes every day, the taking a full inspiration into the lungs, and then giving out the air very slowly and steadily. This will give him command of the muscles of the chest. He will be surprised, at first, to discover the difficulty of a slow and steady expiration. But let him persevere, making this the first of his exercises for the improvement of his voice, every morning. The next of his morning exercises should be in singing the chord and scale, holding the notes as long and

steadily as possible, and ascending as high as his voice will allow (with the cork, if necessary, to keep his mouth open), and with the most careful observance of the following directions. Expand the ribs, so that they press against the dress at the sides, and, by drawing in the muscles of the lower belly, keep the ribs thus expanded. This will allow free and easy play to the lungs. For courses of exercises on these subjects, see the two small books named in Lesson V.

The sounds of the voice, in singing, should be delivered promptly and easily. If the voice is given out carelessly, it comes roughly through the throat, and is called guttural; and if produced in a forced manner, it is driven through the nose, and so becomes nasal. Correctness in singing depends upon mental effort, for it is the mind which commands the delicate muscles of the larynx and throat. Lazy singing is always flat and miserable; hence we always sing musically better when our hearts are most engaged in the song.

A note may be loud or soft. The loudness or softness of the voice is called its force. It is very important to cultivate the habit of using a medium force of voice, so that it may be always easy to sing a note or strain more loudly or more softly than

the rest. This habit is important to comfort and pleasure in singing, and absolutely necessary for expression and refinement. The medium voice of one person is, of course, different from that of another, according to the size of the larynx and the strength of the lungs.

The suggestions given above must be kept constantly in mind in every daily practice. If you enjoyed the advantage of a private teacher, such points as these would be constantly in his mind, and he would see to it that you observed them. Indeed, one of the chief uses of a private teacher is to keep us to our work. The self-educator, however, must summon to his aid sturdy determination and steady perseverance. A lady went to a distinguished teacher of singing, to receive a course of costly lessons in the art. For a large proportion of these lessons, in the early part of the course, he did not permit her to sing a single note, but made her simply pace the room, expanding her lungs, and taking breath in every way which was required to give her command of the material of which voice is made. We have heard that even the great public singers do not think of omitting the daily practice of the scale and chord in long "holding" notes, as we have recommended.

EXERCISE 16.—LEYBURN. KEY B. M. Crotchet = 66, beating only twice in a measure.

(An old English Ballad Tune. Words by M. A. Stodart, from "Poetry" by the Home and Colonial School Society.)

DA CAPO. §

DAL SEGNO.

2 Right joyously we're singing,
We're glad to make it known,
That we love the laud we live in,
And the Queen upon her throne.

Then hurrah for merry England,
And may we all be seen
True to our well-loved country,
And faithful to our Queen. Then hurrah, etc.

If your friend gives you "pattern" with an instrument, tell him to play in the key of B flat (with two flats), or in that of B (with five sharps), whichever he prefers; one is as easy as the other to you. Take care to point on the modulator without book, and to "figure" the tune (one, two, three, fo-nr, five, si-x, seven; one, two, three, fo-ur, five, six, etc.) before you sing it to

words. Indeed, no song is rightly learned till both tune and words are learned "by heart." You will observe the various "signs of repetition" which are explained in the preceding lesson. A second line of words is given, in each case, for the repetition of the music. The tune is harmonised with a bass in "School Music."

LESSONS IN FRENCH.—XXII.

SECTION XXXVIII.—USES OF REFLECTIVE VERBS (*continued*).

1. THE reflective verb *se passer* is used idiomatically in the sense of *to do without*. It is followed by the preposition *de*, when it comes before a noun or a verb.

Vous passez-vous de ce livre? Do you do without that book?
Je ne puis m'en passer, I cannot do without it.

2. *Se servir* [2, ir.; see § 62], *to use*, also requires the preposition *de* before its object.

Je me sers de votre canif, I use your penknife.
Je ne m'en sers pas, I do not use it.

3. The second example of the two rules above shows that, when the object of those verbs is a thing, it is represented in the sentence by the pronoun *en*.

Je m'en sers; je m'en passe, I use it; I do without it.

4. The pronoun* used as indirect object of a reflective verb, if representing a person, follows the verb [§ 100 (4)].

Je puis me passer de lui, I can do without him.
Je m'adresse à vous et à elle, I apply to you and to her.

5. *S'endormir* [2, ir.; see § 62], *to fall asleep*, and *s'éveiller*, *to awake*, are also reflective.

Je m'endors aussitôt que je me couche, I fall asleep as soon as I go to bed.
Je m'éveille à six heures du matin, I awake at six o'clock in the morning.

6. *S'approcher*, *to come near*, *to approach*; *s'éloigner*, *to draw back*, *to leave*, take the preposition *de* before a noun. Their object, when a pronoun, is subject to Rules 3 and 4 above.

Votre fils s'approche-t-il du feu? Does your son draw near the fire?
Il ne s'en approche pas, He does not come near it.
Il s'éloigne de moi et de vous, He goes from me and from you.

RÉSUMÉ OF EXAMPLES.

Vous servez-vous de ce couteau? Do you use that knife?
Je ne m'en sers pas, il ne coupe pas. I do not use it, it does not cut.
De quels couteaux vous servez-vous? What knives do you use?

Nous nous servons de couteaux d'acier. We use steel knives.

Pouvez-vous vous passer d'argent? Can you do without money?
Nous ne pouvons nous en passer. We cannot do without it.
Vous passez-vous de votre maître? Do you do without your teacher?
Nous nous passons de lui. We do without him.

Vous adressez-vous à ces messieurs? Do you apply to those gentlemen?
Nous nous adressons à eux et à vous. We apply to them and to you.

Vous vous endormez facilement. You go to sleep easily.
Je m'éveille de très-bonne heure. I awake very early.
Pourquoi vous approchez-vous du feu? Why do you come near the fire?

Je m'en approche parce que j'ai froid. I come near it because I am cold.

Nous nous éloignons du feu. We go from the fire.

Nous nous en éloignons. We go from it.

Nous nous approchons de notre père. We go near our father.

Nous nous approchons de lui. We go near him.

VOCABULARY.

Aussi, also.	Encre, f., ink.	Ordinairement, generally.
Àussitôt—que, as soon as.	Feûtre, f., window.	Plume, f., pen.
Canif, m., penknife.	Feu, m., fire.	Pourquoi, why.
Démoiselle, young lady.	Fourchette, f., fork.	Prêt-er, l, to lend.
Domestique, m., servant.	Heure, f., hour, o'clock.	Quart, m., quarter.
	Moins, less, before.	Taill-er, l, to mend.
	Obligé, -e, obliged.	

EXERCISE 71.

1. Pouvez-vous vous passer d'encre? 2. Nous pouvons nous en passer, nous n'avons rien à écrire. 3. Vous servez-vous de votre plume? 4. Je ne m'en sers pas; en avez-vous besoin? 5. Ne voulez-vous pas vous approcher du feu? 6. Je vous suis bien obligé, je n'ai pas froid. 7. Pourquoi ces demoiselles s'éloignent-elles de la fenêtre? 8. Elles s'en éloignent parce qu'il y fait trop froid. 9. Ces enfants ne s'adressent-ils pas à vous? 10. Ils s'adressent à moi et à mon frère. 11. À quelle

* The rule does not apply to the reflective pronoun, which is sometimes an indirect object.

heure vous éveillez-vous le matin? 12. Je m'éveille ordinairement à six heures moins un quart. 13. Vous levez-vous aussitôt que vous vous éveillez? 14. Je me lève aussitôt que je m'éveille. 15. De quels livres vous servez-vous? 16. Je me sers des miens et des vôtres. 17. Ne vous servez-vous pas de ceux de votre frère? 18. Je m'en sers aussi. 19. Les plumes dont [Sect. XXX. 8] vous vous servez sont-elles bonnes? 20. Pourquoi votre ami s'éloigne-t-il du feu? 21. Il s'en éloigne parce qu'il a trop chaud. 22. Pourquoi votre domestique s'en approche-t-il? 23. Il s'en approche pour se chauffer. 24. Vous ennuyez-vous ici? 25. Je ne m'ennuie pas.

EXERCISE 72.

1. Will you lend me your penknife? 2. I cannot do without it, I want it to mend my pen. 3. Do you want to use my book? 4. I want to use it, will you lend it to me? 5. What knife does your brother use? 6. He uses my father's knife, and my brother's fork. 7. Will you not draw near the fire? 8. We are much obliged to you, we are warm. 9. Is that young lady warm enough? [Sect. XXXIII. 3.] 10. She is very cold. 11. Tell her (*dites-lui*) to come near the fire. 12. Why do you go from the fire? 13. We are too warm. 14. Does your brother leave the window? 15. He leaves the window because he is cold. 16. To whom does that gentleman apply? 17. He applies to me and to my brother. 18. Why does he not apply to me? 19. Because he is ashamed to speak to you. 20. Do you awake early every morning? 21. I awake early when I go to bed early. 22. Why do you go to sleep? 23. I go to sleep because I am tired. 24. Are you afraid to go near your father? 25. I am not afraid to approach him. 26. Can you do without us? 27. We cannot do without you, but we can do without your brother. 28. Do you want my brother's horse? 29. No, Sir, we can do without it. 30. Do you intend to do without money? 31. You know very well that we cannot do without it. 32. Is your brother weary of being here? 33. He is not weary of being here. 34. Come near the fire, my child.

LESSONS IN ARITHMETIC.—XX.

RATIO AND PROPORTION.

1. IN comparing two numbers or magnitudes with each other, we may inquire either by *how much* one is greater than the other, or *how many times* one contains the other.

This latter relation—namely, that which is expressed by the *quotient* of the one number or magnitude divided by the other—is called their *Ratio*.

Thus the ratio of 6 to 2 is $6 \div 2$, or 3. The ratio of 7 to 5 is $7 \div 5$, or, as it would be written, the fraction $\frac{7}{5}$. The two numbers thus compared are called the *terms* of the ratio. The first term is called the *antecedent*, the last the *consequent*. It will be seen that any ratio may be expressed as a fraction, the antecedent being the numerator, and the consequent the denominator. A ratio is, in fact, the same thing as a fraction. When we talk of a ratio, we regard the fraction from rather a different point of view, namely, as a means of comparing the magnitude of the two numbers which represent the numerator and the denominator, rather than as an expression indicating that a unit is divided into a number of equal parts, and that so many of them are taken.

2. The ratio of two numbers is often expressed by writing two dots, as for a colon, between them. Thus the ratio of 6 to 3 is written $6 : 3$; that of 3 to 5, $3 : 5$, etc.

The expressions $\frac{3}{5}$ and $3 : 5$, it must be borne in mind, mean exactly the same thing.

A *direct* ratio is that which arises from dividing the antecedent by the consequent.

An *inverse* or *reciprocal* ratio is the ratio of the *reciprocals** of the two numbers. Thus, the inverse ratio of $3 : 5$ is the ratio of $\frac{1}{3} : \frac{1}{5}$, or otherwise expressed $\frac{5}{3}$, which is the same as $\frac{5}{3}$, or otherwise expressed, $5 : 3$.

Hence we see that the inverse ratio of two numbers is expressed by inverting the order of the terms when the ratio is

* The reciprocal of a number or fraction is the number or fraction obtained by inverting it. Thus, the reciprocals of $5, \frac{1}{2}, \frac{3}{4}$, etc., are respectively $\frac{1}{5}, 2, \frac{4}{3}$, etc.

expressed by points, or by inverting the fraction which expresses the direct ratio.

A ratio is said to be compounded of two other ratios when it is equal to the product of the two ratios. Thus, $\frac{12}{3}$ is a ratio compounded of the ratios $\frac{4}{3}$ and $\frac{3}{1}$.

3. Proportion.

Different pairs of numbers may have the same ratio. Thus, the ratios $\frac{3}{4}$, $\frac{6}{8}$, $\frac{9}{12}$, are all equal.

When two pairs of numbers have the same ratio, the four numbers involved are said to form a proportion; and they themselves, in reference to this relation subsisting among them, are called proportionals. Thus, 3, 4, 12, 16, are proportionals, because the ratio $\frac{3}{4}$, or $3 : 4 =$ the ratio $\frac{12}{16}$, or $12 : 16$.

A proportion is expressed either by writing the sign of equality (=) between the two equal ratios, or by placing four dots in the form of a square, thus, :: between them.

Thus, the proportionality of 3, 4, 12, 16, might be expressed in any one of the three following ways:—

$$\frac{3}{4} = \frac{12}{16}; \quad 3 : 4 = 12 : 16; \quad 3 : 4 :: 12 : 16.$$

The last expression would be read, 3 is to 4 as 12 is to 16.

The first and fourth terms of a proportion are called the extremes; the middle two, the means.

4. If four numbers be proportional, the product of the extremes is equal to the product of the means.

Take any proportion, 3 : 4 :: 9 : 12, for instance. Expressing this in the fractional form, we have $\frac{3}{4} = \frac{9}{12}$, and reducing these fractions to a common denominator 12×4 , we get—

$$\frac{12 \times 3}{48} = \frac{4 \times 9}{48}, \text{ or } 12 \times 3 = 4 \times 9.$$

Now, 12 and 3 are the extremes, and 4 and 9 are the means, of the given proportion.

Conversely, if the product of two numbers is equal to the product of any other two numbers, the four numbers will form a proportion. Thus, since—

$$8 \times 3 = 6 \times 4 \quad 8, 4, 6, 3 \text{ form a proportion;}$$

$$\text{or, } 8 : 4 :: 6 : 3;$$

$$\text{Or we may write it thus, } 8 : 6 :: 4 : 3;$$

$$\text{or, } 3 : 6 :: 4 : 8;$$

$$\text{or, } 4 : 8 :: 3 : 6;$$

$$\text{or, } 4 : 3 :: 8 : 6.$$

Thus we see that either product may be separated to form the extremes, and that, the order of either the means or the extremes being interchanged, the numbers still form a proportion.

5. If three numbers be given, a fourth can always be found which will form a proportion with them.

This is the same thing as saying that if three terms of a proportion be given, the fourth can be found.

Take any three numbers—3, 4, 5, for instance. Then we have
3 : 4 :: 5 : fourth term.

Therefore—

$$3 \times \text{fourth term} = 5 \times 4 \text{ (since the products of the means and extremes are equal).}$$

Therefore, dividing both of these equalities by 3—

$$\text{Fourth term} = \frac{5 \times 4}{3}, \text{ the required number.}$$

Here we have found the fourth term, but we could in the same way find a number which would form a proportion with the three given numbers when standing in any of the terms. For instance, for the second term we should have—

$$3 : \text{second term} :: 4 : 5,$$

and therefore—

$$4 \times \text{second term} = 5 \times 3.$$

Hence, dividing both of these equalities by 4—

$$\text{second term} = \frac{5 \times 3}{4},$$

and similarly for the other two terms.

The most important application of proportion is the solution of examples of this kind, where three terms of a proportion are given to find a fourth. This is what is usually called Rule of Three, which will be dealt with in a future lesson.

6. It is evident that if the two terms of a ratio be multiplied or divided by the same quantity, the ratio is unaltered.

Any set of numbers are said to be respectively proportional to any other set containing the same number when the one set can be obtained from the other by multiplying or dividing all the numbers of that set by the same number. Thus, 3, 4, 5 are proportional respectively to 9, 12, 15, or to $\frac{3}{2}$, $\frac{4}{3}$, $\frac{5}{4}$.

7. To divide a given number into parts which shall be proportional to any given numbers.

Add the given numbers together, and then, dividing the given number into a number of parts equal to this sum, take as many of these parts as are equal to the given numbers respectively.

EXAMPLE.—Divide 420 in proportion to the numbers 7, 5, and 3.

$$7 + 5 + 3 = 15;$$

And therefore the respective parts are—

$$\frac{7}{15} \times 420 = 196.$$

$$\frac{5}{15} \times 420 = 140.$$

$$\frac{3}{15} \times 420 = 84.$$

These parts are evidently in the proportion of 7, 5, and 3, and their sum, $196 + 140 + 84 = 420$.

8. The same method will apply if the given number or quantity is to be divided proportionally to given fractions.

EXAMPLE.—Divide 266 into parts which shall be respectively proportional to $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{1}{4}$.

Following exactly the same method as before, the answer, without reduction, would be—

$$\frac{\frac{1}{2}}{\frac{1}{2} + \frac{2}{3} + \frac{1}{4}} \times 266, \frac{\frac{2}{3}}{\frac{1}{2} + \frac{2}{3} + \frac{1}{4}} \times 266, \text{ and } \frac{\frac{1}{4}}{\frac{1}{2} + \frac{2}{3} + \frac{1}{4}} \times 266.$$

Or we may proceed thus:—

Reducing the fractions to their least common denominator, which is 60, we get—

$$\frac{30}{60}, \frac{40}{60}, \text{ and } \frac{15}{60}.$$

Now these fractions are proportional respectively to 40, 45, 48.

Hence we have to divide 266 in the proportion of 40, 45, and 48, to which the required answer is, since $40 + 45 + 48 = 133$,

$$\frac{40}{133} \times 266, \frac{45}{133} \times 266, \text{ and } \frac{48}{133} \times 266,$$

or 80, 90, and 96.

EXERCISE 41.

Find in their simplest form:—

1. The ratio of 14 to 7, 36 to 9, 8 to 32, 54 to 6.
2. The ratio of 324 to 81, 802 to 99.
3. The inverse ratio of 4 to 12, and of 42 to 6.
4. Find the fourth term of the proportions, 3 : 5 :: 6 : —; 4 : 8 :: 9 : —; $\frac{1}{2} : \frac{3}{4} :: \frac{5}{6} : —$.
5. Insert the third term in the following proportions—3 : 5 :: — : 6; 4 : 8 :: — : 9; $\frac{1}{2} : \frac{3}{4} :: — : \frac{5}{6}$.
6. Insert the second term in the following proportions—3 : — :: 5 : 6; 4 : — :: 8 : 9; $\frac{1}{2} : — :: \frac{3}{4} : \frac{5}{6}$.
7. Insert the first term in the following proportions— — : 3 :: 5 : 6; — : 4 :: 8 : 9; — : $\frac{1}{2} :: \frac{3}{4} : \frac{5}{6}$.
8. Find a fourth proportional to 2:13, 5:7, and 3:14:50, correct to 5 places of decimals.
9. Divide 100 in the ratio of 3 to 7.
10. Two numbers are in the ratio of 15 to 34, and the smaller is 75; find the other.
11. What two numbers are to each other as 5 to 6, the greater of them being 240?

*** As tests by which the correctness of the processes of addition, subtraction, multiplication, and division may be ascertained, were given in Lessons in Arithmetic, II. to V., it has not been thought requisite to give answers to the Exercises already given in abstract Arithmetic. The answers will, however, be supplied to future examples in concrete Arithmetic.

MECHANICS.—IX.

THE STEELYARD.

ANOTHER weighing instrument is the steelyard, which (Fig. 54) is a lever of the first order, to the short arm of which is attached at *b* a hook from which the substance, *w*, to be weighed is suspended, while on the long arm slides the movable counterpoise *p*. The object aimed at in this instrument being that a small weight, *p*, should balance a large one, *w*, on the hook, it is clear that there must be a corresponding disproportion in the arms—the fulcrum, *a*, must be near one of the ends of the beam. Further, since it is necessary that the steelyard should take an horizontal position, both when loaded and unloaded at its hook,

it is essential that its own centre of gravity should lie somewhere on the short arm; for then the counterpoise can balance it when placed in some position on the other arm, such as that marked *o*, in the figure. For this reason steelyards are made heavy at one end.

To Graduate a Steelyard.—The centre of gravity of the beam being on the hook side of the fulcrum, let it be brought into an

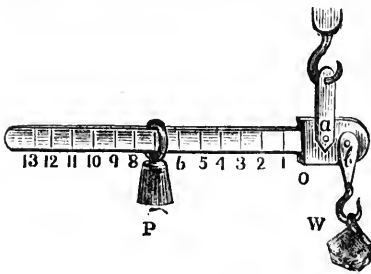


Fig. 54.

horizontal position, no weight being on the hook. Then, as proved in Lessons VII. and VIII., the moment of *P* is equal to the moment of the beam, that is, the weight of the beam multiplied into the distance of its centre of gravity from a vertical line through the fulcrum, is equal to *P* multiplied into the

distance of *o* from that line. At the point *o* so found draw a line across the beam; that line represents the *zero* division of the long arm, or the division at which *P* produces equilibrium, the weight on the hook being nothing, cipher, or zero.

Now, supposing that any number of pounds, *w*, of any substance are hung on the hook, while *P* is shifted to the left until, as in the figure, the arm is again horizontal, we have *P* multiplied by the distance of its ring from the fulcrum *a* equal to *w* multiplied by *ab* (this line *ab* being supposed horizontal), together with the moment of the beam. But *P* multiplied by the distance of the zero division from *a*, is equal to the moment of the beam, as already proved; therefore it follows that *P* multiplied by its distance from the zero division is equal to *w* multiplied by *ab*. Now, in order to graduate, let us suppose *P* one pound and *w* seven. Then we have in numbers seven times *ab* equal once the distance of the counterpoise from *o*, which tells us the exact position of *P* for 7 pounds on the hook, namely, that you find it by measuring from *o* to the left seven pieces each equal to *ab*. Let *w* be 13 pounds or 3 pounds, then in like manner you measure 13 or 3 pieces equal to *ab*. It thus appears that the subdivisions for the successive pounds are equal to each other; and we may therefore lay down the following rule for graduating a steelyard:—

Find first the zero subdivision by bringing the unloaded instrument into an horizontal position by the counterpoise. Put then on the hook, or in the pan, such a number of even pounds as will push the counterpoise to the greatest distance it can go on its arm for even pounds, and divide the distance between this last position and the zero point into as many equal parts as there are then pounds on the hook. The points of division so obtained are the positions of the counterpoise for the several pounds up to that number.

For half and quarter pounds these divisions must be subdivided; and for greater weights than one pound will balance on the long arm, the counterpoise must be doubled or trebled, etc. If the steelyard be intended for weighing small objects, such as letters, the counterpoise may be ounces, or tenths of an ounce, or even smaller weights, as occasion requires. It thus appears that the construction of a steelyard is very simple, and that any handy person of a mechanical turn may make one of steel or iron, or even of a piece of hard wood, without much trouble.

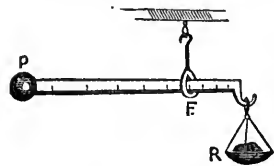


Fig. 55.

THE DANISH BALANCE.

This is a species of steelyard, in which (Fig. 55) the fulcrum is movable, and the counterpoise is the weight of the beam acting at its centre

of gravity, *P*, the substance to be weighed being suspended from a hook or placed in a pan, at the extremity, *R*, on the other side of the fulcrum. The question is, how may you graduate such an instrument? To do this, let us suppose the beam to weigh 1 pound, and that 1 ounce of some substance is placed in the scale; then it is evident that the fulcrum, *F*,

must be shifted to the point in which *P R* is to *F P* in the proportion of 16 to 1, there being 16 ounces in the pound. This comes to dividing the distance *R P* (which is known) into seventeen equal parts, as proved in Lesson IV., and taking the first point of division next to *P* for the fulcrum. If there be 2 ounces in the pan, *R P* must be to *F P* as 16 to 2; that is, you divide *R P* into 18 parts, and take the fulcrum 2 from *P*. If there be 7 ounces, you divide into 23 parts, and take 7 next to *P*; and so on for all the ounces from 1 to 16 you may determine the several positions of the fulcrum, marking them as you proceed. If the beam be of any other weight, you follow a similar course, dividing *R P* into as many equal parts as there are ounces in the sum of the weights of the beam and substance, and counting off as many divisions from *P* as there are ounces in the latter.

From all this it is evident, *first*, that the subdivisions are not equal to each other, as in the steelyard; *secondly*, that the operation of graduation is more troublesome than in that instrument. The Danish balance, however, has the advantage of not being encumbered with a movable counterpoise; it carries its own imperial standard weight within itself.

THE BENT LEVER BALANCE.

The principle of this instrument, a species of which is largely sold for weighing letters, may be understood by the aid of the accompanying Fig. 56. On an upright stand is placed a quadrant arc, *m o*, of which *c* is the centre. Round *c* as a fulcrum revolves a lever, usually bent, but in the figure represented as formed of two arms at right angles to each other. The arm *CB* is generally of small weight, being lightly constructed, while the other, *CG*, called the "index arm," is heavily weighted at its lower end, the centre of gravity of the whole lever thus being nearly

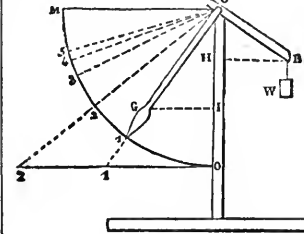


Fig. 56.

at some point, *o*, on that arm. On some substance, *w*, to be weighed, being suspended from *B*, the index moves from its zero point, *o*, up the quadrant until the weight of the lever acting at *G* balances *w* at *B*, that is, until the moments of these forces are equal, which will be when *w* multiplied by *B H* is equal to the weight of the lever multiplied by *G I*. The divisions of the quadrant corresponding

to the several weights 1, 2, 3, 4, etc., suspended from *B* arc, however, best determined by experiment for each weight.

THE LEVER WHEN THE FORCES ARE NOT PARALLEL.

In all the cases of levers and weighing instruments we have so far considered, the forces were supposed parallel—in weighing instruments necessarily so. The treatment of the subject is, however, not complete until the condition of equilibrium is determined for levers the forces acting on which are not parallel. This is the most general case that can occur, and indeed it includes all the others. To clearly understand it, let a lever be defined a *mass of matter of any shape which has one fixed point in it*. It may be a bar straight, or simply bent, or bent and twisted, or it may be a solid block. So long as there is one point fixed, we may treat it as a lever, that point being the fulcrum.

Moreover, the two forces which act on it are supposed to be such that their directions when produced meet, and that their plane passes through the fulcrum. In cases where the two forces do not meet, or their plane does not pass through the fulcrum, there cannot be equilibrium. For example, the outstretched right arm of a man is a lever, of which the fulcrum is in the right shoulder. Suppose, as he stretches it before him in a horizontal position, one force is applied to the hand obliquely from him towards the left to the ground, while another acts horizontally at his elbow towards the right and at right angles to the arm; these forces cannot meet, and therefore would not under any circumstances keep the arm in equilibrium; further, even were they to meet, they would not so keep it unless their plane passed through the fulcrum in the shoulder socket. Supposing the forces, therefore, to be as described, namely, that their directions meet and their plane passes through the fulcrum,

what is the condition of equilibrium? In order that you may clearly understand this, the knowledge of the following geometrical principles is necessary.

FURTHER PROPERTIES OF A PARALLELOGRAM AND TRIANGLE.

1. *The area of a triangle is half that of any parallelogram which has its base for one side, and a line drawn through its vertex parallel to that base for the side opposite.*—This appears from Fig. 57, where $A V B$ is the triangle, and $A B C D$ any parallelogram on $A B$ formed by drawing from A and B any two parallel lines $A D, B C$ to meet the parallel $D C$ to $A B$ through V . For, draw $V E$ parallel to $A D$, and therefore parallel to $B C$, to meet $A B$ in E . Then the triangle $A V B$ is made up of the two triangles $A V E$ and $B V E$. But since $A E V D$ is a parallelogram, the triangle $A V E$ (Lesson III.) is equal to $A D V$, and is therefore half the parallelogram $A E V D$. So likewise is $B V E$ half $B E V C$; and therefore the triangle $A V B$ half $A B C D$.

2. *The area of a triangle is, in numbers, half the product of its base and the perpendicular from its vertex on that base.*—This follows from the previous principle. Let the number of inches or feet, say inches, in $A B$ (Fig. 58) be 6, and in the perpendicular, $V E$, be 7, and construct on $A B$ a parallelogram, $A B C D$, whose sides are parallel to this perpendicular. Such a parallelogram is termed a "rectangle," on account of its angles being all right angles. Mark out the inches on $A B$ and $V E$, and draw the dotted lines in the figure parallel to $A B$ and $V E$, cutting this rectangle into the smaller ones the sides of which are all equal to one inch, and which are therefore so many square inches. Now there are seven rows of these squares, one row above the other, and there are six squares in each row; and therefore there are altogether 7 times 6, or 42, square inches in the rectangle. But the triangle being half the rectangle, is half of 42 square inches, that is, it is, in numbers, half the product of the base and perpendicular. Were the numbers 13 and 9, or any other pair whatever, the reasoning would be the same.

3. *If two triangles stand on opposite sides of a common base, and the line joining their vertices is bisected by that base, the triangles have equal areas.*—In Fig. 59, the triangles $A B C, A B D$ stand on the common base, $A B$, at opposite sides, and $D C$ joining their vertices is supposed to be bisected at M ; I have to prove that the areas of the triangles are equal. Draw $E F$ and $H G$ through A and B parallel to $D C$, and also through D and C draw $H E$ and $G F$ parallel to $A B$. Then we have a large parallelogram $E F G H$, which is divided into four smaller ones by $A B$ and $D C$. But since $D C$ is bisected at M , making $M C$ equal to $M D$, and therefore $A E$ equal to $A F$, the parallelograms $A F G B$ and $A E H B$ are equal to each other. But, as proved above, the triangles $A B C$ and $A B D$ are half of these parallelograms, and therefore are also equal to each other, as was required to be proved.

We now return to our Mechanics, applying these geometrical principles to determine

THE MOMENTS IN THE LEVER OF FORCES NOT PARALLEL.

Two such forces, $A P, A Q$ (Fig. 60), being supposed to meet at some point, A , to which they are transferred, and there compounded into a resultant $A R$, represented by the diagonal of the parallelogram, $A P R Q$, and O being a point taken at random on that diagonal, we can prove the following proposition:—

The moments of two intersecting forces in reference to any point on their resultant are equal to each other.—Now the moment of a force in reference to a point, as has been already explained, is the product of the force by the perpendicular dropped on it from that point. In Fig. 60, therefore, the moment of $A P$ in reference to O , a point on the resultant, is $A P$ multiplied into $O X$,

the perpendicular from O on $A P$. So likewise is the moment of $A Q$ in reference to O equal to $A Q$ multiplied into $O Y$, the corresponding perpendicular. What I have then to prove is that these products are equal. But they are equal; for, from the second geometrical principle above, the areas of the triangles $A O P, A O Q$, are half these products; and, by the third, since these triangles stand on the common base $A O$, and the line $P Q$ is bisected by $A E$, that is, by that base, their areas are equal. The moments of $A P$ and $A Q$, therefore, in reference to O are equal, as I undertook to prove.

Now, to apply this to the lever, using the same figure, let us suppose the two forces to be $A P, A Q$, meeting, as I have stated to be necessary, at some point A . Then it is evident, since there is but one point fixed in the body, that there cannot be equilibrium unless the resultant of $A P$ and $A Q$ passes through that point, and is there resisted by the supports that fix it. The fulcrum, therefore, you see, must be on the resultant, and therefore taking O to be the fulcrum, we must have $A P$ multiplied into $O X$ equal to $A Q$ multiplied into $O Y$, that is, the moments of the forces in reference to the fulcrum must be equal. We arrive thus at the two following modes of stating the condition of equilibrium in a lever, either of which may be selected for use as the occasion requires:—

1. In a lever, the forces not being parallel, the power multiplied by the perpendicular from the fulcrum on its direction is equal to the resistance multiplied by the perpendicular on its direction.

2. The power and resistance are to each other *inversely* as the perpendiculars dropped from the fulcrum on their respective directions.

THE WHEEL AND AXLE.

This useful mechanism, of which several forms are given in Figs. 61, 62, and 63, is a kind of lever, or succession of levers, revolving round an axis, from which they project at right angles.

Corresponding to this central axis line is a cylindrical axle of some thickness, round which winds the rope which bears the resistance, or weight, to be raised. In Fig. 61 is the simplest form of the instrument, consisting of an horizontal axle and four levers, which are worked in succession by the power. In the ship's capstan for raising the anchor (Fig. 62), the resistance acts horizontally at the end of each lever, the power being multiplied in the proportion of the number of levers and men. We have in Fig. 63 another form, where the levers are the spokes of a wheel, and the power A works in succession on them along the tire as they come round.

The principle in all is the same, whether the resistance and power be parallel or not, and may be understood from Fig. 64, which represents a transverse section, the outer circle being the wheel and the inner the axle. The central line of the axle, which you must conceive perpendicular to the paper at the centre of these circles, is the fulcrum, represented by the point O . The line $A N$ thus is seen to be the lever, at the ends of which the power, P , and resistance, R , act; and, as already proved, these forces must be *inversely* as $O A$ to $O B$, which lines are the radii of the wheel and axle respectively. When the power and resistance act parallel to each other this is evident; but the same holds good were they not so to act, as in the capstan, where the power is continually changing direction as the sailors go round; for, referring again to Fig. 64, if the power were to act not in the

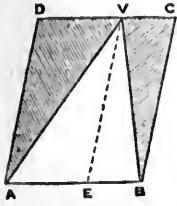


Fig. 57.

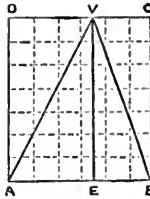


Fig. 58.

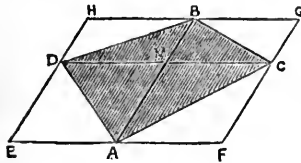


Fig. 59.

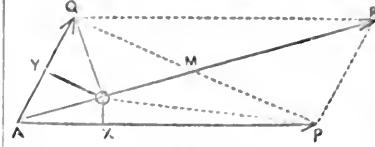


Fig. 60.

the second geometrical principle above, the areas of the triangles $A O P, A O Q$, are half these products; and, by the third, since these triangles stand on the common base $A O$, and the line $P Q$ is bisected by $A E$, that is, by that base, their areas are equal. The moments of $A P$ and $A Q$, therefore, in reference to O are equal, as I undertook to prove.

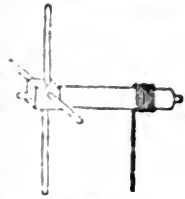


Fig. 61.

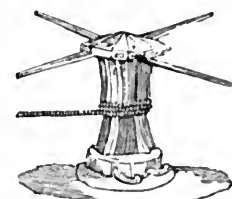


Fig. 62.

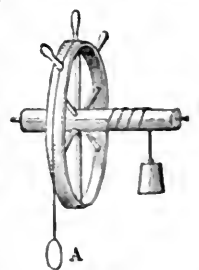


Fig. 63.

LESSONS IN GERMAN.—XXI.

SECTION XL.—PECULIAR IDIOMS—(continued).

line A P, but along any other tangent to the large circle, the perpendicular from the fulcrum o on its direction would still be the radius of the wheel; and, by the general principle of the lever established in this lesson, the power and resistance would be still *inversely* as the radii of wheel and axle.

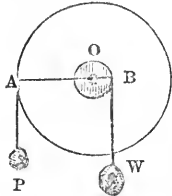


Fig. 64.

A treadmill, used for punishment in prisons, is another instrument of this kind, the power being the weight of the prisoners ascending the steps placed on the outside of the wheel, and the resistance the weight of the water pumped, the corn ground, or other work done. The windlass is another, turned generally by a winch handle, and used to raise water from wells, or lift goods into stores. In Fig. 21 (page 188) the reader will find an example of the utility of the wheel and axle as a mechanical power in the crane, by which two men, by turning the winch-handle attached to the axle, are able to lift a horse out of the steamer alongside of the quay.

A particular form of the windlass, which was first invented in China, and which may therefore be called the "Chinese windlass," is given in Fig. 65, where only the axle is represented, consisting of two parts, one thicker than the other, but both forming one solid piece. The winch handle, or wheel, is to the right connected with the larger axle. The weight to be raised is suspended from a hook attached to a pulley, round which the lifting rope passes, one part winding round the thick axle while the other unwinds from the thin. The weight with each turn of the wheel ascends by the difference between the length of the rope that winds and unwinds, that is, by the difference between the circumferences of the two axles. Moreover, since the weight is equally divided between the two ropes which ascend from the pulley, the force acting at the circumference of each axle is *half the weight*.

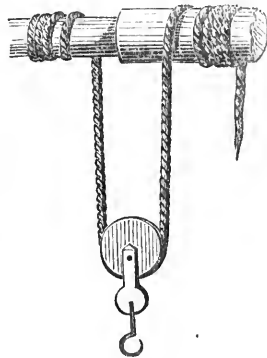


Fig. 65.

It is evident, moreover, that the power applied to the winch handle has to balance the difference of the actions of these forces at the axle, or the moment of the power must be equal to the difference of the moments of these forces. But each force being half the weight, its moment is half the weight multiplied by the radius of the axle at which it acts; and therefore their difference is equal to half the weight multiplied by the difference of the radii of the axles, or, which comes to the same thing, to the weight into half the difference of these radii. But the moment of the power being that force into the radius of the wheel, we immediately learn that—

In the Chinese windlass the power multiplied by the radius of the wheel is equal to the resistance multiplied by the difference of the radii of the axles.

THE COMPOUND WHEEL AND AXLE.

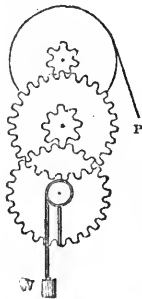


Fig. 66.

This is a combination of wheels and axles, of the kind already explained, made for the same purpose as the similar combination of levers in Lesson VIII., namely, the mechanical advantage of a multiplication of the effect of the power. The wheel and axle being once clearly understood to be a lever, there can be no difficulty in extending the rule which holds good of the compound lever to this combination. In Fig. 66 is such a combination. By cogged teeth the axle of each wheel works on the circumference of the next succeeding, the power, P, being applied by a rope to the circumference of the first wheel, which does not require teeth. It is evident that, as explained of the compound lever, the condition of equilibrium must be that—

In the compound wheel and axle, the power is to the resistance as the product of the radii of the axles is to the product of the radii of the wheels.

Was für ein (§ 66. 5), literally, *what for a*, answers to the English "what kind of," or simply "what;" as:—Was für ein Buch haben Sie? *what kind of a book have you?* Was für ein Messer ist das? *what kind of a knife is that?* Für, in this connection, loses its prepositional character, and may precede any case, as:—Was für Bücher sind dies? *what kind of books are these?* Was für Bücher haben Sie? *what kind of books have you?* Mit was für einem Buche find Sie beschäftigt? *with what kind of (a) book are you employed?*

1. Was für is likewise used in the way of exclamation, corresponding to "what," as:—Was für Thorheit! *what folly!* Was für ein Mann! *what a man!* Welch, abbreviated from welcher, is used in the same manner, as:—Welch ein Mann! *what a man!*

2. Jeder and jeglicher are often preceded by the indefinite article, and are then, accordingly, inflected after the Mixed Declension. (Sect. X.) They are never used in the plural, as:—Der Tod jedes Menschen, or eines jeden Menschen ist gewiß, *the death of every man is certain.* Ein Jeder muß sterben, *every one must die.*

3. Aller, unlike the English "all," is joined directly to its noun without any article intervening, as:—Aller Wein, *all the wine.* Alles Wasser, *all the water, etc.*

Our word "all," when connected with the names of countries, towns, etc., as also in such phrases as "all day, all the time, all my life," etc., is not expressed in German by all, but by ganz, as:—Ganz Europa, *all Europe.* Ganz Böhmen, *all Bohemia.* Die ganze Schweiz, *all Switzerland.* Den ganzen Tag, *all the day, or the whole day.* Die ganze Zeit, *mein ganzes Leben, etc.*

All or all, in some elliptical phrases, is equivalent to our "all gone," "no more," and the like, as:—Sein Geld ist all, *his money is all gone.*

4. Mancher answers to "many a," as:—Mancher Reiche ist unglücklich, *many a rich man is unhappy.*

5. Solcher is often preceded by the indefinite article, as also by kein, and is then, like jeder and jeglicher, inflected after the Mixed Declension, as:—Er ist eines solchen Lebens nicht würdig, *he is not worthy of such a (a such) life.* Ich habe kein solches Buch, *I have no such book.*

6. Aller, mancher, solcher (and welcher, see R. 1) often drop the last syllable, and are then undeclined. Thus, aller, when it precedes a *pronoun*, is often abbreviated to all; mancher, when it precedes an *adjective*, often becomes manch; solcher (as also welcher) is always thus abbreviated when it precedes the *indefinite article*, as also, sometimes, when it precedes an *adjective*, as:—Ich habe all mein Geld verloren, *I have lost all my money.* Ich habe all diese Bücher gekauft, *I have bought all these books.* Manch ehrlicher Mann ist arm, *many an honest man is poor.* Solch ein Tag ist angenehm, *such a day is agreeable.* Solch schönes Papier ist theuer, *such beautiful paper is dear, etc.* It should however be noted, that, as in the above examples, when the abbreviated form is followed by an adjective, this latter, instead of being inflected after the New Declension (Sect. IX. 2), follows that of the Old (§ 29).

7. Einiger and etlicher are regularly declined. They are nearly synonymous, and answer to our words "some, a few," etc., as:—Er sprach nur einige Worte, *he spoke only a few words.* Er hat noch etliche Freunde in Deutschland, *he has still some friends in Germany.* Er wohnt in einiger Entfernung von der Stadt, *he resides at some, or a little distance from the city.* Nach einiger Zeit kam er, *after some time he came.* Ich habe noch etliches Mehl, *I still have got some flour.* Etliches fiel an ten Weg, *some fell by the wayside* (Mark iv. 4).

8. Etwas, besides the signification noticed in Sect. XIV. 2, has also an adverbial use, and answers to "somewhat," as:—Er ist etwas älter, als ich, *he is somewhat (or something) older than I.* Es ist etwas kälter, als vorgestern, *it is somewhat colder than the day before yesterday.*

VOCABULARY.

Abtügen, to lay aside.	Beschwerde, f. hardship.	Blind, blind.
Anblick, m. aspect.	Beiz'er, to possess.	Darüber, about it, thereon.
Annäherung, f. approach.	Bewunderung, f. admiration.	Davon, of it, thereof.
Begehren, to commit.	Bitzen, to form, constitute.	Dennoch, still, notwithstanding.
Beschäftigen, to employ.		

Eigen, own, particular.
 Einer/ter, one another.
 Einmal, once.
 Einwohner, m. inhabitant.
 Erfahren, to experience.
 Erleben, to live to see.
 Gestandenswürdig, astonishing.
 Größer, several, some, a few.
 Feinheit, f. delicacy.
 Firmament, n. firmament.
 Flüchten, to flee.
 Geber, m. giver, donor.
 Gefühl, n. touch, feeling.
 Gemüth, n. mind.
 Genuß, m. enjoyment.
 Geschenk, n. present, gift.

Gesellschaft, f. society.
 Gewähren, to grant, allow.
 Gewiß, certain, certainly.
 Größe, f. size, magnitude.
 Handlung, f. action, procedure.
 Hegen, to cherish.
 Herrlich, glorious.
 Herberufen, to call forth.
 Knechen, m. bone.
 Macht, f. power.
 Mancher, many a.
 Meinung, f. opinion.
 Merkwürdig, remarkable.
 Musik, f. music.
 Nachwelt, f. posterity.
 Nichtsthuun, n. inaction.
 Nothwendigkeit, f. necessity.
 Punkt, m. point.

Seefisch, m. sea-fish.
 Seltsam, strange.
 Selber, such.
 Stehlen, to steal, harden.
 Sturm, m. storm.
 Theils, partly.
 Ueberheit, f. folly.
 Uebereinstimmen, to agree, accord.
 Versammlung, f. meeting.
 Verständigen, to agree, to come to an explanation.
 Verwenden, to employ, apply.
 Vortrefflich, excellent.
 Vorzug, m. advantage.
 Was für, what kind of.
 Wert, n. work.
 Wohlhabend, opulent.
 Zubringen, to spend, pass.
 Zurückziehen, to retire, withdraw.

24. Unter den Einwohnern sind manche sehr wohlhabend. 25. Haben Sie nicht auch schon manches Seltsame erlebt? 26. O ja, ich habe schon manches Merkwürdige erfahren. 27. Mancher tapferer Soldat mußte in der Schlacht sein Leben lassen. 28. Hat nicht der Christknecht nicht viele gute Bücher geschrieben? 29. Gewiß, manche davon sind vortreflich. 30. Haben sich die beiden Freunde über viele Sachen verständiget? 31. Ja, in einigen Punkten sind sie miteinander übereingekommen. 32. Einige englische Schiffe gingen bei diesem Sturme unter. 33. Gutheil fluge Männer zogen sich aus der Versammlung zurück. 34. Alle Gemeinder der Stadt stüchteten sich bei der Annäherung der Feinde. 35. Manche Menschen bringen ihr ganzes Leben mit Nichtsthuun zu. 36. War das Ihr Bruder, der gestern den ganzen Tag in Ihrer Gesellschaft war? 37. Nein, es war mein Neffe, der mich alle Jahre einmal besucht. 38. Welch eine Größe hat die Erde, und wie viel kleiner ist sie dennoch, als die Sonne! 39. Welche Vorzüge hat der Mensch vor den Thieren? 40. Was für eines Vogels Art ist dies? 41. Ist der Schüler fleißig, so lernt er etwas.

EXERCISE 77.

1. Many a learned man has been misunderstood. 2. Oh, what folly does man commit in his life! 3. With what kind of society have you associated? 4. Many an industrious merchant has been ruined by an imprudent speculation. 5. Full many a flower is born to blush unseen [blühet im Verborgenen]. 6. Every leaf, every twig, and every drop of water, testifies infinite wisdom and power. 7. Every one must give an account of himself. 8. The whole environs of Coblenz are romantic. 9. All are well [wohl] at home. 10. The conversation with such persons is instructive. 11. I have never heard of such an accident. 12. It is beautiful weather to-day, but somewhat colder than yesterday. 13. I have had already many a pleasure. 14. I wish to have some lemons. 15. He came somewhat too late.

RÉSUMÉ OF EXAMPLES.

Was für einen Kameraden hast Du? What kind of a companion have you?
 Was für ein Landsmann bist Du? What countryman are you?
 Welch ein Riese! What a giant!
 Ein Jeder ist des Seinen werth. Every one is worthy of his own.
 Ein solcher Auftrag schreckt mich nicht. Such a commission alarms me not.
 Einen solchen Sturm habe ich noch nicht erlebt. Such a storm I have not yet experienced.
 Solch ein Kaiser konnte sich so demüthigen! Such an emperor could thus humble himself.
 Solch' schönes Wetter kommt selten. Such beautiful weather comes seldom.
 Er sprach so leise, daß ich ihn nicht verstehen konnte. He spoke so softly, that I could not understand him.
 Mancher Traum der Jugend schwindet mit den Jahren. Many a dream of youth disappears with the years.
 Manch schönes Buch habe ich schon gelesen. Many a beautiful book have I already read.
 Nach einigen Minuten kehrte er zurück. After some minutes he returned.
 Der Elefant' ist etwas stärker, als das Nashorn. The elephant is somewhat stronger than the rhinoceros.
 Der unerfahrene Kaufmann kann leicht all sein Vermögen verlieren. The inexperienced merchant may easily lose all his fortune.
 Er war das ganze Jahr krank. He was sick all the year.
 In großen Städten sieht man alle Tage etwas Neues. In large cities one sees something new every day.

EXERCISE 76.

1. Was für Wetter ist es heute? 2. Es ist heute schönes Wetter, aber etwas kälter, als gestern. 3. Was für eine Meinung hegt er von dieser Sache? 4. Seine Meinung darüber ist nicht die beste (Seet. XXXV. 3). Meine Gesellschaft ist ihm die angenehmste von der Welt. 6. Was für Aische sind dies? (Seet. XXXV. 3). 7. Es sind Seefische. 8. Mit was für Arbeiten beschäftigt er sich? 9. Er beschäftigt sich theils mit Schreiben, theils mit Lesen. 10. Welch eine Macht hat die Musik über das Gemüth des Menschen! 11. Welch ein hoher Genuß ist es, die Welt zu sehen! 12. Welch einen herrlichen Anblick gewährt das Firmament mit seinen unzähligen Sternen! 13. Jeder Stern am Himmel bildet eine eigene Welt. 14. Der wahre Tugendhafte verwendet jeden Tag seines Lebens darauf, seine Fehler immer mehr abzulagen. 15. Hat nicht jeder Ihrer Freunde einen solchen Hut? 16. Nein, ein Jeder hat einen andern. 17. Solche Männer sind notwendig, um das Vaterland zu retten. 18. Haben Sie jenen Wunden gesehen, der eine Feinheit des Gefühles besitzt, die erlaunenswürdig ist? 19. Ja, ich habe ihn gesehen. 20. Der Geber eines solchen Geschenkes ist zu loben. 21. Die Beschreiner einer solchen Reise stählten den Körper. 22. Solche Handlungen werden die Verwunderung der Nachwelt hervorrufen. 23. So angenehme Stunden habe ich lange nicht gehabt

LESSONS IN BOTANY.—XI.

SECTION XXI.—ON THE NATURAL ORDERS OF FLOWERING PLANTS.

In these papers we shall not enter on the consideration of cryptogamic plants until we have noted the peculiarities that distinguish the different natural orders of flowering plants. Those which possess flowers are far more likely to arouse the young botanist's attention; they are more useful, and are those members of the vegetable world which botanists know most about.

We shall select the Crow-Foot tribe, termed by botanists *Ranunculaceæ*, as the one first to be considered. Let us see, then, in how few words a botanist defines the characters of *Ranunculaceæ* :—

RANUNCULACEÆ.

Characteristics.—Calyx polysepalous; petals hypogynous, in form various, sometimes absent; stamens ordinarily numerous; anthers usually adnate; carpels one or numerous, never combined; ovule reflexed; embryo dicotyledonous, small, at the base of a horny albumen; fruit apocarpous.

A very pretty collection of hard names, is it not? and sufficiently unintelligible. Nevertheless, the reader, we are sure, will admit that if the characters of the *Ranunculus*, or Crow-Foot tribe, admit of description in so few words, it is worth while to learn the meaning of these words. Well, then, let us set about it; let us analyse the definition clause by clause. First then: *calyx polysepalous*; what is the meaning of that? The reader, by this time, knows the meaning of *calyx*; it is the outside greenish-yellow whorl of which the buttercup flower is composed, and being made up of several parts (*sepals*, and the Greek word, *πολύς* [*pol-use*], signifying *many*), the *calyx* is denominated *polysepalous*, a somewhat important characteristic thus easily conveyed in one word. Now for the second clause, *petals hypogynous*. As for the word *petal*, the reader knows its meaning already; but *hypogynous*, what is the meaning of that term? Complex words, like complex plants and complex animals, require dissection. *Hypogynous* being dissected into *hypo* and *gynous*, we shall soon arrive at its meaning. In the first place, *hypo* is an Anglicised form of the Greek word *ὑπο* (*hu-po*), *under*; and *gynous* is evidently a derivation from another Greek word *γυνή* (*gu-ne*), signifying *woman*. When, therefore, it is said that the petals are *hypogynous*, the sense meant to be conveyed is, that they spring from underneath the carpels or female parts of the flower. A very slight examination of a dissected buttercup will show that the arrangement of petals is as

described; or, if the reader do not happen to possess a flower of this kind, he may convince himself of the truth of this description by reference to the accompanying diagram (Fig. 121), in which the little central bodies, marked *c c c*, are the carpels, or female parts of the flower; the little thread-like things, *p p*, being the stamens, or male parts of the flower; the curved lines, *mm*, representing the position of the corolla, and the lower curved lines, *n n*, that of the calyx. Hence the meaning of the term *hypogynous petals* will now be evident, for the curved lines, *mm*, the representatives of their position, are evidently below the little carpels, *c c c*. *Stamens ordinarily numerous; anthers usually adnate*. The general term *stamen*, the reader already knows, is applied to each of the little threads, *p p*, together with its appendages; the *anther* is the mace-like knot at the upper extremity of the stamen. We have, therefore, to consider the meaning of the term *adnate*, which is derived from the Latin *ad*, to, and *natus*, grown, which, therefore, signifies grown to a thing by its whole surface; for example, in the buttercup the anthers adhere to their filaments in the manner represented in the accompanying diagram (Fig. 122). Here the anther consists of the little projections *a* and *b*; evidently they are attached to the filament, *s*, by their whole surface, and not a portion of the same. *Carpels one or numerous, never combined*. This is shown by the figure, *c c c*, where the numerous carpels are quite unconnected with one another.

Ovule reflexed. Let us begin by getting exact ideas respecting the *ovule*; we will then treat about its reflexion afterwards. The casual observer of a buttercup would take the little central protuberances or carpels as they exist in a ripened flower for seeds. They are not seeds, but fruits; very small, but still fruits. If the student possesses a magnifying glass, he may, on cutting a ripened carpel or fruit open, find the real seed inside, presenting an appearance of which Fig. 123 is a magnified representation.

Now, if the fruit be so small, what must the real seed be? Nevertheless, by the aid of a good magnifying glass, all its various parts may be rendered evident. Fig. 124 is its magnified appearance. When the seed of a buttercup is cut open, the observer will perhaps at first see nothing but a mass of white flesh, termed by botanists *albumen*; but if the seed has been accurately divided from top to bottom, a little thing will be observed at *a*; this is the *embryo*, and, small as it seems, this *embryo* is the portion of the seed which represents the future plant. The albumen of the plant is really only so much food for the young embryo to eat before it has grown big enough to shift for itself. The embryo consists of a *radicle*, or representative of the root, and two cotyledons or rudimentary leaves. This the reader might have predicted, without finding these cotyledons, from a consideration that the leaves of buttercups are reticulated, not straight-veined, from which circumstance they must belong to the dicotyledonous division of plants.

Still, we have not arrived at the reason why the ovule is said to be reflexed; and, indeed, this determination belongs so completely to microscopic botany, that we should scarcely have explained the meaning of the term, were we not desirous that no expression should appear useless or unmeaning. This reflected state of the ovule the reader will scarcely see even by the aid of glasses. The word, however, which is derived from the Latin *re*, back, and *flecto*, to bend, means bent suddenly back upon itself, as represented in Fig. 125. At the base of a *horny albumen*. If the reader refers to Fig. 123, he will see that the embryo really rests at the base of the albumen, as described; and inasmuch as this albumen is very hard, it is termed *horny*.

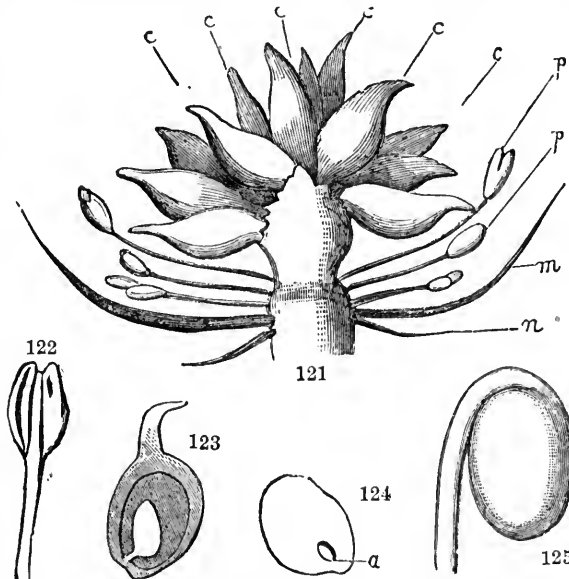
Thus we have almost got through our analysis of the various terms applied to designate the natural order Ranunculaceæ. The reader will admit each term has had a meaning, and that, when understood, these terms are very expressive. Perhaps he may think that the remarks concerning the manner of adhesion and the number of the petals are all well enough, but he may, at the same time, think that the microscopic examination of the seed and its fruits are a little far-fetched. Nevertheless, the reader will find, when his botanical studies have been a little further prosecuted, that the shape and disposition of the embryo constitute some of the most reliable distinctive marks of various orders. We admit, however, that these microscopic signs are, for the most part, unavailable to the botanical student, who must content himself with broader characteristics.

Fruit apocarpous. This is a proper opportunity for making ourselves acquainted with certain general facts in botany, not necessarily connected with the Ranunculaceæ, but which a member of that family of plants may serve to illustrate. Referring to the carpels, or the central or female parts of the flower, these will be found scarcely to alter in appearance, except in size, from the first period of inflorescence to the last, when the perianth or floral envelopes fall off, and the fruit is developed. This fruit, in point of fact, consists of nothing but ripe carpels.

Hence, without any other addition, the fruit of Ranunculaceæ furnishes us with the simplest conditions under which a fruit can exist. All fruit may be defined in strict botanical language to be the matured carpel; but in by far the majority of instances of what are popularly called fruits, the real fruit is masked by the attachment of other appendages. For example, the carpels, or real fruit, bear a very small proportion to the absolute size of an apple or pear. In these by far the greater portion of the fruit, in the ordinary acceptation of the term, consists of a highly developed and succulent calyx.

Referring to our buttercup again, the carpels were observed to remain quite distinct; they never adhere; hence the fruit of a buttercup is said to be *apocarpous* (Greek, *apo*, *ap' o*, from, in the sense of *apart*; and *karpos*, *karpos*, fruit), or non-adherent. Had the carpels been united, then a *syncarpous* (Greek, *syn*, sune, together, and *karpos*, fruit) fruit would have resulted.

Several other distinctive signs of the natural order Ranunculaceæ might be mentioned; but even fewer than those already enumerated might serve pretty clearly to separate it from all others. These essential characteristics are the hypogynous stamens and apocarpous fruit. If the student meets with any plants having these characteristics, no matter how different the general appearance of such plant may be from the general appearance of the buttercup, no matter whether the size is different, the shape or colour of the flower different, still it is almost sure to be a Ranunculus. But what is the use of this classification? the reader may ask. Take a supposed case. You are shipwrecked on some unknown island, or you are a farmer in some unexplored land, and you meet with some gay-looking flowers and tempting-looking herbs; the fruit is apocarpous and the stamens are hypogynous; take care of such plants, neither eat them nor permit your cattle to eat them. They are, most likely, poisonous, this being a leading physiological characteristic of the tribe; and in certain species the poisonous principle is so extremely virulent that death would speedily result from swallowing a small portion. Such knowledge constitutes the really useful part of botany, not a mere classification of plants without reference to the properties of the members falling under each group.



121. BOTANICAL SECTION OF THE RANUNCULUS. 122. ADNATE ANTHERS OF THE BUTTERCUP. 123. FRUIT OF THE BUTTERCUP. 124. SEED OF THE BUTTERCUP. 125. REFLEXED OVULE OF THE BUTTERCUP.

Having thus studied the general characteristics of the Ranunculus order, taking the buttercup as our standard of comparison, let us see how far general appearances may alter without the essential characteristics being interfered with.

What plant is apparently more unlike the buttercup than the Clematis? Nevertheless, it will be found on dissection to present the essential characteristics of a ranunculaceous plant.

How seemingly different, again, from the buttercup are the hepaticas! Yet their structure at once points out the family to which they belong.

But the Larkspur tribe, including the *Delphinium*, differ so greatly in appearance from the yellow buttercup, that none but the botanist can see any alliance between them. To his

educated eye, however, the affinity is evident. The circumstance in reference to which the term larkspur is given depends upon a curious formation of one of the sepals of the calyx, something like the spur on a bird's foot; but it is a condition of less botanical importance, thus assisting to indicate a genus, not an order; and colour is of still less botanical importance. Inside the sepals or calyx of a larkspur are four petals strangely shaped, two of them having long tails. Thus the larkspur wears a complete mask; but the botanist at once recognises the order by the essential signs of apocarpous fruit and hypogynous stamens; and once recognised, once referred to Ranunculaceæ, larkspurs would be justly held in suspicion as poisonous plants, a character which they richly deserve.

Agincourt, 1415.

COPY-SLIP NO. 81.—AGINCOURT, 1415.

Bathurst in Africa.

COPY-SLIP NO. 82.—BATHURST IN AFRICA.

Canada was discovered, 1497.

COPY-SLIP NO. 83.—CANADA WAS DISCOVERED, 1497.

Devonport, a royal dock-yard in Devon.

COPY-SLIP NO. 84.—DEVONPORT, A ROYAL DOCKYARD IN DEVON.

LESSONS IN PENMANSHIP.—XXII.

IN our new and advanced series of Copy-slips, in addition to the small letters of the writing alphabet in four different sizes, the reader will find examples of all the various kinds of capital letters in general use, as well as the forms of the numerals or symbols used to denote numbers. It is impossible to classify the different elementary forms of which the capital letters of the writing alphabet are composed, as we did in the case of the small letters given in our first series in large text; but it will be seen, on comparing the different capitals, that the prevailing strokes are the long curved up-stroke with which the letter **A** is commenced, the thick down-stroke with which it is completed, the thick down-stroke with which the letters **B** and **D** are commenced—a stroke which enters into the composition of the majority of the capital letters—and the curved down-stroke turned at the top and bottom, of which the letter **C** is mainly

composed. The learner should practise writing each capital by itself in order to gain facility in forming them, as the sweeping curves of which these letters are composed differ materially from the somewhat stiff and regular succession of up-strokes and down-strokes, all on the same inclination or slope, that he has hitherto been in the habit of making. Instead of giving our readers a simple name or word to copy in the larger hands, done in copy-books, we have endeavoured to set before him in each copy-slip some fact that he will do well to bear in memory. Thus, after copying Copy-slip No. 81 some dozen times, he will never forget when the battle of Agincourt took place; while Copy-slip No. 82 will, in all probability, cause him to turn to his "Gazetteer" or "Atlas," if he have one, to find whether there be any more Bathursts on the world's surface besides that which happens to be the principal settlement in the British colony, at the mouth of the river Gambia, in Western Africa.

HISTORIC SKETCHES.—XI.

SIMON DE MONTFORT, AND THE FIRST ENGLISH PARLIAMENT.

ON the 12th of December, 1264, a great act was done for England, though by the hand of a rebel. Simon de Montfort, Earl of Leicester, son of that stern, capable soldier, and inexorable bigot, who commanded the crusade against the dissenting Albigenes in 1206-8, took upon himself to recognise the existence of a power that was being rapidly developed in this country, namely, the power of the towns and townsmen. He wrote letters in the king's name to all the barons and high clergy, bidding them assemble in Parliament, or in Grand Council, as Parliament was then called, and for the first time he invited the counties and all the important towns to send representatives to London, in order to confer with the lords and the clergy upon the affairs of the kingdom. It is much to be regretted that none of these letters are extant. Few historical documents could possess more interest for a people who have for 600 years recognised a political constitution with king, lords, and commons, than the writs by virtue of which borough members first took their seats.

But how came the Earl of Leicester to write the letters on his own responsibility, though in the king's name? and what was the object which the earl sought to attain when he sent the writs out? The writing happened on this wise. Ever since the beginning of the young king's (Henry III.) reign, in 1216, there had been a perpetual succession of political troubles. To begin with, the king at that time being only nine years old, it became necessary to appoint a council of regency, a fruitful source of jealousy and heart-burning at all times, and especially so in days when men were wholly swayed by a passionate pride, which was but too ready to take offence, and a spirit of revengeful restlessness which forthwith made them take up arms upon the faintest appearance of real or imaginary slight.

From this regency sprang the never-ending commotions known as the Barons' wars. The barons were too nearly equal in rank and power to admit of one set being in the government while the others were excluded, and the matter was made worse by the ill-advised proceedings of those in power, who availed themselves of the opportunity to annoy and oppress their peers. Besides these causes of disunion, there was another in the fact that the French Dauphin (the eldest son of the French king was always called so, from Dauphiné, of which he was Count) claimed the crown by virtue of an invitation he had received from some of the barons, when King John misgoverned the land. The discontented among the English barons made use of the Dauphin for a time, till the growing unpopularity of the French interference obliged the prince to quit England, which would not have him at any cost.

In order to put a bridle into the barons' mouths, for they were not disposed to render allegiance to Rome, the Pope declared Henry to be of full age when he was but fifteen, just after the Great Charter, which John had given, had been confirmed by the regent and the barons in a council at Oxford. Soon after this Henry was persuaded to claim the Duchy of Normandy, which his father had lost for the English crown; and the French king (Louis VIII.), who had won it, very naturally refusing to give it up, war was declared, and a campaign followed, which nearly had the effect of losing for England the remainder of her French provinces, Poitou, Gascony, and Guienne; and this, of course, did not tend to make Henry's government more popular. But, to make things worse, just at this time (1231) Henry, who was now twenty-four years old, began to commit an error which Englishmen have never forgiven in their kings. He began to cherish foreigners and to neglect his own people.

This conduct in the king was soon resented by the English barons, who, for a time, laid aside their intestine quarrels, and openly declared their intention to dethrone Henry unless he dismissed his foreign friends. Divided counsels among the confederates, however, helped Henry, and he took occasion to punish some of the rebels, and to bestow their property on the Frenchmen, till the Archbishop of Canterbury (like his predecessor Becket), in the interests of liberty, threatened to excommunicate him and his unless he acted differently. For a time Henry submitted, and allowed the Primate to rule; but marrying, in 1236, the daughter of the Count of Provence, and the archbishop dying in the meantime, the king returned to his former

ways, and the alien nuisance became greater than ever. The kingdom swarmed with the countrymen of the queen, and with other foreigners. The Bishop of Valence, of the house of Savoy, was made chief adviser of the crown, and another Savoyard was made primate. The English nobles were nowhere, and in deep disgust they would not come to court.

Bitter and deep was the exasperation of the English, nobles and otherwise; and the irritating method adopted by the king to defray the expenses of his extravagant court, and of his liberality to the strangers, served to heighten it. He exacted loans from private persons whom he never repaid; and he levied taxes and imposts quite regardless of the Great Charter which he had ratified, and which forbade him to do so without consent of Parliament. He was so driven for money after an unsuccessful French war in which he lost Poitou, that he had to sell his jewels and plate to the citizens of London. But things grew ever worse and worse. The clergy were at length disgusted, as well as all other ranks, for the king filled those English benefices which he could control with Italians and Frenchmen. His chaplain, a foreigner, had seven hundred livings at one time.

At length the people, backed up secretly by the nobles, took the matter in hand. They resisted the exactions of the royal officers, and they burned the estates of the foreigners, and the king, knowing who were behind them, was afraid to punish. But resistance unchecked is fatal to authority, as Henry found out. The barons, who had hitherto kept in the background, and had contented themselves with keeping aloof from the court, and so discouraging the king's practices, now came to the front, having a strong force to support them, in the shape of an angry and jealous town population, besides their own tenantry and dependents. They had attempted, some years before, to get the appointment of the Chancellor, and of the Grand Justiciary (this office is now extinct, but at this time it was the highest in the kingdom), into their hands, but they had not succeeded: now they revived the proposition with additions to it, and wished to take all power, direct and indirect, out of the king's hands. In unmeasured terms they reproached him in Parliament for his extortions and his misconduct, and flatly refused to give him any money till he should have sworn once more solemnly to observe the Great Charter. They were not to be taken in by a sham request for the supply under the plea of the king's intention to go to the Crusades. Henry had to swear in the presence of the assembled prelates and barons that he would govern according to the charter before he could touch a farthing of the money of which he stood in so great need.

Chief among the barons who resisted the king was Simon de Montfort, Earl of Leicester. Something has been said of him at the beginning of this notice; let us now look more closely on the man, and fill in the details which are wanting. His father was a French count, whose name is too well known in the history of religious persecution; his mother was a Montmorency; and he himself, the child of French parents, was also born out of England, so that in no sense was he an Englishman except by adoption. The adoption of England as his country came about in this way. Simon's paternal grandmother was Petronilla, sister and co-heiress of Robert Beaumont, last Earl of Leicester of his house. The English barony thus devolved, in default of issue born to Earl Robert, upon the descendants of Petronilla. Simon de Montfort the elder was thus Earl of Leicester, in addition to his other honours, and he did homage for it, and the lands belonging to it, to King John. In consequence of some dispute with that king, he lost both title and lands, and though he afterwards got back the lands he never recovered the title. When Simon died, his eldest son Amauri succeeded him; but the English king refused any longer to receive a homage half of which was owed to the King of France, and Amauri, therefore, was obliged to come to an arrangement by which he should be the liegeman of the King of France, while his younger brother Simon was admitted to homage for the honour and lands of the barony of Leicester. Another fact contributed to make him more and more the Englishman and less the Frenchman. He married, clandestinely it is said, the widowed Countess of Pembroke, sister to Henry III., and the prominence which this alliance gave him forced him to take his place in the ranks of English nobles, with an English nobleman's responsibilities and interests.

But the marriage, clandestine or not, of a princess of the blood-royal with a foreigner did not, under the circumstances already mentioned, pass *sub silentio*. The barons were furious that their consent had not been first sought; the people beheld in the marriage one more notable instance of the king's partiality for foreigners; and the clergy professed to be scandalised at the marriage of one who, after the death of her husband, had vowed to remain single, and had betaken herself to a convent as a *religieuse*. On the bursting of the storm off went Simon de Montfort to Rome, and, by dint of strong personal applications, and, his enemies said, by the free use of his money, obtained the Pope's consent to what he had done. He came back, was received with great joy by the king, and in 1239 was created Earl of Leicester in his own right. Then came disgrace, for reasons upon which it is difficult to speculate; indeed, there seems at the present day to have been so little reason that it is not unwarrantable to attribute the disgrace to the caprice of the king. Simon de Montfort left the country, and continued to reside abroad for several years. One lesson, and a useful one, he had learned during his short experience of political life, namely, that he should not put his trust in princes. He never forgot that lesson, and the fact that he had to learn it loosened considerably the ties which bound him to the king, though it does not appear to have diminished his sense of the personal duty he owed him. Thus we find him lending his sword—he “whom the Gascons feared as the lightning”—to Henry during the short and inglorious campaign which that king made against Louis IX. (Saint Louis) in 1242, and in the course of which De Montfort, by his own prowess, saved Henry from being taken prisoner.

For six years after this the Earl of Leicester lived almost all his time abroad. To him, as to the fittest man, was committed the government of Gascony, and the arduous task of fighting and subduing the professional rebels who dwelt there. In spite of gross neglect on Henry's part, in spite of lack of money and men, the earl succeeded in breaking the heads and the spirit of the Gascons; and when he had recovered the province for Henry, and laid it once more at his feet, it was only to be rewarded with charges of dishonesty and malversation in his office as seneschal, or governor. De Montfort had obliged the king too much, served him too well, and the king resolved therefore to crush him and his claims to gratitude together. But for the unanimous voice of the barons against the step, the earl would have been sent to the Tower, and probably thence to his death; but Henry, thwarted in this, abused the earl before the whole court for his misconduct. De Montfort replied by reminding the king of his great services, and of the broken promises with which they had been requited.

“I will never keep promises made to a traitor,” said the king. Whereupon De Montfort, unable to control himself, gave him the lie, and told him that but for his royalty he should not have lived to repeat the word. “Who can believe that you are a Christian?” he continued. “Have you ever confessed?”

“Certainly,” replied Henry.

“To what end have you done so, since you have neither repented nor made amends?”

“I never repented of anything so much,” returned the king, “as of suffering you to set a foot in England, or to hold land or honour in the realm.”

Thus a great gulf was fixed between Henry and his powerful subject, a gulf which, as will be seen, could not be bridged over during their respective lives. De Montfort went his way and Henry went another, and the former waited for an opportunity to settle his accounts with his debtor. Something has been said of the way in which Henry went. Read what an eminent writer and reviewer (*Edinburgh Review* for January, 1866) says of it:—“He aimed at making the crown virtually independent of the barons. The sons of the men who had extorted the Great Charter were told that it was their business to find money for every rash enterprise which the interests of the king's Continental relations and advisers might suggest; but that they must not presume to demand the resignation of one officer of state, or to murmur if the most important castles of the realm, and the first places in the state, were committed to the hands of aliens. In all this his connection with Louis IX., whose brother-in-law he became, was certainly a misfortune to him. In France the royal power had during the last fifty years been steadily on the advance; in England it had as steadily receded; and Henry was

ever hearing from the other side of the Channel maxims of government and ideas of royal authority which were utterly inapplicable to the actual state of his own kingdom.”

The straits to which this policy, vehemently opposed as it was by the English barons, brought the king has been partially shown. To the council at which Henry has been represented as having to ratify the Great Charter before he could get a supply, the barons came armed, and with armed followers. Simon de Montfort was the guiding spirit among them, and his influence was all powerful. Acting upon his suggestions, they demanded, in addition to previous requirements, that the government of the kingdom should be entrusted to a council of twenty-four barons, who should continue to govern until the flagrant abuses which had crept in should have been reformed; and Henry, unable to say “No” with effect, was obliged to listen while the barons fixed the 11th of June (1258) at Oxford for the time and place of a meeting at which arrangements should be made for carrying this resolution into effect. In the interim De Montfort and his friends seized the Cinque Ports (Dover, Hastings, Hythe, Romney, and Sandwich), as a precaution against the king's foreign friends; and when the 11th of June came they appeared at Oxford in arms, as their fathers had appeared at Runnymede when they presented the Great Charter for signature.

This council, for it was not a parliament, in the modern acceptance of that word has been called “the mad parliament,” for no other reason that one can discover than because the measures agreed to by the members were of a more revolutionary and “thorough” character than were usually debated in such assemblies. Henry was obliged to submit, and the barons proceeded to draw up their resolutions, called the Provisions of Oxford, to the observance of which they required the oath of every lord. By these provisions it was declared that four knights from each county should attend the next parliament in order to represent grievances; that there should be three sessions of the parliament in a year; that the election of sheriffs (officers having much more power then than now) should be annual, and by the votes of the freeholders; that the power of the sheriffs should be curtailed; that no new forests should be made; that the revenues of the counties should not be farmed; and last, not least, that no foreigner should be guardian of any English ward, or be allowed to hold any English castles. It was also arranged, as previously determined, that a council of twenty-four barons, with the Earl of Leicester at their head, should take upon themselves temporarily the government of the kingdom. The royal power was completely subverted.

Had the barons only chosen to act unitedly, and with a single eye to what they had undertaken, they would have had the popular feeling wholly with them, and would have been the means of conferring a lasting benefit on their country. But the old divisions sprung up again, the old jealousies and the old hatreds were revived, and the cause which the barons had in hand was well-nigh lost on the rock on which the friendship of the Earls of Leicester and Gloucester split. Instead of carrying out the much needed reforms, the barons wasted the precious time in striving, after the old fashion, which should be the greater. The king was unkinged, and the twenty-four kings who proposed to reign in his stead could not arrange how they should do so. De Montfort was disliked because he was a foreigner, and because he was too clever for his companions, though as regards his alien origin he set a good example to other aliens by being the first to give up the English castles which had been committed to his care. Unable to settle matters with the other lords, he threw up in disgust and went abroad.

In his absence things grew worse. Little was done by the council of government after the first six months, and the people began to tire of them and to pity the sorry plight to which Henry was reduced. After three years the king was so strong in friends that he determined to resume his authority, and the barons, deprived of the Earl of Leicester's influence and ability, were without the means of thwarting him. The Pope, too, was induced to annul the Provisions of Oxford, or rather he released from the obligation of their oaths all who had sworn to respect them; and, armed with these powers, Henry, in the early part of 1262, resumed his authority by means of a sort of *coup d'état*.

Simon de Montfort refused to accept the terms offered by the king when he returned to power, and accepted by the majority of the barons. His rival, the Earl of Gloucester, having died

in July of 1262, he returned secretly from his voluntary exile in October following, and immediately assumed the leadership of the barons' party. Patiently, artfully, he laboured to reorganise their ranks, and he appealed at the same moment to their patriotism and their pride when he showed them that the Provisions of Oxford were as important to the nation as the Great Charter itself; and when he pointed out that their deliberate act had been ostentatiously set aside by a foreign bishop whose authority in such matters they could not possibly recognise. Under Leicester's skilful guidance the barons reunited as one man, and demanded in the spring of 1263 a ratification of the Provisions. Henry refused, the barons drew the sword, and England was once more the scene of domestic violence and civil war. But the barons had it all their own way. Combining their forces with those of Llewellyn, Prince of Wales, they carried all before them, captured the royal castles, imprisoned the obnoxious aliens who were in posts of authority, and laid that part of the country which was devoted to the king under heavy contributions. London opened its gates, and received them with bells ringing and with flags flying, while the king, who had retired to the Tower, was compelled to be a witness of their triumph. There was no resisting them, and at a Parliament, holden in September, 1263, the Provisions of Oxford were solemnly confirmed by the king, and by Edward, the crown prince (afterwards Edward I.).

In a few weeks only all De Montfort's work had to be done over again. Henry ignored his own solemn act so soon as the barons' army had dispersed, and by the autumn chaos was come again in English politics. It was decided to refer the questions at issue to the arbitration of Louis IX., "a king, a hero, and a man," as Gibbon said of him, and at Amiens, in January, 1264, Louis's award was given absolutely in favour of the king. The barons, who had been somehow or other inadequately represented before the French king, were astounded, but they offered to bow to the decision if only the objectionable claim to thrust foreigners into English honours were withdrawn. This was refused, and war once more broke out.

After the signal victory which De Montfort won at Lewes when he captured both the king and Prince Edward, the earl was completely master of the position. He summoned the Grand Council, supplemented by four knights chosen by each county, to meet him on the 23rd of June, and when they met they conferred despotic power upon him, until the differences between Henry and the barons, which were again to be submitted to French arbitration (the alien question excepted), should be settled. Arrangements were in progress for the new arbitration when the Pope interfered, excommunicated the Earl of Leicester and the barons, and declared Henry free to do as he liked.

The declaration must have sounded rather like a mockery to the king, who was a close prisoner to his own subjects, and it served only to show De Montfort that he must go on steadily, knowing that he had nothing to hope for short of success. He did what in him lay towards doing justice to those under him who were most oppressed by the prevailing system. He tried to free the Anglican Church from the tyrannical authority which the Roman Church arrogated to have over her, and he tried to let the voice of all those who were obliged to contribute towards the burdens of the state, heard in the councils where their political fate was decided. Not merely because he wanted their help, but because he deemed they were entitled to them as of right, he sent summonses to the chosen of the counties, to the chosen of towns, and to the chosen of the inferior clergy, to meet him in Parliament assembled. As the exponent of the popular will he could do no less, and he acted as he did out of conviction that he ought to do so.

On the 12th of December, 1264, the writs went out, directed in the king's name, to the barons and prelates as heretofore, to an extra number of abbots, to the deans of cathedrals, and to every county and every important town. Each county and each town addressed sent up two representatives apiece to the Grand Council of the realm, and their members, in common with the lords of Parliament, settled the affairs of the nation. For himself, De Montfort took nothing; he even allowed another, an Englishman, to be made Grand Justiciary, or chief officer of the kingdom, by a Parliament of his own creation.

What was the upshot of it all? Simply this. The barons, weakened by their own mutual jealousies and distrusts, and by the glittering promises of the king, fell away like water from

their best friend, and left De Montfort to fight out their quarrel, not only alone, but against their own opposition. The final result of it all was, that when Simon de Montfort, with his eldest son, and a few good men and true who remained to him, saw the army of Prince Edward approach his army at Evesham, there was nothing for it but to fight to the death against men whom he himself had trained to discipline and war. "May God have mercy on our souls, for our bodies are Prince Edward's," exclaimed the earl as he saw the enemy advancing against him in force, and he entered on the battle with a full conviction that it was his last.

He died, with his eldest son, Lord Basset, Lord Despencer, and many more, bravely fighting in defence of those principles which he had advocated all his political life. His example and his statesmanship survived him, and we must recognise in him the founder of that system of Parliamentary government which it has been our pride and our privilege to preserve to the present hour. We will finish this article in the words of the *Edinburgh* reviewer, to whose essay we have already referred:—"And when the full survey is taken we shall not forget what is due to the statesman who first struck the key-note of constitutional government, and showed that there was more both of wisdom and of strength in a confiding appeal to a free people, than in the coercive despotism of the first Plantagenets. We shall remember, too, that he applied his principles with a breadth of view and an evenness of hand too rare in later times to the Church as well as to the State, and that almost alone of feudal statesmen he perceived that the just privileges of a national clergy might become, not the chronic difficulty of the State, but her surest and least perishable safeguard. Lastly, we shall bear in mind that, over the coarse ignorance and impure rudeness of the old feudal manners, he bore himself in calm, gentle superiority, cultivated, refined, and unsullied—the very model of an English gentleman: so English in heart, so true to the land of his adoption, that we almost forget, as we think of him, the parentage that is implied in the name of Simon de Montfort."

SYNOPSIS OF EVENTS IN THE LIFE AND REIGN OF HENRY III.

Henry III., the eldest son of King John, by his second consort, Isabel of Angoulême, was the eighth king of England after the Norman Conquest, and the fourth of the Plantagenet Dynasty.

Born at Winchester	Oct. 1, 1207	Disputes between the King and Great Council	1248
Began to reign	Oct. 18, 1216	Gold coin first issued in England	1257
Revision of Magna Charta	1216	The "Mad Parliament" at Oxford	June 11, 1258
French defeated in a battle called the "Fair of Lincoln"	May 19, 1217	The "Barons' War" commences	1263
French quit England	1217	Battle of Lewes	May 14, 1264
Grand Council summoned at Westminster	1225	First regular representative Parliament meets	1264
Ratification of previous Charters	1225	Battle of Evesham	Aug. 4, 1265
Marriage of Simon de Montfort to the Countess of Pembroke	1238	Death of Simon de Montfort	1265
		Henry dies at Bury St. Edmunds	Nov. 16, 1272

SOVEREIGNS CONTEMPORARY WITH HENRY III.

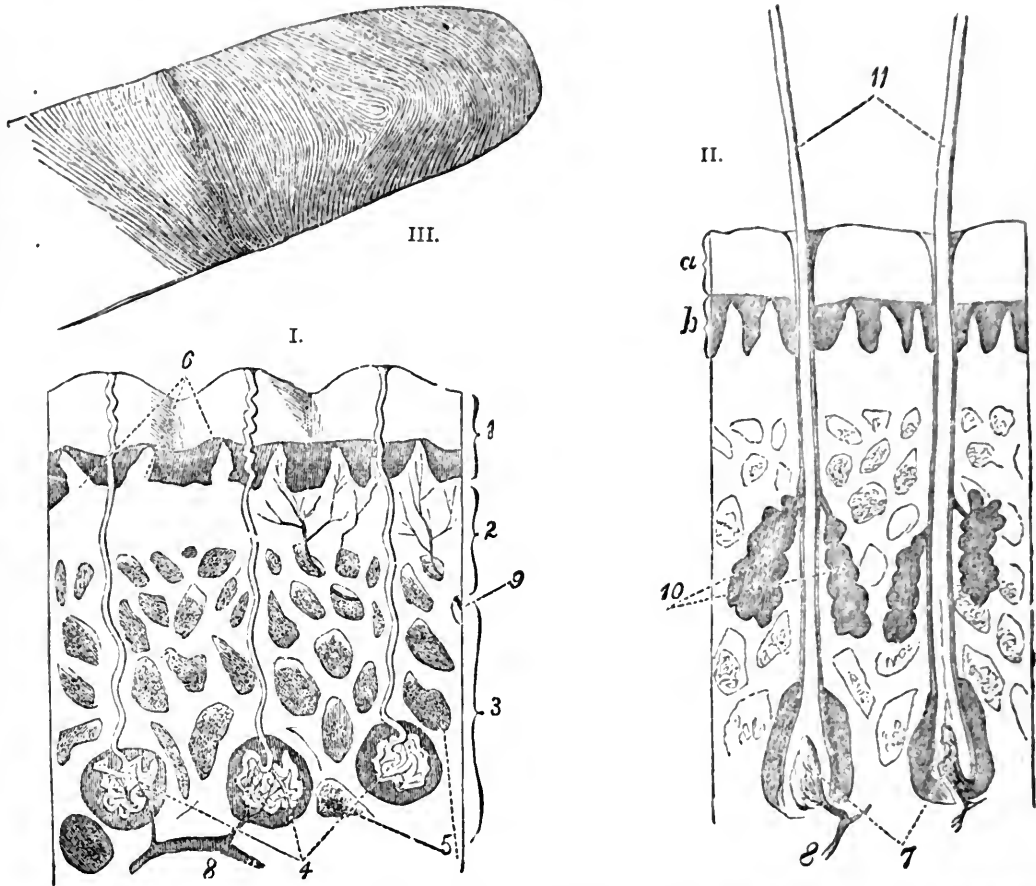
<i>Denmark, Kings of.</i>	<i>Germany, Emperors of.</i>	Celestine IV.	1241
Waldemar II.	Frederick II.	Chair vacant from 1241	
Eric IV.	William	Innocent IV.	1243
Abel	Courad IV.	Alexander IV.	1254
Christopher I.	Interregnum from 1250	Urban IV.	1261
Eric V.	Richard of Cornwall and Alphonso of Castile, rival Emperors	Clement IV.	1265
<i>Eastern Empire.</i>		Chair vacant from 1268	
Peter de Courtenay		Gregory X.	1271
Robert de Courtenay	<i>Norway, Kings of.</i>	<i>Scotland, Kings of.</i>	
Baldwin II.	Haco V.	Alexander II.	1214
	Magnus VI.	Alexander III.	1249
[Constantinople taken from the Latin Emperors by the Greek Emperor Michael VIII.]	<i>Portugal, Kings of.</i>	<i>Spain, Kings of.</i>	
Michael VIII.	Alfonso II.	Henry I.	1214
<i>France, Kings of.</i>	Sancho II.	Ferdinand III.	1217
Philip II.	Alfonso III.	Alphonso X.	1252
Louis VIII.	<i>Rome, Popes of.</i>	<i>Sweden, Kings of.</i>	
Louis IX.	Honorius III.	John I.	1216
Philip III.	Gregory IX.	Eric III.	1222
		Waldemar I.	1250

ANIMAL PHYSIOLOGY.—XI.

THE ORGAN OF TOUCH.

THE sense and organ of touch have been placed last in the list, because we have been all along proceeding from the more special to the more general sensations. The retina of the eye is specially modified and set apart to receive and interpret the light. Light has neither meaning nor effect when applied to other parts of the body; and the retina is out of the reach of other kinds of contact, and is quite insensible even to great heat, as Professor Tyndal has shown experimentally. The ear appreciates the aerial waves which are otherwise unknown. The nose and

When any part is disordered, a general feeling of depression cannot be shaken off. The sense of touch is allied to this general consciousness, but it differs from it in that its impressions are distinctly referred to the parts from which they proceed—the mind is able to localise them with precision. With regard to the locality of the impressions which proceed from the viscera, we know but little except by reason. Hence ignorant people will refer maladies very wrongly. Thus we hear of heartburn and stitch in the side. Nervous people will attribute rheumatic muscular pain to the lungs, stomach complaints to the heart, and lumbago to the kidneys. This wrong reference is made even when the pain or inconvenience is occasioned by a



I. SECTION OF THE HAIRLESS SKIN (MUCH MAGNIFIED). II. SECTION OF THE HAIRY SKIN (MUCH MAGNIFIED). III. TIP OF THE FOREFINGER. Ref. to Nos. in Figs. I., II.—1, epidermis or scarf skin; (a), superficial layers; (b), rete mucosum. 2, cutis or vascular skin. 3, subcutaneous layer, composed of fibres, enclosing—4, sweat glands; and 5, fat cells. 6, papillae. 7, hair bulbs and their papillae. 8, 9, nutrient arteries. 10, oil glands. 11, hairs.

mouth, though they are less exclusively devoted to smell and taste, and not so specially modified to receive these impressions as are the foregoing organs, yet their special sensations are peculiar. The sense of touch is more akin to what may be called common sensation, or general consciousness, and the organ is more widely extended and more intimately connected with other functions than the organs of the other sensations. If the eyes were closed, and no objects presented to the senses of hearing, taste, or smell; and if, further, the body could be floated in a liquid of such temperature and consistence as to present to the mind no sensation of contact, there would still doubtless be a general consciousness of the existence of the body, not only as an intellectual deduction but as a sensation. This sensation forms an indissoluble link between mind and body. When all goes well there is a feeling of pleasurable existence, which may be called general and massive, rather than special or intense.

mechanical cause, as by distension or pressure; but directly the cause of these obnoxious sensations reaches the skin, we can at once fix on the locality. Thus we learn that the sense of touch is distributed over the surface of the skin, and to those extensions of it which proceed from it to line the interior of the passages leading from the exterior of the body. The organ and sense of touch does not go far as we proceed into the interior of the body by these passages. Thus the throat is only sensitive to touch at its top part. The sensation of heat and cold proceeds further down towards the stomach, and below this all localised tactile sensation ceases.

In describing the organ of touch, we must therefore explain the nature of the integument and its appendages, although in so doing we are aware that this integument has many other functions, and is intimately blended with other structures which have nothing to do with the sense, but which we are compelled to notice.

The skin consists of two layers. The outer one is called the cuticle or scarf-skin, and the deeper layer the cutis. The cuticle has neither blood-vessels nor nerves, but consists of cells which are formed at its inner surface (where it lies on the cutis or true skin), and are pushed outward as fresh strata are successively formed below them. When first formed, these cells are filled with fluid; they are oval, and longer in the direction perpendicular to the surface than in the other. As they are thrust outward, they become flattened in the contrary direction, so that at the surface they form dry, transparent layers, which are capable of being shredded off and stripped away in scaly or scurfy fragments by the ordinary wear and tear to which the outer surface is subjected.

The office of this part of the skin is simply protective; and in relation to this office of clothing and defending the blood-bearing skin, it is found thickest where there is the greatest friction, and thinnest where there is least. It is, however, thin everywhere, varying from $\frac{1}{2}$ of an inch in the palm of the hand to $\frac{1}{10}$ of an inch in less exposed parts. As, however, this scarf-skin is in continual process of being rubbed away, it is not only thicker in much-used parts, but is much more rapidly formed on those parts. Moreover, if any peculiar employments make the wear and tear excessive, unwearied nature still supplies the demand, and an excessive manufacture of fresh cells is stimulated from below. Thus, in the polishing of japanned articles it is found that no other fabric but the human cuticle is sufficiently delicate to produce the shining surface. The finest wash-leather would scratch; and hence women are employed to scour trays, etc., all day long; and yet they never wear down to the true skin so as to make the fingers sore, except during the first few weeks. The provision for the repair of this closely-fitting vestment is even carried beyond this, for if the whole cuticle be stripped off, so as to leave the cutis naked and sore, there is an immediate outpouring of fluid from the blood, which forms at once into a scarf-skin.

As this scarf-skin has no blood-vessels running into its substance, it has no means of self-repair; so that in proceeding from the deeper layers to the surface, the cells go through all the processes of birth, death, decay, and dissolution, though the membrane is so thin. Since, also, this skin has no nerves entering it, it has no sensation, and the sensation of touch must be felt *through* it in the same way—though in a much more perfect manner—as we feel anything which touches us through our clothing. It will be seen, then, that it must fit very accurately and closely to the sensitive skin beneath, or the sense would be dull and imperfect. The skin below has an immense number of small hillocks, and each one of these is closely surrounded by, and inclosed in, the inner layer of the cuticle which is moulded upon them. When the cuticle is stripped off after being long soaked in water, it shows an infinite number of small pits, out of which the hillocks or papillæ have been dragged. If the whole be torn away before maceration, i.e., from the living skin, it usually tears away the papillæ with it, leaving a bleeding surface.

In providing at once for the protection of the cutis, and also for the preservation of the acuteness of the sensation of touch, there is this difficulty: those parts which are most used to gain information by touch, are necessarily those which are most subject to friction. In such situations, then, the cuticle must be thick; yet a solid thick sheet would be liable to make us confound impressions made by two points near together which were in contact with the skin. There is a beautiful arrangement to obviate this difficulty, which is found in the cuticle of the tips of the fingers, palm of the hand, etc. Here the surface of the skin is seen to be thrown into small ridges and furrows, which run in curved lines parallel to one another, so that an impression made on the surface, or tops of the ridges, is only conveyed down to the papillæ immediately beneath it, and does not press sideways on those of the other ridges. A more minute examination of the tip of the finger with a lens, will show that these wavy ridges are subdivided into square-shaped masses by cross furrows, which occur at regular intervals, so as to leave the thickened part between of the same width as the ridge. Each one of the square-shaped masses has in its centre a little pit, which is the opening of a sweat-gland. No such definite arrangement of ridge and furrow occurs in other parts of the body, where the sense of touch is comparatively obtuse, or rather, not nicely distinguishing.

The cutis, or blood vascular skin, is tough and elastic, and consists in its deeper layers of interlaced fibres which hold in their interspaces little masses of fat, sweat-glands, oil-glands, and hair-bulbs, with hairs proceeding from these last to rise above the surface. It is also permeated with nerves, arteries, and veins. This, therefore, is a structure having all the endowments of life, and with the faculty of self-sustenance and sensitiveness. The true seat of the sense of touch is, however, its external portion, that which lies immediately under the cuticle. Towards the surface the fibres become closer and denser, and the various glands and fatty masses cease, while the blood-vessels and nerves are more numerous. In order to increase the touching surface, and to bring the nerve-threads closer to the exterior, the outer surface of the true skin is, as we have seen, raised at intervals into papillæ. Each of these is well supplied with vessels and nerves. Under the ridged surface of the palmar side of the hand, these papillæ run in lines corresponding to the ridges, there being two rows to each ridge, and sometimes smaller ones between. In other parts they are scattered irregularly, and are much fewer in number. That these papillæ are the true seats of the sense of touch, appears not only from the fact that nerves are traced into them, but because there is a strict relation between their number in a given space and the delicacy of the sense of touch in those parts. Thus in the space of one square line ($\frac{1}{144}$ of a square inch) there are 108 on the tip of the finger, 40 on the second joint, and only 15 on the last; and this decrease in number is in direct proportion to the sensitiveness of the surface to touch. Where the sense of touch is most acute and discriminating, little oval-shaped bodies have been found, one lying in the centre of each papilla, and these have been called the "little bodies of touch." It must not be supposed, however, that each of these papillæ is capable of transmitting a separate impression to the brain, or that their office is simply tactile. Nerves do not enter all of them, and they are concerned in secreting the substance to form the cuticle. It would seem as though each nerve which conveys a single distinct impression to the mind, had a certain definite space of surface of skin, over which its final branches spread themselves; so that if two objects touch the skin at two different points within this area, they feel like one. In order to be felt as two separate contacts, they must be placed one on one special nerve-surface, and one on another. The size of the special spaces allotted to each nerve-unit is very different in different parts of the body. The determination of the size of these areas, and, by consequence, the accuracy of the sense of touch in various parts of the body, was effected by Weber. His method was at once so ingenious and so simple, that it is curious it should not have been adopted before. He took a pair of compasses, and having placed upon their points very small globules of sealing-wax, opened them to a small distance, and applied them to the surface of the body where the sense of touch was to be tested. The impression produced was as of a single point. He then opened them more and more until two distinct impressions were felt; and then measured the distance on a scale of inches and lines. He thus arrived at very definite and very interesting results. Among many other measurements of the least distances at which two points could be distinctly felt, we quote the following:—

	in. lines		in. lines
Tip of the tongue	0 $\frac{1}{2}$	Back of the hand	1 2
Tip of the forefinger	0 1	Scalp of the head	1 3
Second joint of forefinger	0 2	Breast	1 8
Back of the fingers	0 3	Middle of thigh, arm, and back	2 6
Palms of the hands	0 5		
End of the great toe	0 5		

The reader may verify these estimates for himself, but it is better to try them on some other person, because the impressions produced upon the eye and the mind by the sight and knowledge of the open compasses, have a tendency to bias the information received from the sense alone. The legs of the compasses must be applied both at the same instant, and not moved before the estimate is given. If they are moved, very different results will be given. From these statistics it will be seen that the tip of the tongue is the most discriminating part of the whole body. An easy verification of this will occur to every one when they remember how small a flaw in the teeth the tongue can detect—a flaw which is quite unnoticed by the tip of the finger, if that be applied to it. At first thought, it may seem strange that such acuteness of touch should be bestowed on an organ which is

rarely used to gain tactile information, and so placed as to be difficult of application to external objects; but when we consider how needful it is that the tongue should be able to feel every particle of food, so that we may know whether it is hard or soft, large or small, and be able to place it accurately between the teeth if it be not soft enough or too small, we cease to think the arrangement strange. The tongue, too, works in the dark with very little assistance from other senses, and so must be always on the alert.

Next to the tongue come the tips of the fingers and thumb. These are the salient points of that wonderful piece of mechanism, the hand. The hand of man is pre-eminently the tactile organ, and the free sweep of the arm, which enables it to turn in every direction, and to be applied to every part of the person, is an admirable accessory to its acute sense of touch. The lips are but little inferior to the fingers in acuteness of touch. A story is told of a blind girl, whose employment caused a thickening of the cuticle of her fingers to such an extent as to create a difficulty in reading her New Testament in raised letters for the blind. She at first tried the unfortunate expedient of paring the skin of her fingers, which made them more acute for a short period, but in the end, of course, duller, so that she could no longer read the loved volume. With a sentiment of grief and despair she stooped to give the sacred text a farewell kiss, and so discovered a new mode of studying it. Though, doubtless, this has become quite a platform story, it has in it so much physiological truth that there need be no hesitation in repeating it. Referring again to the probable theory that there is a separate area to each nerve-unit, it will be seen that that area occupies a space of six or seven square inches on the middle of the back or thigh, and only one square line on the tip of the finger. The former measurement is approximately 1,000 times as large as the latter. It is curious how nicely the discriminating sense of touch is adjusted to those parts where it is most likely to be of service. Thus, since the angles of the body are more likely to come in contact with other bodies than its depressions or the middle parts of its segments, we find the skin over the junction of two long bones more able to discriminate than that over their middle portion. The convexities of the joints are usually more discriminating than the concavities; the shoulder more than the arm-pit, and the elbow than the inside of its joint. Yet when we arrive at the hand the reverse is the case, for the palmar surface is more discriminating than the back part. This is for the obvious reason that we usually avoid knocking our knuckles against anything, while to grasp is so natural to the hand that it is quite an instinctive action, as every infant manifests.

A multitude of other points of interest might be dwelt upon did space permit. Thus, sensitiveness to tickling, and the improved appreciation of objects by moving the skin over them, would lead us into considerations quite different from those connected with simple touch.

The sense of heat and cold is different from that of simple touch; and sensitiveness to these has no relation to the cognisance of tactile sensations. If with a cold finger you touch your brow, though the finger will feel any roughness on the brow far sooner than the converse, yet the brow feels the finger cold far more distinctly than the finger feels it to be warm.

We pass on to notice briefly some yet more important applications of the sense of touch; and in order to do this it must be explained that the means by which we distinguish between hard and soft, rough and smooth, elastic and non-elastic, sticky and slippery bodies, by which also we gain our ideas of the form, size, distance, and situation of bodies, involves other sensations than those of simple touch. These ideas lie at the foundation of all mathematical science which treats of time and space. They are derived from the joint senses of touch, and of what has been called the "muscular sense." Simple pressure produces a sensation, as when a body is placed on the palm of the hand while its back rests on a table, but if we remove the table, or the hand, from it, a further sense of weight is conveyed to the mind. This idea of weight is derived from the knowledge the mind has that the muscles which hold the hand up are being exerted. So if the tip of the finger be passed along the edge of the table, it creates not only a consciousness of a number of successive contacts, but also a consciousness that the muscles of the arm and hand are exerted, and their position and condition is being continually altered. Now the nerves which run from the muscles to the brain are quite distinct from those which run from

the skin which overlies those muscles. These nerves, too, are quite capable of conveying definite information to the brain, without the assistance of the nerves of touch. The naked arm (in the dark) may be passed through the air where it touches nothing, and yet the range of its sweep, the position to which it is brought, and the amount of effort required to do all this, is known to the mind. In some rare instances this sense is lost without any of the others being impaired, and a case is on record of a mother who could hold her child while she looked at it, but directly she looked away she let it fall, because the muscular sense (not the muscular power) was gone.

Having indicated the distinction between the muscular and tactile senses, we must leave the reader to follow out for himself the complicated applications of these combined senses to gain a knowledge of outward objects. How, for instance, both are necessary to distinguish india-rubber from clay or from marble; and how the ideas of length, extent, and solidity are gained by passing the hand in one, two, or many directions over the outside of bodies. Let him also notice the wonderful adaptation of the human hand to obtain all this information. If he will take the trouble to do this, he will be struck with the marvellous complexity of the ideas which come trooping into the mind when so simple an action is performed as the grasping an object with the hand.

LESSONS IN FRENCH.—XXIII.

SECTION XXXIX.—REFLECTIVE VERBS CONJUGATED WITH EN.

1. THE verb aller [1, ir.; see § 62], conjugated reflectively, and preceded by the word en, i.e., s'en aller, corresponds to the English expressions to go away, to leave.

2. INDICATIVE PRESENT OF THE VERB S'EN ALLER, TO GO AWAY.

Je m'en vais,	I go away.	Nous nous en allons,	We go away.
Tu t'en vas,	Thou art going away.	Vous vous en allez,	You are going away.
Il s'en va,	He goes away.	Ils s'en vont.	They go away.

3. THE SAME TENSE CONJUGATED INTERROGATIVELY.

Est-ce que je m'en vais?	Do I go away?	Nous en allons-nous?	Do we go away?
T'en vas-tu?	Art thou going away?	Vous en allez-vous?	Do you go away?
S'en va-t-il?	Is he going away?	S'en vont-ils?	Are they going away?

4. Se fâcher, to be or become angry, requires the preposition contre or de before the noun or pronoun following it.

Se fâche-t-il contre votre frère? Does he become angry with your brother?

Il se fâche contre lui,	He is angry with him.
Vous vous fâchez d'un rien,	You get angry at nothing.

5. Se réjouir, to rejoice, is followed by the preposition de.

Je me réjouis de votre bonheur, I rejoice at your happiness.

6. Se plaire [4, ir.; see § 62], to take pleasure, to delight in anything, to like to be in a place, takes a before its object.

Je me plais à la campagne,	I like to be in the country.
Je me plais à étudier, à lire,	I take pleasure in studying, in reading.

7. Se dépêcher, se hâter, to make haste, take do before their object.

Dépêchez-vous de finir vos leçons,	Make haste to finish your lessons.
Pourquoi ne vous dépêchez-vous pas?	Why do you not make haste?

RÉSUMÉ OF EXAMPLES.

Le marchand s'en va-t-il aujourd'hui?	Does the merchant go away to-day?
Nous nous en allons demain.	We are going away to-morrow.
Je m'en vais quand je suis fatigué.	I go away when I am tired.
Pourquoi vous fâchez-vous contre lui?	Why do you get angry with him?
Il se plaît à jouer, il n'étudie jamais.	He takes pleasure in playing, he never studies.
Vous plaisez-vous chez vos parents?	Do you like to be at your relations?
De quoi vous réjouissez-vous?	At what do you rejoice?
Nous nous réjouissons de votre succès.	We rejoice at your success.
Nous nous en réjouissons.	We rejoice at it.
Pourquoi vous dépêchez-vous?	Why do you make haste?

Nous nous dépêchons d'écrire.	<i>We make haste to write.</i>
Nous nous plaignons en Angleterre.	<i>We like to be in England.</i>
Nous ne nous plaignons pas à Paris.	<i>We do not like to be in Paris.</i>
Nous ne nous y plaignons pas.	<i>We do not like to be there.</i>
Vous plaisez-vous à New-York ?	<i>Do you like to be in New York ?</i>
Nous nous y plaignons.	<i>We like to be there.</i>

VOCABULARY.

Ambassadeur, m., am- bassador.	Jamais, never.	Parceque, because.
Arrivée, f., arrival.	Jou-er, 1, to play.	Prochain, -e, next.
Autrui, m., others.	Malheur, m., misfortune.	Retourn-er, 1, to return.
Avec, with.	Midi, m., noon.	Semaine, f., week.
Cour-ir, 2, ir., to run.	Mieux, better.	Tante, f., aunt.
	Ouvrage, m., work.	Turc, turque, Turkish.

EXERCISE 73.

1. Vous en allez-vous bientôt ? 2. Je m'en vais la semaine prochaine. 3. Pourquoi vous en allez-vous ? 4. Parceque je ne me plains pas ici. 5. Vous plaisez-vous mieux chez votre tante qu'ici ? 6. Je m'y plais mieux. 7. N'avez-vous pas tort de vous en aller si tôt ? 8. J'ai raison de m'en aller. 9. Ne vous réjouissez-vous pas des malheurs d'autrui ? 10. Nous ne nous en réjouissons point. 11. Cet homme se fâche-t-il contre le jardinier ? 12. Il se fâche contro lui parce qu'il ne veut pas se dépêcher. 13. Se fâche-t-il bien souvent ? 14. Il se fâche à tout moment, il se fâche d'un rien. 15. Ne vous dépêchez-vous jamais ? 16. Je me dépêche toujours quand j'ai quelque chose à faire. 17. Ne vous plaisez-vous pas à courir et à jouer ? 18. Je me plais à jouer et mon frère se plaît à lire. 19. Vous réjouissez-vous de l'arrivée de l'ambassadeur turc ? 20. Je m'en réjouis. 21. Ne vous plaisez-vous pas en Amérique ? 22. Je m'y plais beaucoup mieux qu'en France. 23. Votre écolier ne se plaît-il pas chez vous ? 24. Il se plaît chez moi, mais il désire retourner chez son père. 25. Dépêchez-vous, il est déjà midi.

EXERCISE 74.

1. At what hour does your friend go away ? 2. He goes away every morning at nine o'clock. 3. Do you go away with him ? 4. I go away with him when I have time. 5. Will you make haste to finish your letter ? 6. I make haste to finish it. 7. Does the gardener get angry with his brother ? 8. He gets angry with (contre) him when he does not make haste. 9. Make haste, my friend, it is ten o'clock. 10. Why do you not make haste ? 11. I like to play, but I do not like to study. 12. Do you like to stay at my house ? 13. I like to stay there. 14. Are you pleased at the arrival of your mother ? 15. I rejoice at it. 16. Is not your brother wrong to go away so soon ? 17. He is right to go away, he has much to do at home. 18. Do you rejoice at other people's misfortunes ? 19. I do not rejoice at them. 20. I rejoice at your success. 21. Does not your brother draw near the fire ? 22. He goes from the fire, he is too warm. 23. Does that young lady get angry with you ? 24. She gets angry at trifles (*de rien*). 25. Do you like to be in Paris ? 26. I like to be there. 27. Can you do without me to-day ? 28. We cannot do without you ; make haste to finish your work. 29. Do you want your penknife ? 30. I want to use it. 31. Make haste to rise, it is six o'clock. 32. Is it fine weather ? 33. No, Sir, it rains. 34. Is your father well this morning ? 35. Yes, Sir, he is very well.

SECTION XL.—THE PAST INDEFINITE [§ 121].

1. The past indefinite is composed of the present of the indicative of one of the auxiliary verbs, avoir and être [§ 45 (8)], and the participle past of a verb. See the different paradigms of verbs, § 47, and following sections.

J'ai parlé ; je suis arrivé, *I have spoken ; I have arrived.*

2. The past indefinite is used to express an action entirely completed, but performed at a time of which a part is not yet elapsed, or at a time entirely past, but not specified [§ 121 (1) (2)].

J'ai vu votre père ce matin, *I have seen your father this morning.*
Je ne vous ai pas encore parlé, *I have not yet spoken to you.*

3. The past indefinite may also be used when the time is specified [§ 121 (3)].

Je lui ai écrit la semaine dernière, *I wrote to him last week.*
Je lui ai envoyé une lettre le mois dernier, *I sent him a letter last month.*

4. In this tense, and in other compound tenses, the adverb is generally placed between the auxiliary verb and the participle [§ 136 (3)].

Vous nous avez souvent parlé, *You have often spoken to us.*
Je ne l'ai pas encore vu, *I have not yet seen him.*

5. The adverbs aujourd'hui, to-day ; demain, to-morrow ; hier, yesterday ; polysyllabic adverbs of manner ending in *ment*, and long adverbs generally, do not come between the auxiliary verb and the participle, but follow Rule 1, Sect. XXXIII. [See § 136 (5)].

Vous avez lu dernièrement, *You read lately.*

6. The impersonal verb y avoir [Sect. XXXII. 3, 4], placed before a word expressing time, corresponds with the English word *ago*.

J'ai reçu une lettre il y a huit jours, *I received a letter a week ago.*
Vous avez acheté une maison il y a un an, *You bought a house a year ago.*

RÉSUMÉ OF EXAMPLES.

Vos neveux nous ont parlé.	<i>Your nephews spoke to us.</i>
Nous avons parlé à votre père.	<i>We spoke to your father.</i>
Le tailleur a-t-il fait mon habit ?	<i>Has the tailor made my coat ?</i>
Le boulanger a mis son chapeau.	<i>The baker has put on his hat.</i>
Le cordonnier a ôté ses souliers.	<i>The shoemaker has taken his shoes off.</i>
Votre frère a dit quelque chose.	<i>Your brother said something.</i>
Votre sœur qu'a-t-elle dit ?	<i>What did your sister say ?</i>
N'avez-vous rien dit à mon cousin ?	<i>Have you told my cousin nothing ?</i>
Je ne lui ai rien dit.	<i>I have told him nothing.</i>
Je ne l'ai jamais rencontré.	<i>I have never met him.</i>
Je ne leur ai jamais parlé.	<i>I never spoke to them.</i>
Qu'avez-vous fait aujourd'hui ?	<i>What have you done to-day ?</i>
Hier nous n'avons pas travaillé.	<i>We did not work yesterday.</i>
Leur e-t-avez-vous souvent parlé ?	<i>Have you often spoken to them about it ?</i>
Je leur en ai souvent parlé.	<i>I have often spoken to them about it.</i>
Je ne le leur ai pas encore dit.	<i>I have not yet said anything to them about it.</i>
N'avez-vous pas assez écrit ?	<i>Have you not written enough ?</i>
Il m'a écrit, il y a longtemps.	<i>He wrote to me a long time ago.</i>
Il nous a répondu il y a un mois.	<i>He replied to us a month ago.</i>

VOCABULARY.

Avocat, m., barrister.	Garçon, m., boy.	Mis, from mettre, put on.
Cela, ceci, that, this.	Hier, yesterday.	Plant-er, 1, to plant.
Dit, from dire, said.	Journée, f., day.	Poir-er, m., pear-tree.
Étudi-er, 1, to study.	Lu, from lire, read.	Soulier, m., shoe.
Gant, m., glove.	Ministre, m., minister.	Vu, from voir, seen.

EXERCISE 75.

1. Qui vous a dit cela ? 2. L'avocat me l'a dit. 3. Lui avez-vous parlé de cette affaire ? 4. Je ne lui en ai pas encore parlé. 5. L'avez-vous vu dernièrement ? 6. Je l'ai vu il y a quelques jours. 7. N'avez-vous pas écrit hier ? 8. Nous avons lu et écrit toute la journée. [Sect. XXV. 9.] 9. N'avez-vous pas ôté vos gants et vos souliers ? 10. Je n'ai pas ôté mes gants, mais j'ai ôté mon chapeau. 11. Le tailleur n'a-t-il pas mis son chapeau ? 12. Oui, Monsieur, il a mis son chapeau. 13. Qu'avez-vous fait à ce petit garçon ? 14. Je ne lui ai rien fait. 15. Ne lui avez-vous point dit que je suis ici ? 16. Je ne le lui ai pas encore dit. 17. Qu'avez-vous étudié ce matin ? 18. Nous avons étudié nos leçons et nous avons lu nos livres. 19. Le jardinier du ministre a-t-il planté le poirier ? 20. Il l'a planté il y a plus de huit jours. 21. Avez-vous acheté un habit de drap noir ? 22. J'en ai acheté un. 23. L'avez-vous porté aujourd'hui ? 24. Je ne l'ai pas encore porté. 25. Nous avons mis nos souliers et nos bas ce matin.

EXERCISE 76.

1. Have you studied to-day ? 2. We have no time to study, we have read a page. 3. Have you not written to my brother ? 4. I have not yet written to him. 5. Has not the German written to my mother ? 6. He has not yet written to her. 7. Have you told (à) my mother that I have taken (pris) this book ? 8. I have not yet seen your mother. 9. What have you done this morning ? 10. We have done nothing. 11. Have you taken off your coat ? 12. I have not taken off my coat, it is too cold. 13. Has the bookseller written to your brother ? 14. He wrote to him a long time ago. 15. Did he write to him a month ago ? 16. He wrote to him more than a year ago. 17. Have you planted a pear-tree ? 18. We have planted several.

10. Is it too cold to (pour) plant trees? 20. It is too warm.
 21. What has the gardener done to your little boy? 22. He
 has done nothing to him. 23. Has any one done anything to
 him? 24. No one has done anything to him. 25. Is anything

the matter with him? 26. Nothing is the matter with him,
 27. Has your father put on his black hat? 28. No, Sir, he has
 not put on his black hat. 29. What has your brother said?
 30. He has said nothing.

Ezekiel, 595 B.C.

COPY-SLIP NO. 85.—EZEKIEL, 595 B.C.

France in Europe.

COPY-SLIP NO. 86.—FRANCE IN EUROPE.

Great Britain and Ireland.

COPY-SLIP NO. 87.—GREAT BRITAIN AND IRELAND.

Harold was killed at Hastings, 1066.

COPY-SLIP NO. 88.—HAROLD WAS KILLED AT HASTINGS, 1066.

Ionian Islands ceded to Greece in 1865.

COPY-SLIP NO. 89.—IONIAN ISLANDS CEDED TO GREECE IN 1865.

Jeddo, or Yeddo, the capital of Japan.

COPY-SLIP NO. 90.—JEDDO, OR YEDDO, THE CAPITAL OF JAPAN.

LESSONS IN PENMANSHIP.—XXIII.

THE copy-slips that accompany this lesson contain two examples of a kind of writing that we have not yet brought under the notice of our readers. Hitherto the turns of the letters in our copy-slips, both at top and bottom, have been curved; but in Copy-slips Nos. 89 and 90 it will be noticed that the turns of the letters are angular or pointed. For this reason this elegant style of writing is called "Angular Hand." It is also called "Ladies' Hand," because this pointed kind of writing is commonly adopted by ladies, and taught in ladies' schools; while in the handwriting of men, for the most part, the letters are

more rounded in the manner exhibited in Copy-slip No. 88. Roundness on the one hand, and angularity on the other, will be found to be the most essential marks of difference in the writing of men and that of women; the former being also distinguished by the neatness and compactness of the letters and the shortness of their loops and tails, while the latter is usually larger and spreads over much space, while the tails and loops of the letters are long and straggling. It must be remembered that in pointing out these as the chief points of difference in the handwriting of men and women, we are only speaking generally and directing attention to the more striking characteristics of the different styles of writing usually adopted by

the opposite sexes. Our readers will notice that, in pursuance of the plan laid down in the last lesson, our copy-slips convey the knowledge of some fact, scriptural, historical, geographical, or chronological. Each may serve, too, as the basis or foundation-stone of a theme or essay, and excite inquiry into the condition of the countries or the history of the personages that are mentioned therein.

LESSONS IN LATIN.—XII.

THE FIFTH DECLENSION.

ALL the nouns of the fifth declension end in *es* in the nominative singular. This ending arises from the addition of the termination *s* to the characteristic vowel of the stem—namely, *ē*, which thus becomes *es*. This characteristic vowel *ē* appears in all the cases. The ablative ending in *ē* is blended with the *ē* of the stem. All the nouns of this declension are feminine, except *dies*, a *day*, and its compound, *meridies*, *mid-day*, the *south*. *Dies*, in good prose, is used as a feminine only when it signifies generally a *time*, or *duration*, or a *fixed day*, an *appointed time*; as *dies dicta*, *dies constituta*, an *appointed day*; *longa dies*, a *long period*; *dammosa dies*, a *time of suffering*; *dies perexigua*, a *very brief period*. In the plural, *dies* and *meridies* are masculine.

FIFTH DECLENSION.

Sign *ei* in the Genitive Singular.

CASE-ENDINGS AND EXAMPLE.

Cases.	Singular.	Cases.	Plural.
N.	-ēs dies, a day.	N.	-ēs dies, days.
G.	-ēi diēi, of a day.	G.	-ērūm diērum, of days.
D.	-ēi diēi, to a day.	D.	-ēbus diēbus, to days.
Ac.	-ēm diēm, a day.	Ac.	-ēs diēs, days.
V.	-ēs dies, O day!	V.	-ēs dies, O days!
Ab.	-ē diē, by a day.	Ab.	-ēbus diēbus, by days.

In the genitive and dative singular—namely, *ei*—the *e* is short when it follows a consonant, as *rei*, *fidēi*; and long when it follows a vowel, as *diēi*, *faciēi*.

Only two words in this declension—namely, *res* and *dies*—have all the cases in both the singular and the plural; all other words are without the genitive, dative, and ablative plural.

Species is commonly added to *res* and *dies*, as having all the cases, but *Cicerō* pronounces the genitive and dative of *species* as not good Latin.

Of the following nouns, only the nominative and accusative plural are found in good prose writers:—

<i>Acies</i> , an edge, line, or sword.	<i>Facies</i> , an appearance. <i>Glacies</i> , glass.	<i>Series</i> , a series. <i>Spes</i> , hope.
<i>Effigies</i> , an effigy or likeness.	<i>Progenies</i> , a progeny or offspring.	

VOCABULARY.

<i>Adversus</i> , -a, -um, against.	<i>Dubius</i> , -a, -um, doubtful.	<i>Recreo</i> , 1, I recreate, quicken, refresh.
<i>Erumna</i> , -æ, f., wretchedness, misery.	<i>Facile</i> , adv., easily.	<i>Res adversa</i> , adverse things, adversity, misfortune.
<i>Afflicto</i> , 1, I beat down, afflict, grieve.	<i>Felicio</i> , <i>felicius</i> , gen. -ōris, happier.	<i>Solutium</i> , -i, n., solace, comfort.
<i>Amitto</i> , 3, I lose.	<i>Humanus</i> , -a, -um, human.	<i>Spes</i> , -ei, f., hope.
<i>Certus</i> , -a, -um, certain, fixed.	<i>Incertus</i> , -a, -um, uncertain.	<i>Tempus</i> , -ōris, n., time.
<i>Conditio</i> , -ōnis, f., a state or condition.	<i>Miser</i> , -a, -um, wretched.	<i>Vanus</i> , -a, -um, empty, vain.
<i>Dulcis</i> , -e, sweet.	<i>Oppōno</i> , 3, I set against.	<i>Vita</i> , -æ, f., life.

EXERCISE 39.—LATIN-ENGLISH.

1. *Spes est incerta et dubia.* 2. *Vis spei est magna in animis hominum.* 3. *Noune magna est vis spei in animo tuo?* 4. *Facile indulgent spei vanæ pueri.* 5. *Spem feliciorum temporem non debemus amittere in ærumnis vitæ.* 6. *O spes, dulci solatio animos miserorum hominum recreas!* 7. *Spe vanæ sæpe fallitur.* 8. *Res humanæ sunt incerta et dubia.* 9. *Conditio rerum humanarum est dubia.* 10. *Rebus adversis virtutem debet opponere.* 11. *Sapiens non extimescit res adversas.* 12. *O, res humane, quam sæpe animos hominum fallitis!* 13. *Animus sapientis non afflicatur rebus adversis.*

EXERCISE 40.—ENGLISH-LATIN.

1. The hope of life is uncertain. 2. The hope of a long life is vain. 3. I refresh my mind with hope. 4. The wise man is not easily beaten down in wretchedness. 5. Adversity beats down the minds of brave men. 6. The minds of brave men are beaten down by adversity.

7. By the solace of hope the mind of a sage is refreshed. 8. We ought not to lose virtue in the miseries of life. 9. The wretchedness of the condition beats down the man. 10. He loses the hope of a happier time.

VOCABULARY.

<i>Adventus</i> , -us, m., advent, coming.	<i>Debeo</i> , 2, I owe.	<i>Rarus</i> , -a, -um, rare, seldom.
<i>Amicitia</i> , -æ, f., friendship.	<i>Etiam</i> , conj., also.	<i>Salus</i> , -utis, f., health, safety.
<i>Avolo</i> , 1, I fly away.	<i>Exemplum</i> , -i, n., an example.	<i>Serenus</i> , -a, -um, serene, fine, bright.
<i>Cito</i> , adv., quickly.	<i>Exspecto</i> , or <i>expecto</i> , 1, I expect, await.	<i>Servo</i> , 1, I keep.
<i>Conquiesco</i> , 3, I am at peace.	<i>Fides</i> , -ei, f., fidelity.	<i>Tristis</i> , -e, sad.
<i>Convoco</i> , 1, I call together.	<i>Incorruptus</i> , -a, -um, incorrupt.	<i>Tutus</i> , -a, -um, safe.
<i>Cupido</i> , adv., desiringly.	<i>Portus</i> , -us, m., a harbour, port.	<i>Ver</i> , <i>veris</i> , n., spring.
		<i>Verus</i> , -a, -um, true.

EXERCISE 41.—LATIN-ENGLISH.

1. *Amicitie fides animum recreat in ærumnis vitæ.* 2. *Veræ amicitie exempla rara sunt.* 3. *Amicorum fidei debemus salutem in adversis rebus.* 4. *Verus amicus etiam in ærumnis vitæ servat fidem.* 5. *Fides etiam miseris portum parat.* 6. *Paratur mihi portus tutus.* 7. *Incorruptus amicus raris est in rebus adversis.* 8. *In fide amicorum conquiescit.* 9. *Veris adventus suavis est.* 10. *Cito avolat dies.* 11. *Dies sereni rari sunt in vere.* 12. *Die constitutâ milites in urbem convocat.* 13. *Certâ die amici in domum meam convocantur.* 14. *Tristes sunt dies miserorum.*

EXERCISE 42.—ENGLISH-LATIN.

1. True friends keep fidelity in the miseries of life. 2. The fidelity of friendship is not a vain hope. 3. Is the fidelity of an incorrupt friend a rare example? 4. In adversity we owe (are indebted for) a port to true friends. 5. The solace of true friendship calls together friends. 6. Fine days quickly fly away. 7. On a certain day the generals call together (their) bands. 8. The soldiers are called together by the king on an appointed day. 9. I await the coming of spring desiringly. 10. A sad day in spring is rare.

We have now gone through the five declensions; and here present, in a tabular view, the several variations:—

NUMBER.	CASES.	DECLENSION.				
		I.	II.	III.	IV.	V.
SINGULAR.	Nom.	-a	-us, -er, -ir, -um	various	-us, -u	-es
	Gen.	-æ	-i	-is	-ūs	-ei
	Dat.	-æ	-o	-i	-ui, -u	-ei
	Ac.	-am	-um	-em, -im	-um, -u	-em
	Voc.	-a	-e, -er, -ir, -um	like nom.	-us, -u	-es
	Ab.	-â	-o	-e, -i	-u, -u	-e
PLURAL.	N. & V.	-es	-i, -a	-es, -a, -ia	-us, -ua	-es
	Gen.	-arum	-orum	-um, -ium	-uum	-erum
	D. & Ab.	-is	-is	-ibus	-ibus, -ubus	-ebus
	Ac.	-as	-os, -a	-es, -a, -ia	-us, -ua	-es

In this summary view, many facts regarding gender, number, and case, are of necessity omitted. The greater number of them may be found in the lessons on the declensions of nouns that have already been given. It seems, however, desirable to add, that grammarians recognise in Latin what is called a common gender. Those nouns are said to be of the common gender (*c.*), which may be applied indifferently either to a male or a female. Such nouns are—

<i>Bos</i> , a bull or a cow.	<i>Incolæ</i> , an inhabitant.	<i>Sacerdos</i> , a priest or priestess.
<i>Canis</i> , a dog or a bitch.	<i>Lepus</i> , a hare.	<i>Testis</i> , a witness.
<i>Hospes</i> , a guest.	<i>Mus</i> , a mouse.	etc. etc.
<i>Hostis</i> , an enemy.	<i>Patens</i> , a parent.	

GENERAL EXERCISES ON THE FIVE DECLENSIONS.

VOCABULARY.

<i>Acutus</i> , -a, -um, sharp.	<i>Commōdus</i> , -a, -um, convenient.	<i>Eximius</i> , -a, -um, eminent, remarkable.
<i>Avarus</i> , -a, -um, avaricious.	<i>Contentus</i> , -a, -um, satisfied.	<i>Exoptatus</i> , -a, -um, wished for, desired.
<i>Barbarus</i> , -a, -um, barbarous.	<i>Credulus</i> , -a, -um, credulous, too believing.	<i>Fames</i> , -is, f., hunger.
<i>Caducus</i> , -a, -um, falling, frail.	<i>Divitiæ</i> , -arum, f., riches.	<i>Felix</i> , <i>felicius</i> , happy.
<i>Clarus</i> , -a, -um, clear, distinguished.	<i>Exiguus</i> , -a, -um, short, narrow.	<i>Frigidus</i> , -a, -um, cold.
		<i>Gelidus</i> , -a, -um, cold.
		<i>Glacies</i> , -ei, f., ice.

Gradus, -us, m., a step.	Limpidus, -a, -um, limpid, bright.	Potens, potētis, powerful.
Græcus, -a, -um, Greek.	Lubricus, -a, -um, stip- pery.	Profundus, -a, -um, deep.
Hircus, hircinis, f., wilder.	Magnificus, -a, -um, magnificent.	Quies, quietis, f., rest, quiet.
Humidus, -a, -um, humid, wet.	Morosus, -a, -um, morose, ill-tempered.	Rotundus, -a, -um, round.
Humus, -i, f., the ground or soil.	Nemo, nōminis, c., no one.	Semper, adv., always.
Infidus, -a, -um, un- faithful.	Nox, noctis, f., night.	Sempiternus, -a, -um, everlasting.
Insuperatus, -a, -um, unhelped for.	Nunquam, adv., never.	Sermo, -onis, m., speech.
Latinus, -a, -um, Latin.	Palus, paludis, f., a swamp.	Sitis, -is, f., thirst.
Læpus, -tris, m., a hare.	Pavidus, -a, -um, fear- ful, timid.	Tardus, -a, -um, slow.
Ligneus, -a, -um, wooden.		Tumidus, -a, -um, tumid, swelling.
		Ultimus, -a, -um, the last.

EXERCISE 43.—LATIN-ENGLISH.

1. Est mihi amicus filius et carus. 2. Infidus est servus tuus. 3. Terra est rotunda. 4. Vera amicitia est sempiterna. 5. Fames et sitis sunt molestæ. 6. Avarus nunquam est contentus. 7. Rex est potens. 8. Gradus tuus tardus est. 9. Virtus patris tui est eximia. 10. Fons est clarus et gelidus. 11. Nomen clarum est ducibus. 12. Amnis limpidus delectat omnes. 13. Cervus sunt alta cornua. 14. Res est magna et insolita. 15. Hic sunt vastæ paludes. 16. Opes credula fallit pueros. 17. Hominibus exigui est dies. 18. Nemo semper felix est. 19. Glacies est lubrica. 20. Pons ligneus custoditur. 21. Non omnes milites sunt fortes. 22. Magnificæ porticus defenduntur. 23. Portus est commodus. 24. Dentibus acutis edimus. 25. Nox est longa et frigida. 26. Bonus laudatur, inprobis vituperatur. 27. Senectus saepe est morosa. 28. Insuperata salus venit. 29. Maro est vastum, profundum, tumidum. 30. Quies valde exoptata facile amittitur. 31. Sermonem Latinum discimus. 32. Nonne doces Græcam linguam? 33. Gentes barbaram remotas sunt. 34. Lepores pavidus evolant. 35. Flos est caducus. 36. Hora ultima venit. 37. Incertæ sunt divitiæ. 38. Mores antiquos amat mater mea. 39. Verba tua sunt dura. 40. Quam humida est humus! 41. Non facile in hiemo agri arantur.

EXERCISE 44.—LATIN-ENGLISH.

1. Faithful friends are loved. 2. I have great riches. 3. They lose wished-for friendship. 4. The ground is wet. 5. Wet ground injures. 6. Hares have sharp teeth. 7. With sharp teeth we all eat. 8. Thy soldiers are brave. 9. Are thy father's soldiers brave? 10. They delight in (abl.) credulous hope. 11. The horns of the bull are strong. 12. The virtues of the king are remarkable. 13. How beautiful is the portico. 14. You ought to learn Latin. 15. Men fear the last hour. 16. The house is guarded by a strong band. 17. Avaricious men are avoided. 18. Ill-tempered women are never loved. 19. The ill-tempered are troublesome. 20. Is friendship eternal? 21. Hope is eternal. 22. How slow are thy steps! 23. Ice is slippery in winter. 24. No one loves hunger and thirst. 25. Quiet quickly flies away. 26. The harbour is convenient for ships. 27. The fearful are never safe. 28. Art thou satisfied with the speech of thy father? 29. They strike a powerful prince. 30. Falling flowers are gathered (lego, 3). 31. He gathers flowers in the march. 32. The Greek language is beautiful. 33. Swelling seas are often found. 34. The rest and solace of true friendship are wished for. 35. No one is always happy.

To how large an extent Latin words enter into the composition of our present English is strikingly seen in the last vocabulary. These words found therein have their English representatives.

LATIN.	ENGLISH REP.	LATIN.	ENGLISH REP.
Acutus	Acute, acutely.	Infidus	Infidel, infidelity.
Avarus	Avaricious, avarici- ously.	Limpidus	Limpid.
Barbarus	Barbarous, barbarism, barbarity.	Lubricus	Lubricate.
Clarus	Clear, clearness, cla- rify.	Magnificus	Magnificent, magnifi- cence.
Commodus	Commodity, commode.	Morosus	Morose, moroseness.
Contentus	Content, contentedness.	Nox	Nocturnal, equinox.
Credulus	Credulous, credulity, incredulity.	Potens	Potent, potentate, po- tency.
Fames	Famish, famise.	Profundus	Profound, profundity.
Felix	Felicity, felicitate.	Quies	Quiet, quietness, quietly.
Frigidus.	Frigid, frigidity.	Rotundus	Rotund, rotundity.
Gelidus	Jelly.	Sempiternus	Sempiternal.
Gradus	Grade, graduate.	Tardus	Tardy.
Humidus	Humid, humidity.	Tumidus	Tumid, tumidity, tu- mour.

The student of Latin will be greatly assisted if, before he attempts to commit a Latin word to memory, he tries to find an English word which is derived from it, and with which he may associate it in his mind.

KEY TO EXERCISES IN LESSONS IN LATIN.—XI.

EXERCISE 35.—LATIN-ENGLISH.

1. Play is pleasant to boys. 2. There are various kinds of play. 3. Boys willingly indulge in play. 4. It is not play pleasant to boys. 5. Play is pleasant to me. 6. Play is exceedingly pleasant to thee. 7. Grave men avoid boyish plays (games). 8. O play, how sweetly thou delightest boys' minds! 9. Kings are not delighted with boyish play. 10. The senses are keen. 11. I have keen senses. 12. Great is the power of the senses. 13. Is the power of the senses great? 14. A brave man does not yield to feelings of pain. 15. Beasts have keen senses. 16. O ye senses, how great pleasure you procure for (occasion) men! 17. The animals are endowed with senses.

EXERCISE 36.—ENGLISH-LATIN.

1. Sensus doloris est amarus. 2. Estne amarus tibi doloris sensus? 3. Omnibus hominibus et omnibus animalibus sensus doloris est amarus. 4. Magna est lætæ vis. 5. Sapiens vi sensuum non vincitur. 6. Fortis lætæ non cedit. 7. Portento vi sensuum cedunt. 8. O lætæ, quam viciâ hominum animos! 9. Pueri libenter indulgent lusu. 10. Multa genera sunt lusus. 11. Lusus omnis generis grati sunt pueris et puellis. 12. Viros non delectant pueriles lusus. 13. Viri puerill lusu non delectantur. 14. Indulgent voluptati pueri et homines. 15. Quam magnopere evitatur lætæ a liberis. 16. Arcubus et sagittis delectant pueri. 17. Arcubus delectant puellæ.

EXERCISE 37.—LATIN-ENGLISH.

1. The terrible thunder greatly moves the minds of men. 2. Is not the sound of thunder terrible? 3. The roaring of thunder is frightful. 4. Thunder is frightful. 5. Lightning precedes thunder. 6. Many men fear thunder. 7. Thunder is feared by many men. 8. O thunder, how frightful is thy roaring! 9. The house resounds with the thunder. 10. Men's knees are strong. 11. The vigour of the knees indicates the strength of the body. 12. The knees have great strength. 13. Suppliants fall on (their) knees. 14. O knees, how much you tremble! 15. In the knees there is great strength.

EXERCISE 37.—ENGLISH-LATIN.

1. Hominis genu validum est. 2. Validis genibus sonat vigor. 3. Suntne valida genua tua? 4. Silve resonant horribili sonu tonitruis. 5. Sonus tonitruis animalia permoveet. 6. Tonitrua validis bestis extimescitur. 7. Sunt mihi debilia genua. 8. Santne patri tuo debilia genua? 9. Non; valida genua sunt patri meo. 10. Permoveor multo fulmine. 11. Fremitus tonitruis supplices permovent. 12. Supplex pulchram domum indicat.

LESSONS IN DRAWING.—XII.

In the last two lessons we have dwelt altogether upon the treatment of shadows, which belong more especially to flat surfaces, as they come more commonly under our general observation, and are found to be under the most simple conditions. We now propose to enter upon the consideration of shadows connected with convex and concave or curved surfaces, where we have to represent the relief and rotundity of an object. These require a different style of treatment to those on a flat or evenly-shaded surface. For flat shadows—namely, those on the sides of walls, or on the ground—we have employed straight lines only, without crossing them with other straight lines, and thus produce either dark or light shades by making the lines broader, or closer together, or wider apart, as the tone of the shadow required; but with rounded forms we must adopt the practice of crossing lines by others, straight lines by straight, and curved lines by curved, making the lines to follow the course of curvature, which, independently of the tone employed, materially assist us in producing the effect of rounded forms. The first essay will be a flat tint, for which the pupil must use a B or BB pencil with a tolerably broad point. Fig. 82 is a series of regular perpendicular lines crossed over with inclined lines at a very acute angle with the perpendicular; the angle of inclination may be understood by referring to the crossed lines, a (we caution the pupil at present against crossing the lines at right angles, thereby producing a kind of rectangular network); this first example must be repeated over and over again until it is mastered. The first difficulty will be to draw the lines equidistant from each other, so that the intervals between them be uniformly regular, both with regard to the first-drawn perpendicular lines and those which cross them. In the next place, the beginner will at first be almost certain to make some of his lines broader, some darker than others. To avoid this, he must endeavour to use equal pressure; and then again, probably, they will not be parallel with each other. To overcome all these

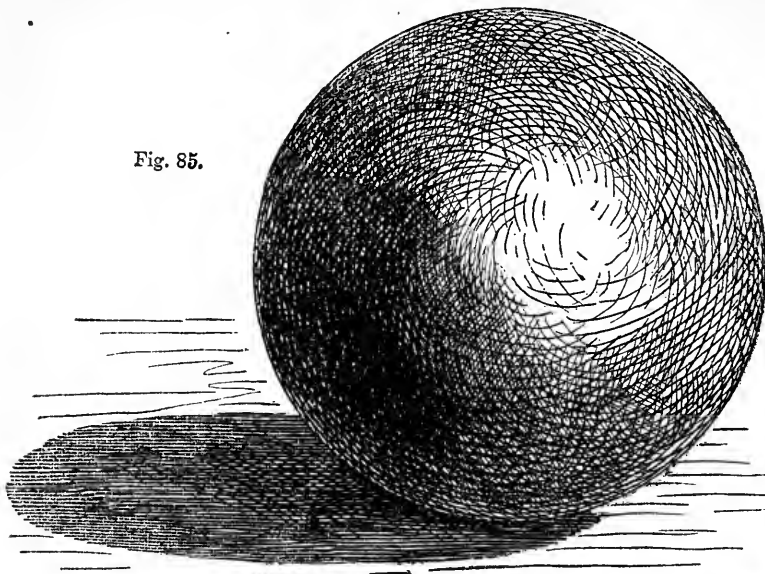


Fig. 85.

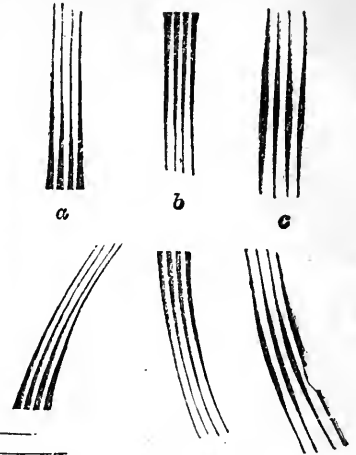


Fig. 83.

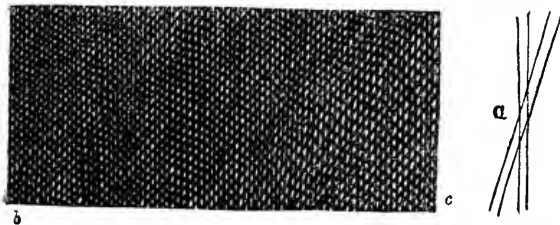


Fig. 82.

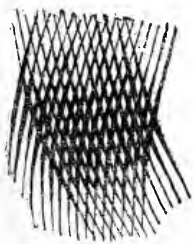


Fig. 84.

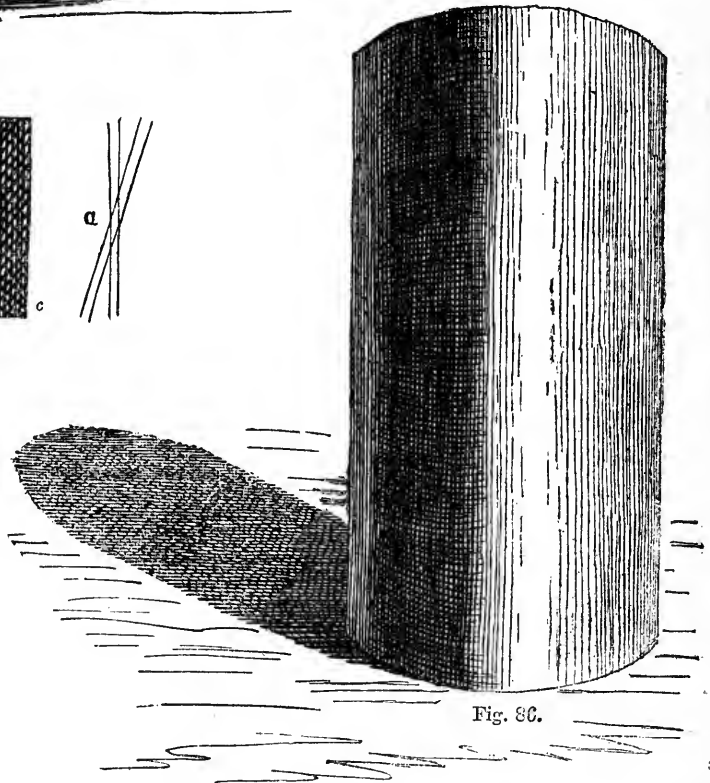


Fig. 86.

little impediments to progress, he will require very considerable practice before he thinks of attempting the next step in shading, which differs from that already explained in the manner of drawing the line.

It will be noticed that in Fig. 82 the learner placed the pencil upon the paper before he began to draw each line, nor was it taken off until the line was finished; in fact, it was very much like drawing a number of downward strokes like the "straight stroke" in Copy-slip No. 25, in our Lessons in Penmanship (page 117). The kind of line we are now considering is one that must have no perceptible beginning or ending, where the pencil either commences the movement for drawing the line *before* it touches

the paper, as *a* (Fig. 83) or as *b*, where, at the termination, the pencil is gradually raised from the paper; or as *c*, where the manner of *a* and *b* is combined; that is, where the line commences imperceptibly and ends imperceptibly, first, by lowering the pencil in an inclined direction to the paper at the commencement, and by raising it gradually at the end before leaving off, so that the *strength* of the line when completed is in the *middle*. Curved lines drawn in the same way must also be repeatedly practised. The straight lines (Fig. 82) are for flat tints, back grounds, etc.; the curved lines are employed for rounded forms.

After the pupil has mastered the manner of drawing these various kinds of line, he may then proceed to cross them, as in

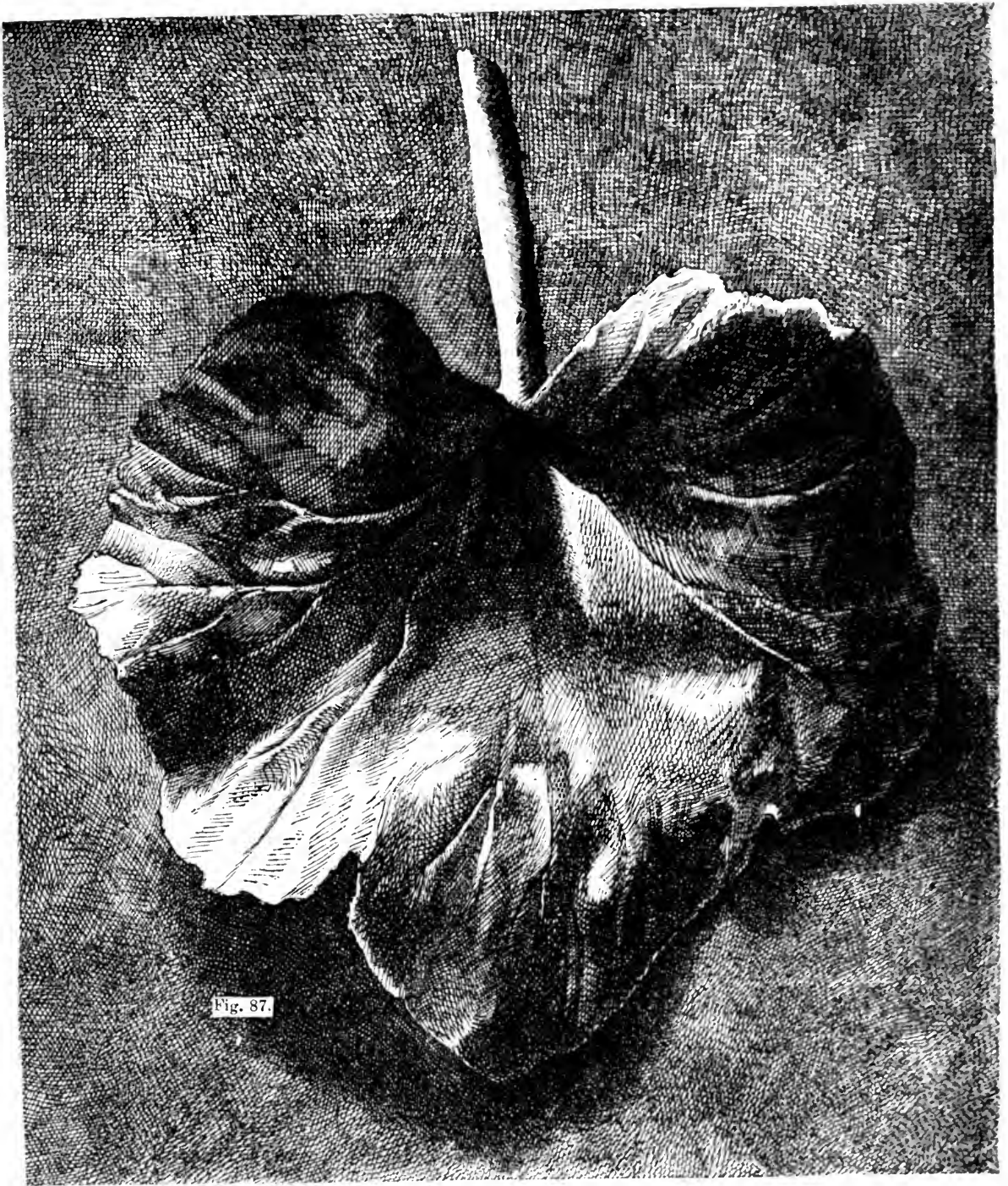


Fig. 87.

Fig. 84, observing again that he must not as yet cross them at right angles. Perhaps he may ask, why not *as yet*? is there any decided objection to lines crossed at right angles? Certainly not, when done by an experienced hand: but the reason why we object to his crossing them in that way at present is because he will have first to acquire the power of making all his lines *equal* in *tone*, *thickness*, and *strength*, and at regular intervening distances; and this we know will demand all the thought and care he can bestow for a while before he must attempt to cross them in *any* direction.

The reason for commencing the line (as shown at *b*, Fig. 83) firmly, and then gradually lifting up the pencil when drawing

lines for an even tint of shade of some extent is, that we may continue the line by the manner of *c*, so that the extremities of these lines as they lap over one another may form an even line without any perceptible joint. Very probably it may be necessary to repeat the example *c* many times successively (but this depends upon the extent of the shadow), and then we finally end with the example *a*. Let the pupil draw a square of about four or five inches' side, and fill it up by this method of making an even shade tint. If he were to work the whole space with continued portions similar to Fig. 82, the joints of these portions would show, and spoil the tint: the edge, *b c* (Fig. 82) would be shown across the shadow as many times as the portion was repeated.

Believing the pupil now to be master of the method of drawing a single line under any one of the conditions above named, whether straight or curved, we will proceed to apply them, or rather to combine them so as to form tints required in shading. Of course we can do little for the pupil towards helping him in his judgment regarding the tones of shadows; his own observation must be his guide in deciding how dark or how light a shadow is. Shadows and tones must be compared with one another, because the circumstances surrounding them will so far influence their intensity that it would be impossible to give rules for shadows under all conditions. They are so varied and so changeable that we can do no more than give him a few general principles to guide his practice.

We have said before that cast shadows are, for certain reasons already given, generally darker than broad shadows; we will add now that the *highest light* and *darkest shadow* are together; and as the strength of the light upon an object or collection of objects gradually diminishes, so the depth or intensity of the shadows diminishes also. Take an example:—Place a chair near to a window, and another chair in the part of the room farthest from the window; the light which falls upon the chair near to the window will be much stronger than that which falls upon the farther chair. Observe the broad shadows and the cast shadows from the legs upon the ground, the latter especially, of the first chair. Compare them with the corresponding shadows of the second chair, or that farthest from the window. We venture to say, without more comment, that the pupil will have seen enough from this experiment to satisfy him upon this point. This principle of the darkest shadow being near to the highest light is found to be the same respecting the shadow on a ball (Fig. 85), or on the side of a column (Fig. 86), and in thousands of cases besides, so numerous that we need not look far for examples. The great difficulty in shading is the management of the half tints. Any one can make an extreme shade of black; and if the right feeling for half tints and semi-tones is not a natural one—something analogous to that of a good ear for music—it can be to a great extent acquired, though in some cases it will demand a much greater amount of practical experience and observation than in others before they begin to perceive the many varieties of tone which are spread upon the surface of an object, especially if it be an irregular one. But when we have to add colour in connection with light and shade, we go farther into a field of change and variety that is unbounded. And here is the test of the painter. It is the management of the minor tones which makes all the difference between a first-rate artist and a common country sign-painter. The latter may paint a red cow sufficiently well to answer the purpose of giving a title to the village alehouse. We will grant that he has the ability to make a tolerable representation of the animal in outline, but when he attempts to paint it he will do nothing more than fill up the outline with red, and darken the parts in shade with black, because he can see nothing further; but the eye of the true artist would seize upon the innumerable tints spread all over the surface—the various degrees of colour influenced by the position and strength of the light, some parts more brilliant, some more subdued, intermingled with greys of various hues in every portion—added to which are the reflections of colour and of light amongst the shadows, some warm, some cold: in short, to name all the changes and tones that would require his especial attention can only be done by him who is able to paint them. Here, then, is the secret why one painter is greater than another; and their comparative excellence is determined by their ability to perceive and represent few or many of the infinite varieties of tones scattered over every object in Nature.

It will be readily seen, on referring to Figs. 85, 86, and 87, where curved lines in working the shadows are used in preference to straight ones, and, on the contrary, where straight are preferred to curved; curved lines must be used to represent curved surfaces, either convex or concave. The ball (Fig. 85), is altogether shaded by curved lines, which render such important service in giving effect to rounded forms. Straight lines are the principal composing lines of the shadow on the cylinder (Fig. 86). On account of its uniformity of surface and because it is perpendicular, perpendicular lines are employed; whilst the apparent rotundity of the cylinder is made to depend upon the *tone* of the shadow rather than upon the lines which compose it; the shadow having its reflection, its deep shade, and its half tint, the last blending into the highest light. As to the proper strength of

tone to be given to these portions of the shadow, the pupil must be guided by his own judgment, which the more it is exercised the keener will be his perception of the tone of a shadow or reflection by comparing it with other shadows and reflections, for by comparison only we can undertake to say how dark or how light a tint must be.

Fig. 87 is drawn from a cast of a geranium leaf, where a mixture of lines is employed, some more curvilinear than others, according to the rotundity of the surface to be copied; for it must be observed that in proportion as a rounded surface approaches the flat, so will it require straighter lines to represent it.

In a former lesson we mentioned the *stump*, an instrument used for laying on a tint by rubbing; this may be used for the first instalment of a shadow, that is, for rubbing in a flat tint over the broader and more decided parts of the shadow, the whole being afterwards passed over by the line method. In using the stump, the tint must not be made as dark as the shadow ought to be when finished, nor must it be carried into the half tones uniting the shade with the high light. An effect can be much more readily produced with the stump, but the danger is lest the shadows should be made *dirty* or *cloudy*. After a little experience this method will be found to be quicker than doing it altogether by lines, inasmuch as it saves a little labour; but the shadows *must* be passed over with lines after the stump has laid the foundation, otherwise all the crispness, clearness of tone, and definite precision of character will be sacrificed. We strongly advise the pupil to provide himself with a few plaster casts of leaves, fruit, and ornament. The advantages of casts are many. They can be placed in any light, and they present so many different views that they may be said to be inexhaustible copies.

LESSONS IN ENGLISH.—XII.

DERIVATIONS: PREFIXES (continued).

PAUSING for a moment in the details of our subject, I would ask you whether you know what words are. Take the word *father*. What is it? Father, as it stands here on the page, is a combination of straight and curved lines. What does the combination of lines represent? A combination of sounds. What does the combination of sounds represent? A state of mind; a mental conception. What does the mental conception represent? An external object; an external object that has the quality of being a father, or that bears the relation which we designate by the term father. So then the whole connection between an external object and the written or printed name of this book may be set forth thus:—Lines make letters; letters make syllables; syllables make words; words represent sounds; sounds represent ideas; ideas represent outward objects—that is, persons or things. Consequently, objects are the basis of language; ideas are its essence; sounds are its medium, and lines are its forms. These outward objects, and internal realities, are set forth by signs,—signs made by the mouth—signs made by the hand. The lips, then, and the fingers are the interpreters of the person. What progress in civilisation is implied in this connection of the pen with the mind and with the universe; the pen describing, and the press diffusing, so as to be universally understood, the most subtle of all essences; states of thought and feeling; and the wisest, as well as the wisest of all generalisations which we term the laws of God, or God's own operations in the government of the universe! The study of language, thus viewed, is the study of the mind of man, as well as the study of the works and the will of God. Deep and mysterious study, worthy of our best powers, and sure to be attended by an ample reward! And if the study of language is the study of the human mind, and the Divine mind in their activity and their utterances, then no one who has not made some proficiency in the study is, or can be, competent to interpret or expound man's will or God's will, profane or sacred literature. To resume our subject:

Olig, of Greek origin (*ολιγος*, pronounced ol'-i-gos, a few), is the first part of *oligarchy* (Greek, *αρχη*, pronounced ar'-ke, government), government by a few; *oligarch*, one of a small number of rulers.

Omnis, of Latin origin (*omnis*, all), is seen in *omniscient* (Latin, *scio*, I know), all-knowing; *omnipotent* (Latin, *potens*, powerful), all-powerful; *omnipresent*, existing everywhere; *omnivorous*, all-devouring.

Ortho, of Greek origin (Greek, *orthos*, pronounced or'-thos, straight, right), as in *orthodoxy*, right opinion; *orthogonal*, right-angled; *orthopædic*, right-footed, etc.

"Athanasius is commonly accounted the very rule of orthodoxy in this point."—Cudworth, "Intellectual System."

This prefix forms part also of *orthography* (Greek, *γραφή*, pronounced graf'-fe, writing), right writing, that is, in the spelling of words; as *orthoepey* (Greek, *επος*, pronounced ep'-os, a word) is right pronunciation.

Over, of Saxon origin, as in *overarch*, *overbalance*, *overbear*, *overcharge*, *overboard*, *over-boil*, *over-bounteous*, frequently denoting too much, as *over-careful*, that is, careful to excess. *Overcome* has two significations, to conquer, and to come over or upon.

"He found the means to subdue both the one and the other, compelling as well the overcomers as the overcome to be his tributaries."—Brende, "Quintus Curtius."

"Mac. Can such things be
And overcome us like a summer's cloud,
Without our special wonder?"—Shakespeare.

Over when employed for above, as "*over* two hundred," is to be avoided as an Americanism. To *overtake* is to come up with in walking or running.

"And had he not in his extremest need
Been helped through the swiftness of his steed,
He had him overtaken in his flight."—Spenser.

In the passive the verb *overtake* seems to denote the being suddenly surprised into an action; *surprise* is from the French *surprendre* (consisting of *sur*, above or over, and *prendre*, to take), whence *surprise* is the same as *overtake* in both derivation and meaning.

"Brethren, if a man be overtaken in a fault."—Gal. vi. 1.

It is not difficult to see how to overtake may mean to get over, overcome, surprise, but how it means to come up with is less easy to conceive. The notion of *over*, or of superiority may, however, lie in the act by which you succeed in coming up to the person you wish to overtake; thus, by walking more quickly than he, you overtake your friend, you take a step over his, and get beyond him.

Out, of Saxon origin, beyond a certain limit, is a very common prefix, as in *outbid*, *outdo*, *outface*, *outlaw*, *outlive*, *outstrip*, etc. *Outrage* has nothing to do with *out*. *Outrage* comes from the mediæval Latin word *ultradium*, through the French *outrage*, *outrage*. *Ultradium*, from *ultra*, beyond, denoted a surplussage paid to the lord by his subject on failure of paying his dues in proper time, whence *outrage* came to signify something in excess and to have an offensive meaning.

Pan, of Greek origin (*pas*, pas, m.; *πασα*, pa'-sa f.; *παν*, pan, n., all), is found in *panacea* (Greek, *ακεραια*, pronounced a-ke'-o-mi, I heal), all-heal, a universal remedy; in *pancreas* (Greek, *κρεας*, pronounced kre'-as, flesh), all flesh—that is, the sweetbread; and in *pandeets* (Greek, *δεχομαι*, pronounced dek'-o-mi, I receive), a common title of the Greek miscellanies. The term is known in history in its application to a digest of the civil law published by the Emperor Justinian. Again, *pan* occurs in *pantheism* (Greek, *θεος*, pronounced the'-os, God), all-goodness—that is, the system which regards God and the universe as the same. *Pan* forms the first part of pantomime (Greek *μιμος*, pronounced mi'-mos, a mimic; and the word mimic is from mimos), all-mimicry, because the performance consisted solely of imitation.

"The pantomimes who maintained their reputation from the age of Augustus to the sixth century, expressed, without the use of words, the various fables of the gods and heroes of antiquity; and the perfection of their art, which sometimes disarmed the gravity of the philosopher, always excited the applause and wonder of the people."—Gibbon, "Roman Empire."

Para, of Greek origin (*παρα*, pronounced pa-ra, by the side of, as in parallels, i.e., parallel lines), has in English various acceptations. In *parable* (Greek, *βαλλω*, pronounced bal'-lo, I throw), something put by the side of another thing, a comparison, a similitude. In Scripture, the parables of the Old Testament are short, pithy, and weighty sayings; the parables of the New Testament are short tales, setting forth religious truth under similitudes; the former are apothegms; the latter allegories. *Para* appears in *paraclete* (Greek, *καλειν*, pronounced kal'-ine, to call), the Advocate or Comforter (John xiv. 16).

Paradise is a Persian word, denoting a park, and has no connection with the Greek *para*; in Hebrew, *parais*, a garden.

Par, of Latin origin (*para*, partis, a part), appears in *participle* (Latin, *capio*, I take)—that is, to partake. This word *partake* is a hybrid, being formed of an English and a Latin word; it is therefore a cross in the breed between Latin and English.

Pent, or *penta*, of Greek origin (*πεντε*, pronounced pen'-te, five), as in *pentagon*, a figure having five sides; *pentateuch* (*fivefold*), the name given to what are called "the five books of Moses"—namely, Genesis, Exodus, Leviticus, Numbers, and Deuteronomy.

Per, of Latin origin, through, by; as, *peradventure*, by chance. It is found in *perambulate* (Latin, *ambulo*, I walk), to walk through, over.

"The ancients used to crown virgins with the flowers of this plant (milkwort) when they perambulated the fields, to implore fertility thereto."—Miller, "Gardener's Dictionary."

The *per* passes into *pol* in *pollute* (Latin, *polluo*, per, and *lutum*, mud). *Pol* is found also in *pollicitation*, a promising, from the Latin *pollicitor*, I promise.

Peri, of Greek origin (*περι*, pronounced per'-re), meaning around; as, *periphery* (Greek, *φερα*, fer'-ro, I bear), a circumference; also in *periphrasis* (Greek, *φρασις*, fra'-sis, a phrase, a speech), a circumlocution, or roundabout mode of utterance; as, the *loss of life*, for death.

Phil and *philo*, of Greek origin (*φιλος*, fil'-los, a lover), as in *philologer*, a lover of science (particularly the science of language); *philosopher* (Greek, *σοφια*, sof'-ia, wisdom), a lover of wisdom; *philomel* (Greek, *μελος*, mel'-los, a song), applied to the nightingale; *philanthropy* (Greek, *ανθρωπος*, an-thro'-pos, a man), the love of mankind.

Phys, of Greek origin (Greek, *φυσis*, fu'-sis, nature), *physic*, and *physician*, originally meant natural philosophy and a natural philosopher; but derivatively, the words came to refer to a knowledge of such natural objects as were held to conduce to the art of healing. *Physics*, plural, still means Natural Philosophy; and the French word *physicien* means a Natural Philosopher, or one acquainted with the laws of nature.

Physiognomy consists of the Greek words *φυσis*, fu'-sis, nature, and *γνωσκα*, gi-no'-sko, I know; and so properly denotes a knowledge of nature by outward appearances; but, as employed, the word signifies a knowledge of a man's character, as gained from his countenance. *Physiology* is the science of nature, but in a particular way; a science, that is, of the structure and laws of the human frame in particular, and of animal organisation in general.

"I find that the most eminent and original physiologist of the present age (M. Cuvier) has been led, by his enlightened researches concerning the laws of the animal economy, into a train of thinking strikingly similar."—Dugald Stewart, "Philosophy of the Mind."

Pleni, of Latin origin (*plenus*, full; hence *plenty*), is found in *plenipotentiary* (Latin, *potens*, powerful), one who has been entrusted with full power or authority.

"Let the plenipotentiary sophisters of England settle with the diplomatic sophisters of France in what manner right is to be corrected by an infusion of wrong, and how truth may be rendered more true by a due intermixture of falsehood."—Burke.

The Greek word *πλεος* (ple'-os) is the same as the Latin *plenus*, found in our "plenty." This word supplies the first syllable in *pleonasm*, a fulness of expression so as to become excessive.

"It is a *pleonasm*, a figure used in Scripture, by a multiplicity of expressions, to signify some one notable thing."—South.

Poly, of Greek origin (*πολυς*, pol'-use, many, much), appears in *polyanthus* (Greek, *αθος*, an'-thos, a flower), so called from its many flowers; and in *polygamy* (Greek, *γαμος* [gam'-os], marriage), having many wives.

"Polygamy was not commonly tolerated in Greece, for marriage was thought to be a conjunction of one man with one woman."—Potter, "Antiquities of Greece."

Poly is also the first syllable of *polyglot* (Greek, *γλωττα*, gloat'-ta, a tongue), one who knows many languages; also a book written in many languages, as the "Polyglot Bible."

Post, of Latin origin, after, afterwards, appears in *postdate*, to date after the time of writing, at some later time; in *postpone* (Latin, *pono*, I place), to put off; and in *postscript* (Latin, *scriptum*, a writing), something added to a letter.

Postumus, erroneously spelt *posthumous*, from the Latin *postumus*, the same as *postremus* (from *post*, *after*), signifies late, very late, the latest, the last. This word is applied to a child born after the father's death, or a book published after the author's death.

Sometimes the word is spelt *posthume*, for *postume*. We have here an instance of the effect on spelling of a supposed etymology. *Postume* was thought to be composed of *post*, *after*, and *humus*, the ground, and hence the word was written *posthume*. It is, however, the superlative of the Latin *posterus*, and is used in the Latin language with the same applications as in English. Richardson is wrong in the etymology which he gives of this word.

Pre, of Latin origin, *before*, as in *precaution* (from Latin, *cavere*, to beware), forethought.

"Precaution trudgeth all about
To see the candles fairly out."

Churchill, "The Ghost."

Pre is found in *precede* (Latin, *cedo*, I go), in *precipitous* (Latin, *caput*, the head), headlong; in *precocious* (Latin, *coquere*, to cook), cooked before, forward, too soon ready.

"I had heard of divers forward and precose youths, and some I have known, but I never did either heare or read of anything like to this sweete child."—Evelyn, "Memoirs."

LESSONS IN GEOGRAPHY.—XI.

In our last lesson it was stated that it is generally believed by geographers in the present day that the southern pole of the axis on which the earth revolves once in the course of every twenty-four hours, is situated in the midst of a vast continent to which access is forbidden by the masses of ice that fringe its coasts, and the steep rampart of volcanic mountains that rises abruptly from the very edge of its shore. The northern pole of the earth's axis, on the contrary, is supposed to be in the midst of an open ocean, navigable by vessels, if a ready and practicable means of entrance to its waters could be found through the ice-fields that encircle it. Possibly we are on the eve of solving the problem, and discovering with certainty what may be the condition of the regions that lie around the North Pole, for an expedition thither is preparing under the auspices of the French Government, which will in all probability set out for its destination in 1869, under the command of its originator, M. Gustave Lambert. It is M. Lambert's intention to avoid the routes taken by former explorers, and to push his way to the north through Behring Strait.

To tell the story of Arctic explorations since Sir John Franklin left England on his third expedition of discovery to the north in 1844, to die three years after on the dreary wastes of King William Land, hard by Point Victory—an apt name for the last resting-place of a man to whom belongs the merit and honour of having discovered the "north-west passage" from England to the shores of Asia by sea—"barren honour" as it is and must be to all save himself and his companions, as its discovery can never be attended with results useful to commerce—would occupy too much space. It will, therefore, suffice to say that of late years the most active and successful explorers of the regions that lie north of the line of waters that stretch from Baffin Bay on the east to Banks Strait on the west, are Dr. Elisha Kent Kane and Dr. Isaac J. Hayes. Both of these travellers are Americans, and both have received a gold medal from the Royal Geographical Society as an acknowledgment of the eminent services rendered to geography by their discoveries—the former having received the Founder's Gold Medal in 1856, for his services in connection with the American expeditions sent out in search of Franklin in 1850 and 1853, and the latter the Patron's Gold Medal in 1867, for his memorable expedition in 1860-61, towards the supposed open polar sea, in which he attained lat. 81° 35' in Smith Sound, a more northern point of land than has been reached by any previous navigator.

Coming southward from Smith Sound, up which Dr. Hayes penetrated to within 9° 25', or somewhat less than 600 miles of the North Pole, we have Greenland or Danish America on our right, which was visited by Mr. Edward Whymper, a well-known Alpine explorer, in 1867. Owing to an epidemic, which had carried off about ten per cent. of the population, this

explorer was not successful in penetrating as far into the interior as he intended, and another journey will be necessary to ascertain from what sources sustenance is derived by the herds of deer that come from the interior of the country to the coasts at certain periods, and after a short stay return once more to their yet undiscovered haunts. In Alaska Mr. Frederick Whymper, an artist attached to the late Russo-American Telegraph Expedition, has been more successful, having advanced more than 1,200 miles into the heart of the country along the course of the Kwichpac or Youcon River, a magnificent stream that discharges its waters into the ocean nearly opposite the Isle of St. Lawrence, that lies like a breakwater across the entrance to Behring Strait, between the opposing coasts of Asia and America.

Mr. Frederick Whymper's journey into the interior of Alaska was made in 1866-7. He travelled by sledge from Norton Sound, a deep inlet to the south-east of Behring Strait, to the banks of the Youkon River, spending the winter months at Nulato, the last of the trading ports that the Russians have established along the course of the river and the interior of the country. In the spring he re-commenced his journey, and made his way up the stream in a boat, consisting of a framework covered with skins, to a point about 600 miles distant from Nulato, where the Porcupine River enters the Youkon. He then turned, and descended the course of the river to the sea. The Youkon is navigable for 1,800 miles from its embouchure during the summer months, but for at least eight months of the year it is frozen over. The natives on the coast are Esquimaux, while in the interior, and on the banks of the river, parties of Indians are occasionally met with. Public attention has recently been directed to Alaska, formerly Russian America, on account of its sale by the Russian government to the United States in 1867, for the sum of 7,000,000 dollars, or about £1,400,000.

Some hundreds of miles lower down the west continent of North America, a little to the north of the boundary line between the British dominions and the United States, lies a broad belt of forest land and fertile pasture ground, watered by the head-streams of the Saskatchewan and the Red River, which stretches from the western confines of the new dominion of Canada to the Rocky Mountains. This region was visited by Viscount Milton and Dr. Cheadle in 1861-63; the expedition being "undertaken with the design of discovering the most direct route through British territory to the gold regions of Cariboo (in British Columbia), and exploring the unknown country on the western flank of the Rocky Mountains, in the neighbourhood of the sources of the north branch of the Thompson River." This expedition has furnished us with much valuable information about a country that has hitherto been entirely abandoned to Indians and trappers, but which contains upwards of 65,000 square miles of land, of unsurpassed fertility, abounding in mineral wealth, and which is destined to become, at no very distant period perhaps, one of the principal centres of British colonisation, affording the true north-west passage by land from Europe, through our colonies of Canada and British Columbia, to the splendid harbours of Esquimaux and the great coal-fields of Vancouver Island, which offer every advantage for the protection and supply of a merchant fleet trading thence to India, China, and Japan. Our illustration* will give the reader some idea of the beauty and grandeur of the scenery on the eastern slope of the Rocky Mountains. It is a view of the valley near Jasper House, or Fort Assiniboine, a little trading station on the bank of the Athabasca or Elk River, which emerges from the heart of the Rocky Mountains through a narrow gorge near this point, and expands into a lake about three or four miles long, the shores of which are beautifully wooded with clumps and clusters of dark-green pines, and covered with luxuriant verdure. In the background, on the right of the picture, is an ice-capped conical mountain called the Priest's Rock, which forms a prominent feature in the landscape, while on the left is seen the flattened top and profile of a steep ascent rising almost perpendicularly from the plains below, called the Roche à Myette.

Passing still southwards through the United States—the western parts of which are now being opened up by strong and resolute backwoodsmen from the outlying districts of the Central

* This illustration is taken, by permission of the authors, from the "North-West Passage by Land," by Lord Milton, M.P., and Dr. Cheadle. London: Cassell, Petter, and Galpin.

States, the pioneers of advancing civilisation—and through Mexico—the most ill-conditioned country under the sun, as far as its people are concerned, yet in itself fair, rich, and fruitful, and worthy of being the home of an energetic and industrious race, instead of a paradise of thieves and cut-throats—we come to Central America, which deserves a passing mention here for the explorations of Captain, now Admiral, Belford Pin and others, who are seeking to turn the stream of emigration setting steadily out from the southern parts of the United States into British Honduras, a country especially adapted for the production of cotton, sugar, and indigo; and the attempts that have been made to bring about the cutting of a ship canal across the narrow slip of land that separates Lake Nicaragua from the waters of the Pacific, to form, with the lake itself and the river St. Juan a water-way through the isthmus for ships trading from Europe and the eastern coasts of America to India, China, Japan, and the shores and thousand islands of the vast Pacific.

Southward yet a little further, and we come to South America,

the Tapajos River, another vast tributary of that river, which drains the central and northern part of the province of Matto Grosso.

Of the semi-organised republics of South America, which have scarcely recovered the effects of the revolution which separated them from Spain in the first quarter of the present century, and which (especially La Plata, or the States of the Argentine Confederation) have much to do in eradicating the sources of intestine discord before they can attain the condition of prosperous, peace-loving countries, there is little or nothing *new to say*; and turning eastward across the Atlantic we reach the last of the six great divisions of the world, the continent of Africa, in which it is necessary to trace the history of geographical discovery since 1820.

After the travels of Sporrman, Shaw, Norden, Bruce, Le Vaillant, Mungo Park, and Horneman, which threw a flood of light upon the geography of Africa in the last century, we owe much to Adams, Tuckey, Bowditch, Mollien, Major Laing,



THE UPPER LAKE OF THE ATHABASCA RIVER AND THE PRIEST'S ROCK.

a continent of whose central regions little more is known with any degree of certainty than has been yet learnt of the unexplored heart of Africa. But even here travellers have been busy in collecting facts to add to our limited knowledge of these parts of the world's surface, for Mr. Henry W. Bates, the present assistant secretary of the Royal Geographical Society, explored the countries on either bank of the mighty river Amazons between the years 1848 and 1859, giving us a series of vivid and animated descriptions of the habits of animals, sketches of Brazilian and Indian life, and aspects of nature under the equator, during eleven years of travel, in his work entitled "The Naturalist on the River Amazons." Mr. Bates's researches have been ably supplemented by Mr. W. Chandless, who received the Patron's Gold Medal in 1866 for his exploration of the river Purus, one of the southern affluents of the Amazons, which he ascended for a distance of 1,800 miles, making, by observations as he proceeded, an accurate map of the windings of the river. Previous to this journey of discovery Mr. Chandless had travelled through South America from the head-streams of the Parana—a river which rises in the Brazilian province of Matto Grosso, and joins the Parana near the town of Corrientes, in the Argentine State of that name—to the mouth of the Amazons, down

and Messrs. Ritchie and Lyon in the present century. The labours of Messrs. Denham and Clapperton, and Dr. Oudney, in exploring the interior of this continent in 1822, added considerably to our knowledge of North-Central Africa. When we look upon a modern map of Africa, all the geographical positions which are laid down in Bornou, round Lake Tchad, the lake itself, the direction of the course of rivers in this region, the rectification of the course of the Niger, and other topographical details, such as the position of mountains, etc., are due to the last-mentioned travellers. Clapperton closed his successful career by reaching Sokkatoo from the Gulf of Benin, and died in 1826, leaving his labours unfinished, after having accomplished the remarkable journey from Tripoli to Benin, and enriched geography with a vast collection of new and accurate discoveries. Timbuctoo, that singular object of African travellers, was reached by Major Laing in the same year, but at a later period, when he also paid the debt of nature. In 1890, Richard and John Lander undertook to resolve the problem of the direction of the Niger from the point to which it had been traced by Park and Clapperton. They proposed to descend the river along its course from Boussa, where it had so far been traced, and to follow its course to the Atlantic Ocean, in order to

ascertain its embouchure. After encountering many and great dangers, they reached the sea by the central or principal branch of the Niger, which is the river called Nun, and which disembogues itself into the Atlantic Ocean, between the Bight of Benin and the Bight of Biafra. The source of this river, as determined by Laing, is at the foot of Mount Loma, in the Kong Mountains. From this point to Timbuctoo its course was known; but the brothers Lander made it known from Boussa to the ocean, and so solved a part of the geographical problem which had so long existed without a satisfactory solution.

LESSONS IN ARITHMETIC.—XXI.

CONCRETE OR COMMERCIAL ARITHMETIC.

1. We have hitherto been concerned with what are called *abstract numbers*—that is to say, numbers *abstracted* from their connection with any special thing, object, or magnitude; and we have established all the principles connected with them which are necessary to be known by the student of elementary arithmetic. We now proceed to apply these principles to *concrete numbers*—that is to say, to numbers which indicate some actual magnitude, object, or thing—as, for instance, time, money, length, etc.

Theoretically, we are already in possession of principles which enable us to perform any calculation with reference to any concrete number. Take length, for instance. Suppose that we fix upon a certain length, and call it a mile. By means of this mile we could measure any other length whatever. For by fractions or decimals we could express any part or parts of a mile whatsoever; we could add, subtract, multiply, or divide any number of miles or parts of a mile, etc. etc. But it is manifest that, although this could be done, great inconvenience would arise from the cumbrous nature of the operations. In treating, for instance, of fractional parts of a mile, it would be often very difficult to realise the length indicated. What idea would most people have of $\frac{1}{5280}$ of a mile? But if they were told that this length is very nearly indeed equal to a foot, they would form a very clear conception of the length. Hence, in measuring all magnitudes, the method of *subdivision* has been employed. Certain magnitudes have been fixed upon and named, and then these again divided and subdivided, and names given to the divisions, as convenience best suggested.

Quantities expressed in this way by means of different subdivisions are called *compound quantities*. Thus, a sum of money, expressed in pounds, shillings, and pence, is a compound quantity. The names of the various subdivisions are generally called *denominations*.

2. *Accurate Standard or Unit.*

On proceeding to measure any magnitude or quantity, it is evident that it is of the utmost importance to come to an exact definition of some one fixed magnitude of the same kind, with which we may compare all such magnitudes. Such a fixed magnitude is called a *standard*. When this has been done, then the standard can be subdivided, or multiples of it can be taken, as we please, and names given to the subdivisions or multiples.

The subdivisions which are employed in England in the coinage and weights and measures are, as might be expected, not founded upon one carefully prepared and philosophical system, but have gradually grown up during long centuries, having often been suggested by special convenience or local usage. The subject has of late received much attention, and the possibility and advantage of establishing a uniform *decimal system* of coinage, weights, and measures, have been discussed with considerable warmth.

On July 29th, 1864, an Act of Parliament was passed to render permissive the use of a decimal system of weights and measures called the "Metric System." Contracts and transactions, therefore, based on this system are now legal. We shall, however, return to this subject hereafter.

We proceed now to treat of the subdivisions of various concrete quantities which are now generally in use.

MEASURES OF TIME.

3. The time of the revolution of the earth in its orbit can be shown by the calculations of astronomical science to be an unvarying quantity, or, at any rate, to be subject to no appreci-

able variation for an immense number of centuries. Now, it is found that this time is 365.24224 (*i.e.*, about 365.25, or 365 $\frac{1}{4}$) mean solar days, a solar day being the interval which elapses between noon and noon—that is, between the times when the sun is successively highest in the heavens.*

The year is made to consist of 365 days—*i.e.*, about $\frac{1}{4}$ of a day less than the time of the revolution of the earth in its orbit. To every fourth year (*Bissextile* or *leap year*, as it is called) one day is added, and thus at the end of every four years the earth is again *very nearly* in the same part of its orbit as it was at the beginning of them. We say *very nearly*, because the earth actually revolves round the sun in 365.24224 days, which is less than 365 $\frac{1}{4}$ days by .00776 of a day. This error in *excess* amounts to a day in about 128 years—*i.e.*, to very nearly 3 days in 4 centuries. Hence, to make our reckoning still more accurate, we *omit* 3 days in 4 centuries; and this is done by making the year which completes every century *not* a leap year, except such centuries as are divisible by 4. Thus A.D. 1700, 1800, and 1900 are not leap years, but A.D. 2000—*i.e.*, the year completing the twentieth century—is a leap year.

The establishment of the leap year is due to Julius Cæsar; that of the omission of the leap year three times in 400 years to Pope Gregory XIII., who, in the year A.D. 1582, when the error amounted to ten days, caused the ten days which followed October 4th to be omitted in the reckoning. October 5th consequently was called October 15th.

This latter system, the *New Style*, as it is called, was not adopted in England until A.D. 1752, when the difference between this and the old mode of reckoning amounted to about eleven days. The difference between the Old and New Style amounts at present to about twelve days. Thus any fixed day—Christmas Day and Lady Day, for instance—Old Style, would occur twelve days later than our present Christmas and Lady Day. Russia is now the only country in Europe which retains the Old Style.

Having, then, thus established a fixed invariable standard whereby to measure time, we are enabled to make any further subdivisions for convenience.

DIVISIONS OF TIME.

60 seconds	= 1 minute,	written thus, 1 m., or 1'.
60 minutes	= 1 hour	" 1 hr.
24 hours	= 1 day	" 1 d.
7 days	= 1 week	" 1 wk.
4 weeks	= 1 common month	" 1 mo.
12 calendar months, or } 365 days	= 1 year	" 1 yr.

Any number of seconds are written either thus—35", 23", or 35 sec., 23 sec.

It is better, however, in indicating *time*, to use the abbreviations *sec.* and *min.* for seconds and minutes, inasmuch as the same names and the marks ' and " are used for certain divisions of the circle (Art. 18).

The *Calendar* months into which the year is divided do not each contain the same number of days. The number in each month, however, may be remembered by the following lines:—

Thirty days has September,
April, June, and November;
February twenty-eight alone—
All the rest have thirty-one;
But leap year comes one year in four,
And February then has one day more.

MEASURES OF LENGTH.

4. Having determined, as above explained, an exact measure of *time*, we are enabled, curious as it may appear, to deduce from it a fixed and invariable measure of *length*. We might, of course, take any object—a piece of metal, say—and, giving to its length a particular name, thus obtain a means of measuring all other magnitudes. But this object, whatever it might be, and however carefully preserved, would be liable to be lost, to alteration from decay, variation of temperature, etc. It is therefore very desirable to have some invariable and independent

* A solar day is not actually of unvarying duration, but is at some times in the year rather longer, and at others rather shorter, than its average length. It is this average length of the solar day which is called the mean solar day, and is divided into 24 hours.

means to which we can always have recourse, to give us an exactly accurate standard of length with which to compare all other lengths.

Now, the interval of time called a second being invariable, it is found that a pendulum which, in the latitude of Greenwich, under certain conditions, oscillates in one second, is of a certain length. It is further proved, from mechanical and mathematical principles, that this length must always be exactly the same whenever the experiment is tried under exactly the same conditions. This accurate and scientific method, however, as might be expected, was not the way in which a measure of length was first determined. A certain measure called a yard having been established, and this yard divided into 36 equal parts, called inches, it was found that the length of the pendulum oscillating in one second of time at Greenwich contained 39.1393 such inches. We thus see that we have a means of recovering and correcting, at any time, the measure of the yard.

The actual standard yard was fixed, by Act of Parliament passed 1835, to be "the straight line or distance between the centre of the two points in the gold studs in the straight brass rod now in the custody of the Clerk of the House of Commons, whereon the words 'Standard Yard, 1760,' are engraved." The Act further states that in the latitude of London the pendulum vibrating seconds of mean time *in vacuo* at the level of the sea is 39.1393 inches.

This standard, however, was, in fact, destroyed in 1834, at the fire of the House of Commons, before the Act passed. The Astronomical Society, however, had carefully prepared a standard yard, which is calculated to differ from the old one by not more than $\frac{1}{110}$ th of an inch.

We cannot here touch upon the ingenious and refined processes by which measurements are made when extreme accuracy is required, as, for instance, in determining a new standard length from the old one, or in finding to what amount of variation a given measured length is subject, from unavoidable external causes. The reader may consult the article *Standard* in the "Penny Cyclopaedia," which will give him a good general idea of the subject.

SUBDIVISIONS OF LENGTH, OR LINEAR MEASURE.

5. The smallest measure is a barleycorn, or one-third of an inch; so called because, originally, the inch was obtained by placing together lengthwise three barleycorns taken from the centre of the ear. Little more, however, than the name of this subdivision remains, measurements being generally conducted in decimal or fractional parts of an inch.

TABLE OF LINEAR MEASURE.

3 barleycorns	= 1 inch	written 1 in.
12 inches	= 1 foot	" 1 ft.
3 feet	= 1 yard	" 1 yd.
5½ yards	= 1 rod, perch, or pole	" 1 r. or p.
40 rods, or 220 yards	= 1 furlong	" 1 fur.
8 furlongs, or 320 rods	= 1 mile	" 1 m.
3 miles	= 1 league	" 1 l.
60 geographical miles, or } 69½ common miles	= 1 degree*	" 1 deg. or 1°.
360 degrees	= 1 great circle of the globe.	

Other measures of length are sometimes used, having reference to special descriptions of magnitudes. For instance, 12 lines make 1 inch; 4 inches make 1 hand; 9 inches 1 span; 18 inches 1 cubit; 6 feet 1 fathom. In measuring roads and land, a chain 22 yards or 4 rods long is used, called, from its inventor, *Gunter's chain*. It is divided into 100 links, each of which therefore contains $\frac{1}{100}$ of a rod, or 7.92 inches.

CLOTH MEASURE.

In the measurement of cloth, linen, etc., the following lengths are sometimes used:—

2½ inches	= 1 nail	written 1 n.
4 nails, or 9 inches	= 1 quarter (of a yard)	" 1 qr.
3 quarters	= 1 Flemish ell	" 1 Fl. e.
5 quarters	= 1 English ell	" 1 E. e.
6 quarters	= 1 French ell	" 1 Fr. e.

The last three measures are now very seldom used in England.

* A degree is in reality an angle; but, in measuring the earth's circumference, we give the name of degree to that portion of it which subtends an angle of one degree at the centre. See "Angular Measure," in Lesson 23.

OUR HOLIDAY.

CRICKET.—I.

THE early days of spring bring with them the return of the cricketing season, and by many persons they are more gladly welcomed on that account, than for all the other charms which accompany them. Cricket is, undoubtedly, the national pastime of England. Every rural village has its players; towns and counties all over the kingdom are pitted against each other in rivalry for the palm of superiority in the game. Commencing in school-days, the pastime is often carried on as the chosen recreation of mature years; and with real benefit to him who practises it. For cricket is a vigorous and manly game, free from abuses that attend some other field sports, and well calculated to refresh and strengthen the physical powers, while it has sufficient science in its elements to give a not unprofitable exercise to the mental faculties also.

Cricket, for so universal a pastime, is a very modern game. It owes its origin, in its present form, to a meeting in the year 1774, of some noblemen and gentlemen, who wished to improve the "bat and ball" of the period, and drew up a set of rules to fix the character of the implements employed, as well as the mode of play. These rules were subsequently amended and modified, and they gradually gained general acceptance. The first great cricket club was established at the close of the last century. It was called the White Conduit Club, from the circumstance of its play usually being held in the White Conduit Fields; and from this club the far-famed Marylebone Club of the present day took its rise.

There are two forms of the game of cricket—one known as single, and the other as double wicket. For single wicket only a few players are required; but for double wicket, it is necessary, to play the proper game, that two sides should be formed, with eleven players on each side. Any large open field, that is tolerably level, will do for the practice of the game; but a good cricket ground, fit for the set play of club against club, should be—at least that portion of it between the wickets—as level and as well kept as a good bowling-green, or, as is sometimes said with but little exaggeration, "as a billiard-table."

The implements used in the game are bats, balls, and wickets. In single wicket one bat and one wicket only are necessary; for the double game there must be at least two of each, an extra supply being always advisable in case of an accident during the game. The form of the cricket-bat is, no doubt, familiar to all our readers; its length should be suited to the height of the player, and such that he may wield it readily and with good effect; but, by the rules of the game, no bat must be more than thirty-eight inches long, or more than four-and-a-quarter inches in the widest part.

The ball is made of leather, and as it has to undergo very hard usage, it is best if made with what is known as the "treble seam." Its size is fixed at not less than nine inches nor more than nine-and-a-quarter inches in circumference. It must weigh not less than five-and-a-half ounces, nor more than five ounces and three-quarters. Both sides in the game play with the same ball; but at the commencement of each innings either party may call for a new one. The player is not restricted as to the precise bat he may use, provided it be a cricket-bat within the dimensions above specified.

Each wicket consists of three stumps, usually made of strong and polished wood, and pointed at one end so as to be firmly fixed in the ground. The height at which they stand when set is fixed at twenty-seven inches out of the ground. There must be sufficient space between the stumps to prevent the ball from passing through. The top of each stump is grooved, and in the grooves, when the stumps are set, two small pieces of wood called *bails* are laid from stump to stump. The length of the bails is fixed at eight inches.

These are all the accessories that are actually required for the game. But padded gloves and leg-guards are frequently used by the principal players—the batsman and the wicket-keeper—to prevent injury to the hands or legs when playing. They are especially useful when the bowling is of the fast order which has become so much in vogue in recent times. One set is sufficient for a small club, or for a school party, for the common use of its members; but young players can do very well without them, when they have only beginners like themselves to contend against.

We come now to the preparation and allotment of the cricket ground preparatory to play, confining our remarks at present to the usual game of double wicket. If only an ordinary field be available for the game, the most level portion of it, as near the centre as possible, is selected for the purpose of pitching the wickets. These must be directly opposite each other, and at a distance of twenty-two yards apart. A line six feet eight inches in length is drawn with chalk upon the ground at each wicket, so that the stumps stand in its centre. This is called the *bowling crease*. At each end of it another but short line is drawn at right angles behind the wicket, and this is named the *return crease*. The object of these lines is to mark out the space within which the bowler must be standing when he delivers the ball. In front of the wicket, four feet from it, and parallel with the bowling crease, another line, called the *poping crease*, is drawn. No precise length is defined for the popping crease, save that it must be at least as long as the bowling crease behind it. Within the space marked by these two creases is the batsman's proper ground, passing out of which he risks being put out of the game, by a touch of the wicket with the ball by one of the opposite side. The nature of the creases, and the ground marked out by them, will be made clear by diagram No. 1.

Before commencing the game, the two parties—divided, we will suppose, into the ordinary number of eleven on each side—select two umpires, whose duty it is to see that the rules of the game are adhered to, and settle disputed points that may arise in the course of the play. The umpires pitch the wickets, and the captains or leading members of the two elevens toss for innings; that is, which side shall first take the bat in the play. The winner's party generally go first to the wickets. The order in which they shall take the bat is decided by their leader. Two of the party station themselves, bat in hand, before the wickets, facing each other; and they are then ready for the game.

The opposite side select their bowler, and the captain of this eleven stations his men at the various points of the ground, according to his knowledge of their particular aptitude in *fielding*—that is, in catching the ball, stopping it, etc. The positions in which the fielders as a body shall be placed are fixed by custom, which is founded on experience of where they are most likely to be effective. These positions are occasionally varied to suit the character of the bowling, whether fast or slow; but as a rule the men are stationed for medium bowling nearly in the positions indicated by diagram No. 2.

All being now in readiness for the game, the bowler takes the ball, and, after calling "play" before starting, delivers the ball in the direction of the wicket farthest from him. His object is to strike it with the ball, and if he succeed in the attempt, the batsman stationed at that wicket is out. The object of the batsman obviously is to keep the ball off his wicket, and also, by striking it to a distance, to make one or more *runs* towards the game for his party. A run is scored when the batsman is able to pass from wicket to wicket without being put out before he comes fairly behind the popping crease, or places the end of his bat within it. If the batsman runs from one wicket to the other, and then returns to the wicket he started from, he counts two runs for his party, and so on.

When the ball is struck, the fielders, waiting in eager expectation, strive to catch it or otherwise stop it, and return it immediately to the wicket-keeper or bowler, that he may strike the wicket with it before the batsman reaches home. If this be done, or if the ball be caught in the first instance, the batsman is out, and another of his party succeeds him, until all the eleven have taken the bat in turn. The number of runs they have made between them is then counted up, and their opponents, now taking their innings, try to get a higher number if possible. Usually, in a game of double wicket, each side has two innings, and the party that can boast the highest total at the end of the play wins the game.

This is a brief explanation of the mode and the object of the play; but it may be as well to remark here that, besides the runs gained by the batsmen in the manner before mentioned, the side which has the innings are sometimes allowed to score runs through the negligence of their opponents. Thus, if the ball, instead of being fairly bowled, is thrown or jerked towards the wicket, it is called a "no ball," and the batsman's party score one for it. Again, if it pass over the striker's head, or so wide of the wicket as to be out of his reach, it is a "wide ball," and the batsman's party score one for it. Or, if either the "no ball" or "wide ball" be not stopped by the fielders, the batsmen may run from wicket to wicket, as if the ball had been struck in their play, and count as many runs as they can make.

There are also other ways of the batsman's being put out than those mentioned in the foregoing description; but these will be found fully detailed in the laws of the game, which will be given in another paper. In this we shall also give a little practical advice to the young player, with illustrations of the proper attitudes in batting, bowling, etc.

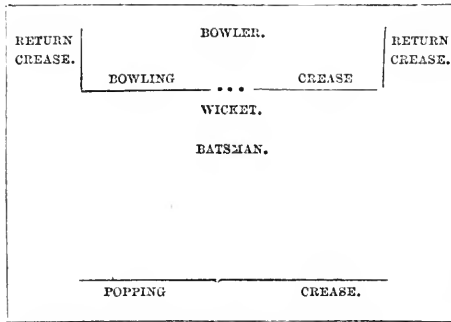


DIAGRAM NO. 1. THE BOWLING AND POPPING CREASES.

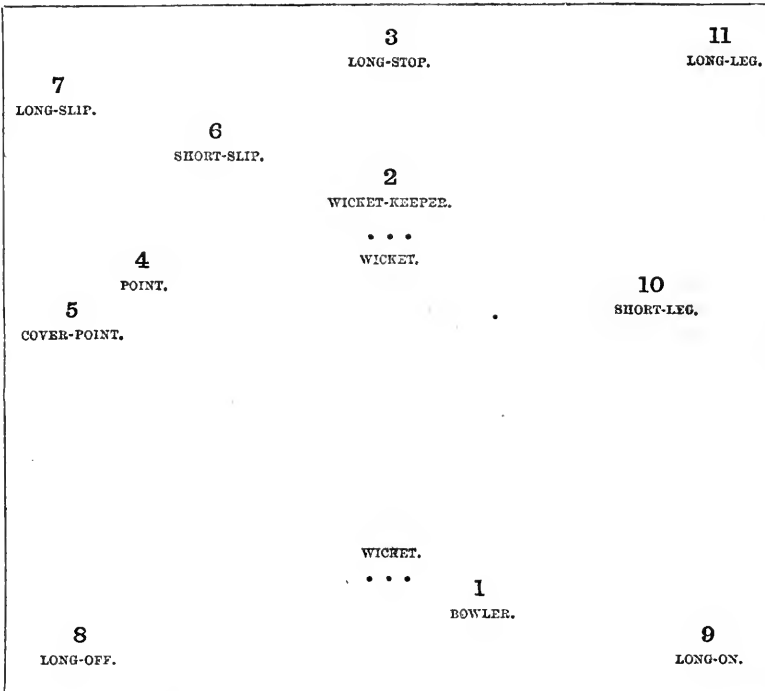


DIAGRAM NO. 2. DISPOSITION OF THE PLAYERS ON THE CRICKET FIELD.

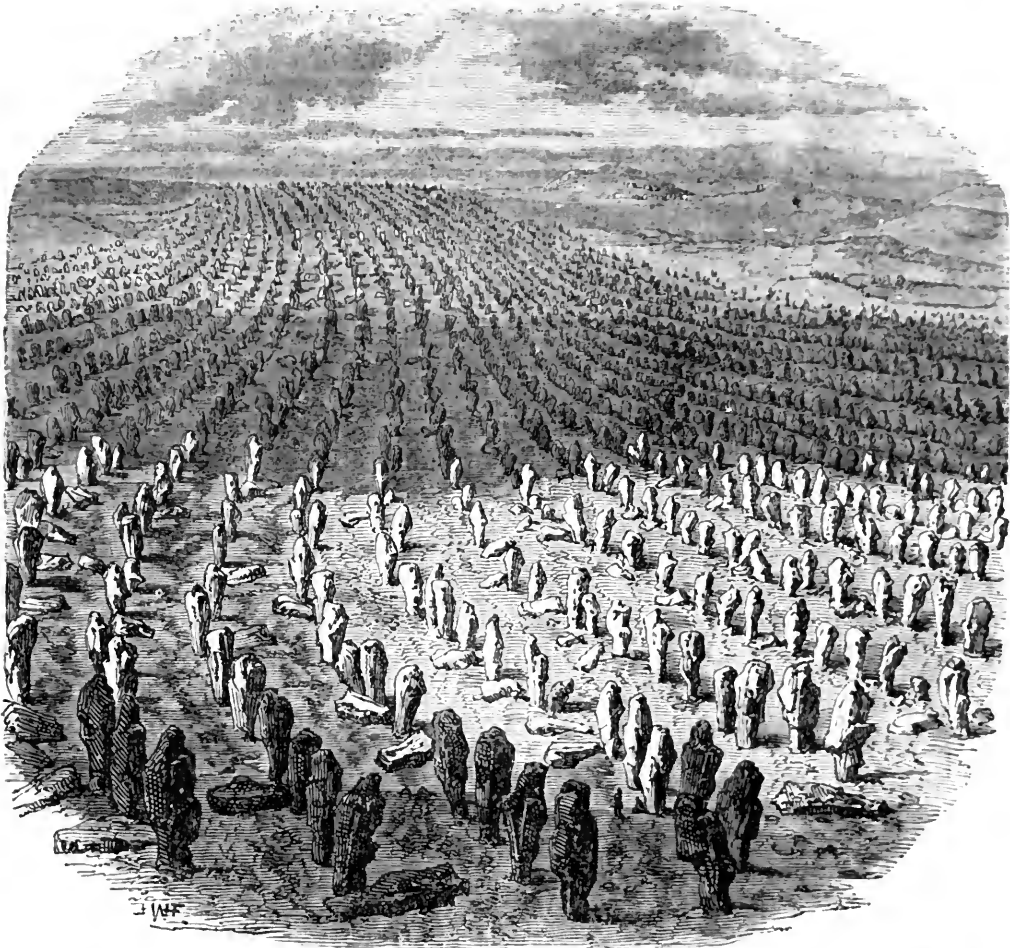
LESSONS IN ARCHITECTURE.—II.

BUILDINGS IN UNHEWN STONE.

We will now proceed to trace briefly but distinctly the progress of architecture amongst the different nations of antiquity, for the purpose of reaching our own times in chronological order. Before entering into details, we may point out the particular features which characterise the grand periods of the art, and the different systems in which its resources were developed in order to satisfy the numerous demands of the civilisation in which it originated.

Architecture, like all the productions of the human mind,

The simplicity of the first erections for religious purposes may be seen in the construction of the altars of early times. The first sacrifices, which the Bible and ancient tradition trace up to the creation, were made upon consecrated heaps of stones, which were collected upon high places. These first altars, called BETH-EL (*the House of God*), were erected in Chaldea, in Judea, and in Egypt. They were built, according to the Scriptures, of stones without cement, in the places where they were raised afforded proper materials. In other places they were constructed of turf and earth, where the plain country presented no solid materials. Such erections or mounds are found in Asia Minor and in India; at Heliopolis, celebrated for the worship of the



DRUIDICAL REMAINS ON THE PLAIN OF CARNAC, IN THE DEPARTMENT OF MORBIHAN. FRANCE.

presents at first only simple rudiments, quite in accordance with primitive manners. From the earliest ages we find three great divisions established amongst all nations: first, private buildings; secondly, religious edifices; and thirdly, military constructions of a defensive character.

The first care of a people, as we remarked before, would be to construct individual habitations; but being at first hunters and shepherds, they would be necessarily wanderers, and their dwellings would be tents constructed of the skins of animals, or cottages made of branches of trees. When they dwelt on the borders of rivers they would employ reeds; Asia and Egypt present us with examples of this kind. In some exceptional cases they dwelt in caverns, or in shallow excavations. The cottages were usually circular; piles of stones and earth, arranged in a circle, constituted their foundation. This form is found amongst all nations; that of the square, requiring more complicated combinations, was not adopted at first.

sun, and the great sidereal divinity of the Syrians. Lucian describes a throne or altar to the sun composed of four great stones arranged in the form of a table. At Ortosia, in Syria, there is an edifice of this kind raised in an open enclosure, and built of stones in a square form. Strabo relates that, travelling in Egypt, he saw his road covered with temples devoted to the god Mercury, which were composed of two unhewn stones, which supported a third, resembling the *cromlechs* which are to be seen in some parts of England. Artemidorus, quoted by Strabo, mentions that in Africa, near Carthage, the god Melkart (Moloch), or the Phœnician Hercules, was worshipped in a similar manner three or four stones being placed one upon another in the form of a rude altar or table.

This simple manner of building applied to primitive altars, and to the sacred enclosures which surrounded them, after having been developed, as we have seen, in Asia and Africa, extended into Europe from the borders of the Black Sea and the Caucasus,

where M. Dubois, of Neufchatel, saw a great number, even to the Atlantic Ocean and to the northern seas. Pausanias describes some of these in Argolis, and recent travellers have seen others in Greece. It is well known that they exist in France, in England, in Norway, and in Sweden, where all these works of early civilisation are known under the name of Celtic and Druidical monuments. America presents numerous examples of similar constructions, which show how rising nations exhibit the same analogies, as their arts are in the process of formation.

Simple as this system of building is, for it cannot yet be called architecture, we recognise the periods of its commencement, its progress, and its development. Thus the most ancient of these edifices, such as were erected by the most ignorant people, were built of enormous stones in the shape which nature gave them. Moreover, they selected those which presented the square form, if they did not give them this form by manual labour. Stonehenge, in England, exhibits a number of square pillars supporting enormous architraves, the whole appearing to have constituted a large and well-constructed edifice. These evidences of the first attempts of past civilisation are gradually and daily disappearing under the progress of those which are being developed around them. Thus Asia has lost most of her ancient monuments, owing to the early state of her progress in the arts. Africa, for the same reason, presents as few examples, although they are mentioned by ancient authors. Greece and Italy, and their neighbouring islands, only exhibit examples of the same kind in places nearly deserted. The northern countries of Europe alone preserve some, because that civilisation was later there; and the history of their sudden and unexpected conquests extends only to a period of about two thousand years. In America the later civilisation of the Aztecs (1196) and the Mexicans caused the primitive monuments around them to disappear, by the development of their own. This process is perfectly analogous to that which took place first in Asia, then in Greece, Africa, and Italy, and which we now see taking place in the western countries, where their materials are used for roads and private buildings.

This simple and primitive style of architecture appears to have been originally universal, if it was not simultaneous with the progress of civilisation, which marched from east to west; and has left monuments and edifices so varied as to occasion them to be classified, and have names given to each class. These names are borrowed from the old Celtic tongue, or language of the Druids. Thus, erections of the first class, which consisted of long stones, erect and isolated (standing singly) like obelisks, were called *Peulvans*, or *Menhirs*. Buildings of the second class, consisting of a huge unhewn stone, supported on two or more rough stones set on end on the earth, are called *Cromlechs* by British archaeologists and *Dolmens* by French antiquarians. The third class consists of *Uncovered Alleys*, of upright stones, placed in rows like trees, and occupying a very considerable area, like those of the plain of Carnac, in the department of Morbihan, part of the old province of Brittany, in France. While in the fourth class these long rows of stones assume a circular or elliptical form, and support stones placed on them horizontally so as to form a lintel or architrave. The military constructions of early times appear to have been mounds or artificial hills, at the summit of which there was a shallow excavation, of which the edges formed a rampart. It is certain that in countries where hills naturally occurred they were fortified in the same way as those which were raised by art. These natural fortifications are still to be seen in the neighbourhood of Athens and the Piræus, and they were of immense service in the last war of independence. Mankind in a savage or wandering state having no instruments for raising the earth or digging ditches, made fortified enclosures with heaped stones, having a double slope. The entrances to these fortresses were defended by artificial hills, placed inside near the gates.

LESSONS IN FRENCH.—XXIV.

SECTION XLII.—THE PAST PARTICIPLE [§ 134].

1. The past participle, which in French forms a part of every compound tense [§ 45 (8)], is susceptible of changes in its termination.

2. The student will find, in the table of the terminations of the regular verbs [§ 60], the different changes which the past

participle of these verbs undergoes. The feminine termination of the past participle of the irregular verbs will be found in the alphabetical table, § 62.

3. The last letter of the feminine termination is always an *n* mute.

4. The plural of a past participle not ending with an *s* is formed by the addition of that letter to the singular, masculine or feminine.

5. The participle past, accompanied by the auxiliary verb *avoir*, never agrees with the nominative or subject [§ 134 (3)].

Les demoiselles ont chanté, *The young ladies sang.*
Ces messieurs ont lu toute la *Those gentlemen read the whole day*
journée,

6. The participle past, having *être* as its auxiliary verb assumes in its termination the gender and number of the subject [§ 134 (2)].

Ma fille est arrivée ce matin, *My daughter arrived this morning.*
Nos frères ne sont pas venus, *Our brothers are not come.*

7. The participle, accompanied by the auxiliary verb *avoir*, agrees in gender and number with its direct object or régime direct [§ 2 (2), § 42 (4)], when that object precedes it [§ 134 (4)].

Les dames que nous avons vues, *The ladies whom we have seen.*
Les lettres que nous avons lues, *The letters which we have read.*

8. When the régime direct or objective (accusative) follows the participle, no agreement takes place [§ 134 (5)].

Avez-vous vu les dames? *Have you seen the ladies?*
Avons-nous lu les lettres? *Have we read the letters?*

9. A participle past never agrees with its régime indirect, or indirect object (dative or ablative) [§ 2 (3), § 42 (5)].

Les dames à qui nous avons parlé, *The ladies to whom we have spoken.*

10. The participle past used adjectively, that is, without an auxiliary verb, follows the rule of the adjective [§ 66 (3), § 134 (1)].

Des livres bien imprimés, *Well-printed books.*

11. The participle, preceded by the relative pronoun *en*, remains invariable, although the *en* should relate to a feminine or plural noun [§ 135 (7)].

Avez-vous apporté des plumes? *Have you brought pens?*
J'en ai apporté, *I have brought some.*

12. The presence of *en* does not, however, prevent the agreement of the participle, when it is preceded by a régime direct [§ 135 (7)].

Les plumes que j'en ai apportées, *The pens which I have brought from it.*

RÉSUMÉ OF EXAMPLES.

Vos sœurs ont-elles écrit?	<i>Have your sisters written?</i>
Elles n'ont pas encore écrit.	<i>They have not yet written.</i>
Les lettres que nous avons écrites.	<i>The letters which we have written.</i>
Avez-vous écrit vos lettres?	<i>Have you written your letters?</i>
Je les ai lues, je les ai écrites.	<i>I have read them, I have written them.</i>
Les avez-vous apportées?	<i>Have you brought them?</i>
Je ne les ai pas apportées.	<i>I have not brought them.</i>
Avez-vous appelé ces dames?	<i>Have you called those ladies?</i>
Je ne les ai pas appelées.	<i>I have not called them.</i>
Qui avez-vous vu ce matin?	<i>Whom have you seen this morning?</i>
Nous avons vu ces demoiselles.	<i>We have seen those young ladies.</i>
Nous les avons vues.	<i>We have seen them.</i>
Nous ne leur avons pas parlé.	<i>We have not spoken to them.</i>
Avez-vous des livres reliés?	<i>Have you bound books?</i>
J'ai des livres brochés.	<i>I have unbound (stitched in paper covers) books.</i>
Avez-vous acheté des pommes?	<i>Have you bought apples?</i>
J'en ai acheté.	<i>I have bought some.</i>
Nous en avons acheté.	<i>We have bought some.</i>
Nous les en avons persuadés.	<i>We have persuaded them of it.</i>

VOCABULARY.

Achet-er, 1, to buy [§ 49 (5)].	Dit, from dire, 4, ir., said.	Laiiss-er, 1, to leave.
Appel-er, 1, to call [§ 49 (4)].	Donn-er, 1, to give.	Nouvelle, f., news.
Apport-er, 1, to bring.	Entend-re, 4, to hear.	Oubli-er, 1, to forget.
Bel-le, beautiful.	Examin-er, 1, to examine.	Rec-evoir, 3, to receive.
Bourse, f., purse.	Exprès, on purpose.	Reli-er, 1, to bind.
Broch-er, 1, to stitch.	Fleur, f., flower.	Revenus, m. pl., income.
Cass-er, 1, to break.	Gard-er, 1, to keep.	Tasse, f., cup.
Commission, f., errand.	Gravure, f., engraving.	Vu, from voir, 3, ir., seen.

EXERCISE 77.

1. Nous avez-vous apporté nos habits? 2. Nous ne les avons pas encore apportés. 3. Les avez-vous oubliés? 4. Nous ne les avons pas oubliés, mais nous n'avons pas eu le temps de les apporter. 5. Pourquoi n'avez-vous pas appelé les marchands? 6. Je les ai appelés, mais ils ne m'ont pas entendu. 7. Avez-vous entendu cette musique? 8. Je l'ai entendue. 9. N'avez-vous pas vu les jolies fleurs qui j'ai apportées? 10. Je les ai vues; à qui les avez-vous données? 11. Je ne les ai données à personne, je les ai gardées pour vous. 12. Avez-vous bien examiné ces gravures? 13. Je les ai bien examinées. 14. Les avez-vous achetées? 15. Je ne les ai point achetées. 16. N'avez-vous point reçu vos revenus? 17. Je ne les ai point encore reçus. 18. La domestique a-t-elle cassé ces tasses? 19. Elle les a cassées. 20. A-t-elle cassé des tasses exprès? 21. Elle n'en a pas cassé exprès. 22. Avez-vous acheté des livres reliés ou brochés. 23. J'ai acheté des livres reliés. 24. Nous avez-vous dit ces paroles? 25. Nous vous les avons dites, mais vous les avez oubliées. 26. Je n'ai pas oublié votre commission.

EXERCISE 78.

1. Have you seen my cups? 2. I have not yet seen them. 3. Have you brought me my books? 4. I have not forgotten them, I have left them at my brother's. 5. Has your mother called your sisters? 6. She has not yet called them. 7. Has the servant told you this news? 8. She has told me this news. 9. She has told it me. 10. Have you forgotten my errand? 11. We have not forgotten it, we have forgotten my money. 12. Where have you left your purse? 13. We left it at the merchant's. 14. Have you bought the beautiful engravings which I saw at your bookseller's? 15. I have not seen them. 16. Has your mother bought them? 17. She has bought books, but she has bought no engravings. 18. Has that little girl broken my cups? 19. She has broken them on purpose. 20. Does that lady receive her income every month? 21. She receives it every six months. 22. Is the house which you have bought large? 23. I have bought no house. 24. Did you receive a letter from your father yesterday? 25. I received a letter from him four days ago. 26. Have you spoken to those ladies? 27. I have spoken to them. 28. Have you given them flowers? 29. I have given them some (en). 30. Are the books which you have bought bound? 31. No, Sir, they are in paper covers. 32. Have you examined that house? 33. I have not examined it. 34. Your brother (en) has examined several (plusieurs).

SECTION XLII.—USE OF THE AUXILIARIES [§ 46].

1. The active verb [§ 43 (2) (3)], that is, the verb which has or may have a direct regimen or object, always takes avoir as its auxiliary [§ 46 (1)].

Nous avons écrit à notre banquier, *We have written to our banker.*

2. Almost all neuter verbs, i.e., verbs which cannot have a direct object, take the auxiliary avoir, when they express action. Nous avons couru, marché, parlé, *We have run, walked, spoken.*

3. The compound tenses of a few neuter verbs, expressing action, are, however, conjugated with être:—Aller, to go; arriver, to arrive; choir, to fall; décider, to die; mourir, to die; naître, to be born; venir, to come; parvenir, to succeed; devenir, to become; revenir, to return.

À quelle heure êtes-vous venu? *At what hour did you come?*
Je suis né en France, *I was born in France.*

Look carefully at the last example, and mark that, when the person spoken of is living, the French use the present and not the past of the auxiliary with the past participle of naître, to be born:—Cette dame est née en Angleterre, *that lady (is) was born in England.* Mon frère est né en France, *my brother (is) was born in France.*

4. A few neuter verbs [§ 46 (3)] take avoir, when they express action, and être, when they express situation.

Votre frère a-t-il sorti aujourd'hui? *Has your brother gone out this morning?*
Votre frère est-il sorti? *Is your brother gone out?*

5. The past indefinite of the verb être [4, ir.] (J'ai été, etc.) is used instead of the preterite indefinite of aller (Je suis allé), when speaking of a place where one has been.

Le médecin a été à Paris, *The physician has been at Paris.*
J'ai été à l'église ce matin, *I went to church this morning.*

6. When, however, we are still in a given place, or on the road towards it, the expression je suis allé, etc., is used.

Le médecin est allé à Londres, *The physician is gone to London.*
Votre sœur est allée à l'église, *Your sister is gone to church.*

RÉSUMÉ OF EXAMPLES.

Avez-vous été au bal hier au soir? *Did you go to the ball last evening?*
Nous n'y avons pas été, *We did not go.*
Où cette demoiselle a-t-elle été? *Whither did that young lady go?*
Elle a été chez son frère et chez nous, *She went to her brother's and to our house.*
Où votre sœur est-elle allée ce matin? *Where is your sister gone this morning?*
Elle est allée trouver sa cousine, *She is gone to her cousin's.*
N'avez-vous pas sorti aujourd'hui? *Did you not go out to-day?*
Je n'ai pas encore sorti, *I have not yet been out.*
Où est Monsieur le général? *Where is the general?*
Je ne sais pas, Monsieur; il est sorti, *I do not know, Sir; he is gone out.*
Où ce Monsieur est-il né? *Where was that gentleman born?*
Il est né à Paris ou à Lyon, *He was born in Paris or Lyons.*
Votre nièce a-t-elle été voir son frère? *Did your niece go to visit her brother?*
Elle a été le voir hier, *She went to see him yesterday (and is back).*
Elle est allée le voir hier, *She went to see him yesterday (and is not back).*

VOCABULARY.

Bijouterie, f., <i>jewellery.</i>	Magasin, m., <i>warehouse.</i>	Orfèvre, m., <i>goldsmith.</i>
Chapelier, m., <i>hatter.</i>	Malade, sick.	Partir, 2, ir., <i>to set out.</i>
Espagne, f., <i>Spain.</i>	Été, from être, 4, ir., <i>been.</i>	Retourner, 1, <i>to return.</i>
Horloger, m., <i>watch-maker.</i>	Marchandise, f., <i>merchandise.</i>	Sortir, 2, ir., <i>to go out.</i>
Maçon, m., <i>mason.</i>	Montre, f., <i>watch.</i>	Suisse, <i>Switzerland.</i>
	Né, from naître, 4, ir., <i>to be born.</i>	Venu, from venir, 2, ir., <i>come.</i>

EXERCISE 79.

1. À quelle heure votre sœur est-elle venue? 2. Elle est venue à huit heures moins un quart. 3. Ces demoiselles sont-elles nées à Rouen ou à Caen? 4. Elles ne sont nées ni à Rouen ni à Caen, elles sont nées à Strasbourg. 5. L'horloger est-il chez lui? 6. Non, Monsieur, il est allé à son magasin. 7. A-t-il été à Paris cette année? 8. Oui, Madame, il y a été. 9. Y a-t-il acheté des marchandises? 10. Il y a acheté de la bijouterie. 11. Avez-vous été trouver mon père? 12. J'ai été le trouver. 13. Votre chapelier a-t-il sorti aujourd'hui? 14. Il n'a pas sorti, il est malade. 15. Le maçon est-il à la maison? 16. Non, Madame, il est sorti. 17. Quand est-il sorti? 18. Il est sorti il y a une heure. 19. Votre chapelier est-il arrivé aujourd'hui ou hier? 20. Il est arrivé hier à quatre heures du matin. 21. Notre tailleur a-t-il été voir son père aujourd'hui? 22. Il est parti pour Lyon. 23. L'orfèvre de mon cousin n'est-il pas parti pour l'Espagne? 24. Non, Monsieur, il est retourné en Allemagne. 25. Ma sœur a été à l'église ce matin, et elle est allée à l'école il y a une demi-heure.

EXERCISE 80.

1. Is the physician at home? 2. No, Sir, he is not at home; he is out. 3. Have you been out this morning? 4. No, Sir, I have not been out; I am sick. 5. Is your sister's little girl out? 6. Yes, Sir, she is out; she is at my brother's. 7. At what hour did the hatter arrive? 8. He arrived last evening at nine. 9. Did the jeweller go to Paris or Lyons this year? 10. He went to Paris six months ago, but he is back (de retour). 11. Did you go to my brother or to my sister? 12. I have not had time to go to them. 13. Where was that gentleman born? 14. He was born in England—in Exeter or in Portsmouth. 15. Was not your sister born in Paris? 16. No, Sir, she was born in Madrid, in Spain. 17. Did you tell me that your brother has bought a good house? 18. He has bought a very good house in London. 19. Do you know at what time the watchmaker arrived? 20. He arrived this morning at a quarter before five. 21. Has he brought much jewellery? 22. He has not brought much jewellery, but he has brought many watches. 23. Has he been in France or in Germany? 24. He has been in France, in Germany, and in Switzerland. 25. Is your sister in (à la maison), Sir? 26. No, Sir, she is out; she is gone to church. 27. Did she go to school yesterday? 28. She went to school and to church. 29. Is she there now? 30. No, Sir, she is back. 31. Is the hatter arrived? 32. Yes, Sir, he is

arrived. 33. When did he arrive? 34. He arrived yesterday, at nine o'clock in the morning.

SECTION XLIII.—IDIOMATIC EXPRESSIONS.

1. Combien de temps corresponds with the English expression *how long*.

Combien de temps avez-vous demeuré en Italie? *How long did you live in Italy?*

2. Combien de fois answers to the English *how often, how many times*.

Combien de fois y avez-vous été? *How many times have you been there?*

3. Jusqu'ou is used for *how far, what distance, etc.*

Jusqu'ou avez-vous été? *How far have you been?*

4. Jusqu'à quelle heure, *till what hour*, means also *how late*.

Jusqu'à quelle heure avez-vous attendu? *How late did you wait?*

5. D'où means *whence*; par où, *which way, in what direction*.

D'où venez-vous, mon ami? *Whence do you come, my friend?*

Par où votre ami est-il allé? *Which way is your friend gone?*

6. Mener [§ 49], *porter, to take, to carry; amener, apporter, to bring, to take with one; emmener, emporter, to take, to carry away*. We use *mener, amener, emmener, for to take, to bring, to take away*, in the sense of *conducting, leading, guiding, on foot or in a vehicle*. *Porter, apporter, emporter, mean to carry, to bring, to carry away, etc.*

Menez votre sœur à l'école. *Take your sister to school.*

Portez ce livre à votre sœur. *Take this book to your sister.*

RÉSUMÉ OF EXAMPLES.

Jusqu'ou votre frère est-il allé? *How far is your brother gone?*

Il est allé jusqu'à Paris. *He is gone as far as Paris.*

Combien de temps va-t-il y rester? *How long is he going to stay there?*

Il va y rester jusqu'au printemps. *He is going to stay there until spring.*

Combien de temps avez-vous demeuré à Londres? *How long did you live in London?*

Nous y avons demeuré six ans. *We lived there six years.*

Jusqu'ou avez-vous été? *How far did you go?*

Nous avons été jusqu'aux Champs Elysées. *We went as far as the Champs Elysées.*

Jusqu'à quelle heure avez-vous écrit? *How late did you write?*

J'ai écrit jusqu'à minuit. *I wrote until midnight.*

D'où viennent ces Allemandes? *Whence come those German ladies?*

Elles viennent d'Aix-la-Chapelle. *They come from Aix-la-Chapelle.*

Par où sont-elles venues? *Which way did they come?*

Elles sont venues par Bruxelles. *They came by Brussels.*

Menez-vous cette petite fille à l'école? *Do you take (lead) that little girl to school?*

Je ne l'y mène pas, je l'y porte; elle est trop petite pour marcher. *I do not lead her there, I carry her there; she is too small to walk.*

Amenez-vous vos enfants? *Do you bring your children?*

Portez-vous une lettre à la poste? *Do you take a letter to the post-office?*

J'emmène mon cheval, j'emporte ma montre. *I bring away my horse, I bring away my watch.*

VOCABULARY.

Ainé, -e, <i>eldest</i> .	Ici, <i>here</i> .	Promis, <i>from promettre, 4, ir., promised</i> .
Apport-er, 1, <i>to bring</i> .	Loin, <i>far</i> .	Quitt-er, 1, <i>to leave</i> .
Bruit, m., <i>noise</i> .	Magnifique, <i>magnificent</i> .	Soieries, f.pl., <i>silk goods</i> .
Drap, m., <i>cloth</i> .	Midi, <i>noon</i> .	Voiture, f., <i>carriage</i> .
Élève, m., <i>pupil</i> .	Minuit, <i>midnight</i> .	Voyageur, m., <i>traveller</i> .
Fils, <i>son</i> .	Pied, m., <i>foot</i> .	
Fin, -e, <i>fine</i> .		

EXERCISE 81.

1. Le jeune homme est-il allé loin? 2. Il n'est pas allé bien loin, il n'est allé que jusqu'à Paris. 3. Vos enfants font trop de bruit, pourquoi ne les emmenez-vous pas? 4. Ils sont malades, ils ne peuvent marcher. 5. Comment les avez-vous amenés ici? 6. Je les ai amenés en voiture. 7. À quelle heure amenez-vous le médecin? 8. Je l'amène tous les jours à midi. 9. Combien de fois par jour menez-vous vos élèves à l'église? 10. Je les mène à l'église deux fois par jour. 11. Combien de fois y avez-vous été? 12. J'y ai été plusieurs fois. 13. Par où ces voyageurs sont-ils venus? 14. Ils sont venus par Amiens et par Rouen. 15. D'où apportez-vous cette nouvelle? 16. Je l'apporte de Cologne. 17. D'où avez-vous amené ces superbes chevaux? 18. Je les ai amenés d'Angleterre. 19. Si vous quittez la France, avez-vous l'intention d'emmener votre fils?

20. J'ai l'intention de l'emmener. 21. Qu'avez-vous apporté de France? 22. Nous avons apporté de magnifiques soieries, des draps fins et des chapeaux de Lyon. 23. Avez-vous amené votre fille à pied ou à cheval? 24. Je l'ai amenée en voiture. 25. Vos frères nous ont apporté des livres.

EXERCISE 82.

1. How long did your son live in London? 2. He lived there ten years. 3. How far is the physician gone? 4. The physician is gone as far as Cologne. 5. Has he taken his son with him? 6. He has not taken him. 7. How have you brought your two little girls? 8. I brought one in a carriage, and my wife carried the other. 9. Is she too little to walk? 10. She is not too small to walk, but she is ill. 11. Have you brought your horse? 12. We have brought two horses. 13. Have you brought the books which you have promised me? 14. I have forgotten to bring them. 15. Has that lady brought her eldest son? 16. She has brought all her children. 17. How did they come? 18. They came in a carriage. 19. Which way did your brother come from Germany? 20. He came by Aix-la-Chapelle and Brussels. 21. Do you intend to take your son to school this afternoon? 22. I do not intend to take him there, it is too cold. 23. Is that child too ill to walk? 24. He is too ill to walk, and I intend to carry him. 25. Why do you not take him in a carriage? 26. My brother has taken my horse away. 27. Have you brought the physician? 28. I have not brought him, no one is ill at our house. 29. Will you take this book to church? 30. I have another, I do not want it. 31. Have you taken my letter to the post-office? 32. I have forgotten it. 33. How late did you write? 34. I wrote until after midnight. 35. Whence do your sisters come? 36. They come from Paris.

HISTORIC SKETCHES.—XII.

THE PROTECTOR OF THE COMMONWEALTH.

At the Royal Palace of Whitehall, on the 3rd of September, 1658, a man lay dying. Eight days before he felt so confident of life that he told his wife not to think he should die, as he felt sure of the contrary. Now he was speechless, sinking; and the last thing about which he had seriously troubled himself was a curious metaphysical one. "Tell me," he said to Sterry, a minister who stood by him, "is it possible to fall from grace?" "It is not possible," said the minister. "Then," exclaimed the dying man, "I am safe; for I know that I was once in grace." And then he prayed, "Lord, though a miserable and wretched creature, I am in covenant with thee through thy grace, and may and will come to thee for thy people. Thou hast made me a mean instrument to do them some good, and thee service. Many of them set too high a value upon me, though others would be glad of my death. Lord, however thou disposest of me, continue and go on to do good for them. Teach those who look too much upon thy instruments, to depend more upon thyself, and pardon such as desire to trample upon the dust of a poor worm, for they are thy people too."

The attention of all England was riveted on the sick room at Whitehall, with keen and sincere interest. From the lips of many went forth earnest prayers that God would be pleased to spare the invalid's life; in the hearts of many there were fears and misgivings as to what would come in the event of that prayer being rejected; in other hearts there were joy and exultation over the death of a sinner; while in others, that should have been kindly disposed, there was a certain sort of assurance that there is something in the misfortunes of our greatest friends which is not displeasing to us. A frightful wind-storm raged, rooting up trees in the park, and tearing off the roofs of houses in London. The friends of the dying argued that God was giving warning of his intention to take to himself the great soul of the sufferer; his enemies argued that "the princes of the powers of the air" were holding fearful revels amid the storm-driven clouds in honour of the prospect of seizing on a great offender's soul.

The dying man was Oliver Cromwell, Lord Protector of England and Ireland, the man who for ten years had governed the kingdom in a right kingly way, and made it stronger and more respected by all foreign powers than it had been since the days of Henry V. and Agincourt; the man who had subverted the subverters of the monarchy, and had yet annihilated monarchy

itself in the person of his own king, by bringing him to a public trial and a public execution; the man who had overcome all rivals, punished all rebels against his own authority, and seated himself firmly on the throne of kings (having been originally but a country gentleman), though he had refused, and refused resolutely, the name and emblems of royalty.

It was the 3rd of September, the day Cromwell was wont to call his fortunate day. On a 3rd of September he overcame the Scots' army at Dunbar, when, looking at the position of his army in a military point of view, he was committed to certain destruction at their hands; on a 3rd of September he had fought the battle of Worcester, "the Lord's crowning mercy to him," as he called it, when the royalist cause was lost in England, so long as Cromwell could move a regiment or man a ship. His wife and his friends hoped much from this circumstance, that the worst of the fever seemed to come upon him on this his fortunate day. Fortunate indeed if he could realise in his own case the assertion of the wise king, that the day of one's death is better than the day of his birth; fortunate too, still, if he could feel that death was but the entrance into life, the outlet from a world of which, and of the people and things in which, he was heartily tired and weary; the means by which, and by which only, he could enter into rest.

In this last sense surely the 3rd of September was still Cromwell's fortunate day, for if ever a man was weary of life and anxious to be quit of the cares of it, Cromwell must have been that man.

Whether he was to be blamed or not for the part he had taken in the recent troubles—whether he was the murderer of the king, or whether in putting him to death he had done but a solemn act of justice—the result to him was the same: the weight of the government pressed heavily upon his shoulders, and he found at the end of ten years that all he had for the labour which he had taken under the sun was vanity and vexation of spirit. Fatigue of body and mind, continuous and severe, occasioned by causes acting from without, were supplemented latterly by a spring of bitterness welling up within, sapping the strong man's energy, gnawing away at the very vitals of his strength, overwhelming him with a dreadful sense of responsibility and fear lest he had striven in vain and in the wrong direction. Once he had felt no hesitation about what he should do, and believed that his decision was an inspiration direct from the Spirit of the Almighty; now he doubted whether all things were lawful or expedient unto him. Once he had felt no difficulty in telling his troopers, by way of assurance against their fears as to the propriety of offering personal violence to the king, "If I should meet the king in battle, I would shoot the king;" now he was uneasy in his mind when even his favourite daughter, Mrs. Claypole, suggested to him doubts as to the integrity of his conduct in the sight of God. Even his old friends, the men who had stood by him through good report and evil until his genius eclipsed them and turned them into rivals and opponents, these too had forsaken him, and left him alone in the state like a lodge in a garden of cucumbers. Then he found how, without being bitter, a man's household may be among his foes. His mother, a homely woman, quite incapable of realising the magnitude and the difficulties of her son's position, disquieted him in return for his filial devotion to her with the expression of her convictions that they and the like of them had no business in the royal palaces. His children were incapable, excepting perhaps Henry, of appreciating his statesmanship and his motives, and were therefore divided from him by a great gulf of want of sympathy; while some of them, if the accounts of those times are to be trusted, actually reproached him for what he had done for the country. On one side, a numerous and implacable enemy, burning with desire to revenge the unpardonable death of "the royal martyr," and the losses they had incurred in his behalf—on another side, a formidable array of enemies who had once been friends and associates; the hatred of foreign nations, only kept from finding expression by the fear inspired by his sword; chronic rebellion at home; within the camp lukewarm allies, ready to fall away like water as soon as they should "perceive the least rub in his fortunes;" his own kith and kin not with him, and uneasy in his own mind about grace and acceptance; doubtful, too, as has been said, whether or not he had striven in vain for the ultimate good of his country—what comfort could he have in living? He was alone, and he felt it keenly; the still strong man felt the need of some sympathy, some divider of cares with

whom he could relieve himself of the great burden of public and private care which came upon him daily in the singularly exceptional position in which he found himself placed. As age increased he suffered more and more from the chilling wind of isolation, and seemed to yearn after that rest which the weary love. Yet the spirit of duty within him, the duty which he believed he was called to discharge in England, strove to prevent his wish to depart; he saw his work all unfinished, and he knew that he had no fit successor; he believed—some say affected to believe—that his work was God's work, and he wished to do it to the utmost of his power. For duty's sake and religion's, and because it was "God's high gift," he guarded his life "from scathe and wrong," and his hold on life was not a little strengthened by the natural dread a man has of loosening it through sudden violence and deadly malice. Such a dread had Cromwell for a companion, in addition to his load of carking cares and weighty troubles. Plots to assassinate him were continually being made, and were only baffled by the most watchful energy and the most exemplary punishments. The knowledge of their existence, and the consciousness that at any moment he might fall a victim, contributed to make a man whose mind was already overlaid, a man who had a religious or superstitious dread of being sent to his account suddenly, "disappointed, unaided," without any reckoning made, excitable and nervous to an almost unbearable degree.

In August, 1658, he was at Hampton Court Palace, watching the sure progress of disease in the body of his best beloved child, Elizabeth Claypole. He was, and had been for some time, far from well, but the absorbing attractions of his daughter's state made him oblivious or indifferent to his own ills. On the 6th of August the strongest link of affection that bound him to the world was snapped; Elizabeth Claypole died, and then the Protector found out, what other men had known long since, that he was very ill. For a time he distracted himself by the sad cares of the last offices for his daughter, whom he caused to be buried with imperial pomp among kings and queens in Westminster Abbey; but this done he had leisure to find out that he was mortal. At the moment of his daughter's death he was confined to his bed with gout, and upon that fever supervened. His pulse became intermittent, but his physicians did not seem to be anxious, and he, on his wife expressing her fears as to the issue of his illness, bade her be sure he should not die, since he knew he should not "from better authority than any which you can have from Galen or Hippocrates. It is the answer of God himself to our prayers; not to mine alone, but to those of others who have a more intimate interest in him than I have."

For sake of the change he had moved from Hampton Court to Whitehall, where he took to his bed, and within a month of his daughter's decease he had followed her to her long home. Thurloe, his faithful secretary and most devoted friend, announced the event to the Deputy of Ireland in a letter wherein he said of Cromwell, "He is gone to heaven, embalmed with the tears of his people, and upon the wings of the prayers of the saints."

With a magnificent ceremonial, copied from that which was used at the funeral of the Spanish King Philip II., in 1598, the Republican Government laid the body of Oliver Cromwell in Westminster Abbey, where it remained with those of princes and senators till the restoration of the monarchy, when the spirit of revenge wreaked itself on the corpse of the spoiler of kings by causing it to be exposed on the gallows at Tyburn, and then buried in a hole like the carcase of a dog. To Cromwell himself it could scarcely have mattered much where they laid his body or what they did with it after he had done with it; the splendid funeral at St. Peter's was as little in accordance with his habits and ways as the ignominious barbarity at Tyburn. He was beyond the reach of honour and dishonour, insensible to flattery as to blame; but to those who remained these two ceremonials signified something. What had Cromwell done that gave significance to them?

In order to answer this question it is necessary to take a survey of the life of the man, as the history of it is presented to us in the records of his time, and by the light of dispassionate, truth-seeking inquiry instituted since then.

Oliver Cromwell was born on April 25, 1599, at Huntingdon, and was the son of a country gentleman of moderate estate, who was of the same family as that Thomas Cromwell

Cardinal Wolsey's favourite secretary, who was made Earl of Essex by Henry VIII., and was afterwards beheaded by him. Oliver was sent to the University, where he made but small proficiency in his studies, and fell, it is said, into some wild courses. Reforming his mode of life, however, on a sudden but sincere conviction that it was a wrong one, Cromwell married, and at the same time warmly embraced the puritanical faith, which was then beginning to acquire great influence throughout the country. For reasons of economy he gave up housekeeping as a country gentleman, and farmed some land which he took near St. Ives; but his operations in this direction were not successful, the duties of the farmer being probably neglected for those of the religious politician. In conjunction with his kinsman, John Hampden, he formed a project of emigrating to America, believing that there alone he could live in the enjoyment of that freedom of conscience and of political action which was denied to him and his brethren here. How that project was frustrated by royal order, on the very eve of completion, has been already shown at length in No. VII. of the present series of Historic Sketches (page 222).

Soon after the veto was put on his emigration, Cromwell was sent to Parliament as member for the town of Cambridge, and though he seldom spoke, and when he did, not in a way to captivate or lead the house, his vote was invariably to be found in the lists of those who had maintained the popular right against the kingly power. He did not take a prominent part in the political and domestic matters which brought about the rupture between the King and the Parliament, but he made good use of his time, and of his great powers of observation and reflection, to make up his mind thoroughly both as to the rightness of the common cause, and as to the integrity and capacity of the men engaged on both sides of it. Having formed very strong opinions upon the most important questions of the day, he cleaved to them as a strongly persuaded man does with uncompromising intensity; and the shape of the quarrel in the state, and the peculiar habit of his mind, caused him to see plainly a great gulf fixed between what he believed to be on one side the cause of God himself, and on the other the cause of God's enemies.

In all important points before the breaking out of civil war we find him voting on the popular side, lending whatever weight his influence had to the cause of liberty; and when by the flight of the king from London, and by the rearing of the royal standard at Nottingham, August 25, 1642, war became inevitable, Cromwell, then in his forty-third year, was among the first to offer his sword to the Parliament, and he was forthwith commissioned to raise a troop of horsemen to serve in the Parliamentary army. This troop, which he soon increased to a regiment, he raised from among the yeomen and well-to-do farmers in Cambridgeshire and the neighbouring counties, ensuring thereby a certain amount of education among his men, and a large admixture of that free spirit which cannot grow but in an independent atmosphere. He severely disciplined his recruits till they became the famous "Ironsides," dreadful in battle; he prayed with them, preached to them, fought with them, and by cool courage and fervent zeal succeeded in inspiring them with a belief that a prophet had risen up among them.

First at Gainsborough, and then at Horncastle, in Yorkshire, Cromwell displayed his military ability as a general, by defeating with severe loss some divisions of the Royalist army under the Marquis of Newcastle; and soon afterwards, in 1644, he was appointed second in command of the Parliamentary army operating in the Eastern counties under the Earl of Manchester. In conjunction with Fairfax and Lambert, the Earl of Manchester, having been victorious in the east, marched to York and besieged it, the issue being the battle of Marston Moor, where the cavalry and infantry under the command of Oliver Cromwell broke the scerried ranks of Prince Rupert, and carried the day "for God and the Houses."

At Dennington Castle, near Newbury, where King Charles had left his baggage and artillery after the rout of his army at the latter place, a difference arose between Cromwell and the Earl of Manchester which first showed the firmness and dominance of the spirit which actuated the future Protector. Cromwell was for taking the castle and the guns, the earl was for marching elsewhere, and upon this question the two men split, Cromwell thereafter taking his own independent line across the difficult country of politics which was before him. It matters

not now to follow him through all his military achievements prior to the death of the king: suffice it to say that he was incessantly employed, retaining by stratagem his seat as a member of Parliament the while, and that he figured in all the great battles of the war, including Naseby, June 14, 1645, and always was attended by success.

Thoroughly persuaded of the dishonesty of the king; convinced that, unless he were completely overthrown, the last state of England would be worse than the first; persuaded also that there was not any man, or any set of men on the Parliamentary side, who could prevent this except himself, he determined, about the time King Charles was given up by the Scots, with whom he had taken refuge, to gather up the reins into his own hands, and to drive the chariot of the state along the only road which in his opinion was a safe one. Firmly, harshly, perseveringly, prayerfully, he addressed himself to his task, which was to overthrow the power—namely, the Parliament—which had overthrown the king, to subject the king utterly, even by death if need be, and to bring under obedience those rival chiefs and commanders, who, he foresaw, would never tolerate quietly the assumption of power by one whom they looked on as their equal or inferior.

It was by Cromwell's orders, or at least with his concurrence, that Cornet Joyce, with a strong party of cavalry, made a sort of raid on the captive king's guard at Holdenby, in Yorkshire, where he was on his way to be given up to the Parliament, and snatching the king from the hands of the Scots' and Parliamentary commissioners, brought him to the head-quarters of the army. The army at that time was in open quarrel with the Parliament on the subject of the limitations which that body had thought fit to place upon the authority and influence of the military. The Parliament itself was divided into many factions, all pulling a different way, none of them seeking the general good, but only the advancement of their own petty interests. Cromwell, whose influence with the army was at this time paramount, resolved to crush the rival but divided power, and knowing the immense importance of the possession of the king's person, gladly acquiesced in, if he did not order, the violent taking of Charles from the custody of the Parliamentary commissioners.

Immediately he heard of the king's re-arrest he left London, hastened to the army, and putting himself at its head, marched to St. Albans, where he opened negotiations with the Parliament in London. The nation looked on approvingly, being disgusted with the way in which the Houses had used their power, with the taxes they levied, the harsh laws they enacted, and the tyrannical manner in which the executive was carried on; and though London held out in favour of the Parliament, the army marched up and demanded admittance, which was conceded to them without show of resistance. This was in June, 1647.

On November 11, in the same year, King Charles, who was a sort of prisoner at large at Hampton Court Palace, fled to the Isle of Wight, where he was detained at Carisbrook Castle by the governor, Colonel Hammond. Meantime the army, represented by Cromwell, had completely overawed the Parliament, which was allowed, however, still to exist till the dictator had used them for his purposes. The negotiations between it and the king having proved futile, Cromwell summoned a council of the principal officers of the army to devise some means of settling the nation. At this council it was resolved, after much prayer and much deliberation, to bring the king to trial for having committed treason against the people by levying war upon them.

Plots and counterplots now took place, some having in view the overthrow of the officers, some of the Parliament, some the restoration of the king, the result being that a second civil war broke out, aided by the Scots, and England was ablaze again from end to end. Promptly, skilfully, successfully, Cromwell and his friends crushed the rebellion and the invasion; and that being done, they resolved to bring the king to punishment for the part he had had in them. The Parliament resisting, the army came to London; and the Houses having still declared their willingness to treat with the king, and their entire disapproval of the course taken by the army, Cromwell resolved to coerce them still more, and on the 6th of December, 1648, "purged" the House by seizing some two hundred of the members inimical to his interests, and allowing no more than some sixty of the most partisan-like to remain. It was by a High Court of Justice appointed by this "Rump" Parliament that King Charles was

brought to trial in Westminster Hall, and by a sentence of that court, signed, amongst others, by Oliver Cromwell, he was publicly executed "in the open space before Whitehall," on the 30th of January, 1648-9. There was no other way in the state to which things had come; it was war to the knife, and so wide had become the difference in political and religious feeling between the opposed parties, that the intolerant absolutism of one of them was inevitable.

For four years after this event the government of England was nominally republican, and really a sort of parliamentary executive under the control of the army. The prime mover, though he kept himself in the background, was Oliver Cromwell, whose will made itself law, and whose policy guided the state. Ireland, the state of which was more wretched and deplorable, perhaps, than at any other time in her history, was to be "tranquillised," and Cromwell marched through it in inexorable fashion, putting whole garrisons to the sword, burning, killing, and destroying, in pursuance of what his stern, strong nature conceived to be the only efficacious way of dealing with her. Ireland was tranquil in the sleep of death, and never again was able to trouble the sister island with her aspirations after life. It was an awful opiate the Puritan leader gave her, and deadly and bitter was the hatred with which she woke from the effects of it. With no worse malediction can an Irishman curse to-day than with "the curse of Cromwell."

The Dutch were punished for the aid they gave to the king's cause by a naval war, which was singularly brilliant, and in which the names of De Ruyter, De Witt, Van Tromp, Blake, Ayscough, Venables, and Monk, shine out in bold relief. Scotland, which had espoused the cause of Charles II., and had proclaimed him king, was overrun by the same irresistible man who had crushed the opponents of the Commonwealth and Puritanism in Ireland. At Dunbar, at Stirling, and then at Worcester, whither the Scots' army had penetrated in order to be overthrown, the strong hand and wise head of Oliver Cromwell prevailed, and the royal cause was irretrievably lost.

In 1653 it became obvious to the army, or to the man who commanded it, that parliamentary government must cease in form as well as in reality. The exceptional state of England rendered it impossible to have a divided government, and in divisions and petty squabbles the Parliament, mutilated as it was, was only strong. Every day the civil and the military powers were coming into collision. In the face of smouldering war at home, avowed hostility abroad, and the still unsettled state of the realm, this sort of thing would not do. Cromwell resolved to take the helm himself, and alone to steer the ship of the state. On the 20th of April, 1653, he dismissed the sham Parliament, over which Praise God Barebones presided, and was forthwith made Protector of the Commonwealth of England.

From that moment England rose to be a first-rate power in Europe. The Dutch were ruinously beaten in a two days' naval battle, in which Van Tromp, their great admiral, was killed. Spain, the greatest power in Europe, was victoriously withstood, and lost, among other possessions, the island of Jamaica; France, under Cardinal Mazarin, was glad to be well with the Republic of England; and Portugal received condign punishment for some assistance she gave to the exiled king. At home a firm and disinterested rule served to heal many of the wounds from which poor England bled; and with a commerce protected afloat, and industry encouraged on shore, the English people grew prosperous, wealthy, and in some sort contented. Now and again the royalists, and those enemies of theirs who were enemies of the Commonwealth also, gave the government trouble; and it was seriously proposed, in order to put an end to their hopes, that Cromwell should make himself king, and found a new dynasty. In 1657 the crown was actually offered to him, but he firmly refused it, and accepted instead "the humble petition and advice," wherein were laid down rules for his guidance in the government, and in which his authority was defined.

For twelve months he continued to carry on his work, hoping against hope that it might be an abiding one; welding the disintegrated masses of English society into a strong, united community; striving to do justice to all, though many would not suffer him; making the country he had been called upon to govern prosperous at home and respected abroad. Space fails to tell of all he did, or to seek out a knowledge of the intentions he was not allowed to fulfil. Regarded with respectful hatred by the royalists, with envy by those whom he had outstripped

in the race, with admiration by those who loved their country more than themselves, and prized the objects for which England had struggled and fought; loved by very few, unhappy in himself, Cromwell sank to rest; and enough has been said here to make it intelligible why to many of his countrymen a funeral and a tomb less than the most splendid seemed all unworthy of him, and also why, when Charles II. was restored to his father's throne, there were found men to suggest and approve the senseless barbarity which led to the exposure of his dead body on Tyburn gallows. Perhaps even these men, after "the merry monarch" had reigned a few years, might have looked back and said—when they saw the Dutch in the Medway, the French all-powerful through money, the Spaniards insulting the English flag in all places in the world, and the revenues of the kingdom squandered on mistresses and frivolity, while the servants of the state died of hunger—that sombre, harsh, ungenial as Cromwell might have been, he never allowed an Englishman to have cause to blush for his nationality, never made the state interests subservient to his own, never gave the people such provocation as did the restored line of princes, that in less than thirty years after the day of their unfortunate restoration they hurled them off the throne, and forbade firmly and for ever their re-accession to it.

SYNOPSIS OF EVENTS IN THE LIFE OF OLIVER CROMWELL, LORD PROTECTOR OF THE ENGLISH COMMONWEALTH.

Oliver Cromwell, who virtually held supreme sway over England from the surrender of Charles I. by the Scotch in 1647, was the son of a gentleman of Huntingdonshire, and grandson of Sir Henry Cromwell, of Hinchinbrook. By his wife, Elizabeth Bourchier, daughter of Sir John Bourchier, he had two sons and six daughters.

Born at Huntingdon April 25, 1599	"Long Parliament" ended by Cromwell . . . April 20, 1653
Elected Member of Parliament for Huntingdon . . . 1628	Blake defeats the Dutch off the North Foreland, June 2, 1653
Prevented from emigrating to New England by Charles I. 1637	Blake defeats the Dutch off the coast of Holland, July, 1653
Elected Member of Parliament for Cambridge . . . 1640	Cromwell made Lord Protector . . . December 16, 1653
Civil War between the King and Parliament began August 25, 1642	Expedition under Blake sent against the pirates of the Mediterranean 1654
[For Events and Battles in Civil War, see page 122.]	War declared against Spain . . . 1654
Members expelled from the House of Commons by "Pride's Purge" . Dec. 6, 1648	Defeat of Penn and Venables at Hispaniola, or Hayti . . . 1654
"Rump" or Barebones' Parliament 1648	Capture of Jamaica 1655
Charles I. executed, Jan. 30, 1649	Cromwell refuses the Crown . . 1657
Temporary abolition of House of Lords 1649	Destruction of the Spanish Fleet at Santa Cruz by Blake April 20, 1657
Cromwell goes to Ireland . . . 1649	Capture of Dunkirk June, 1658
Proclamation of Charles II. by the Scots 1649	Death of Blake August 27, 1658
Execution of Montrose, May 21 1650	Cromwell dies at Whitehall September 3, 1658
Battle of Dunbar Sept. 3, 1650	RICHARD CROMWELL, LORD PROTECTOR.
Charles II. crowned at Scone January 1, 1651	Born at Huntingdon 1625
Battle of Worcester, Sept. 3, 1651	Became Lord Protector, September 3, 1658
Navigation Laws enacted, October, 1651	Deposed by the Army, April 22, 1659
Dutch Admiral Van Tromp defeats the English Fleet in the Channel Nov. 29, 1652	Restoration of Charles II. May 29, 1660
Blake defeats the Dutch Fleet off Portsmouth, Feb. 18-20, 1653	Richard Cromwell dies at Hursley, Hampshire, July 17, 1712

SOVEREIGNS CONTEMPORARY WITH OLIVER AND RICHARD CROMWELL.

Denmark, King of. Frederick III. . . 1648	Portugal, Kings of. John IV. 1640	Sweden, Sovereigns of. Christina III. . . 1633
France, King of. Louis XIV. 1643	Alphonso VI. 1656	Charles X. 1654
Germany, Emperors of. Ferdinand III. . . 1637	Rome, Popes of. Innocent X. 1644	Charles XI. 1660
Leopold I. 1658	Alexander VII. . . 1655	Turkey, Sultan of. Mahomet IV. . . . 1649
Poland, Kings of. John II. (sometimes styled Casimir V.) . . 1649	Russia, Cæars of. Alexis 1645	United Provinces of the Netherlands, Stadtholders of. William II. 1647
	Spain, Kings of. Philip IV. 1621	Interregnum 1653

LESSONS IN BOTANY.—XII.

THE reader will now begin to understand the general principles on which a natural classification of vegetables is effected. In the first place, we divide them into cryptogamic and phanogamous; then we divide the latter into endogenous and exogenous. Next we proceed to establish orders, from a consideration of such characteristics as the position of stamens, nature of fruit, character of seed; and, as we have already seen, we usually give to each order a name derived from some leading genus or sub-division. Thus, our principal genus in the *Ranunculus* order is the *Ranunculus* or Crowfoot; hence the generic name *Ranunculaceæ* is given; and we subdivide this genus into species by the addition of terms which consideration will render obvious. For example, there is one species of *Ranunculus* which is more poisonous than the rest; botanists, therefore, apply to this species the appellation of *wicked*, or *sceleratus*; hence, when the expression *Ranunculus sceleratus* is met with, the reader is made acquainted with the following facts in the following order:—The plant is a flowering plant, is an exogenous plant, belongs to the order of *Ranunculaceæ*, to the genus *Ranunculus*, and is a member of the species designated *sceleratus*.

More than one poisonous principle abounds in the *Ranunculaceæ*, but of these the alkali, termed by chemists *aconitine*, is the most violent. It is a white substance, something like flour to look at, and so frightfully poisonous that the twentieth part of a grain, or even less, is a fatal dose. Of all the various species of aconitum, that termed *Aconitum ferox* is the most dangerous. This plant grows in the Himalaya Mountains, and was on one occasion used by the Nepaules as a means of ridding themselves of us, their invaders. A few leaves of this *Aconitum ferox* being thrown into a well, poisoned all the water to such an extent that men or beasts drinking of it were almost infallibly killed.

Many of the most beautiful and striking flowers in our gardens belong to the order of *Ranunculaceæ*. In our last lesson we mentioned some of these—the *Hepaticas*; the *Larkspurs*, short and tall; and the *Delphiniums* of all shades and tints of blue, from the brilliant azure of the *Delphinium corulescens* to the dark indigo tint of the *Delphinium grandiflorum*.

Anemones, those pretty flowers with their variously-coloured petals and drooping flowers—these, too, belong to the order of *Ranunculaceæ*, as also do the large showy peonies and the *Monk's Hoods* or *Aconites*, flowers which have also the characteristics of the *Ranunculaceæ*, as the student who examines them will not fail to recognise.

Our space does not admit of more being said concerning the order *Ranunculaceæ*. We must conclude, therefore, by stating that their fruits are denominated by botanists *achania*, or *follicles*, terms which have been explained in a former lesson.

SECTION XXII. — PAPAVERACEÆ, OR THE POPPY TRIBE.

Let us now commence the study of another natural order, the *Papaveraceæ*, or *Poppy Tribe*, bearing some affinity to the order *Ranunculaceæ*, but differing from it by certain characteristic signs, which are described in botanical phraseology as follows:—

Characters: Sepals two, rarely three, caducous; petals hypogynous; their number double or quadruple that of the sepals; imbricated and crumpled in æstivation; stamens numerous, hypogynous; ovary unilocular, placentas parietal,

sometimes prolonged into vertical plates, at other times filiform; fruit, capsular; seed, dicotyledonous and albuminous.

Such are the botanical characteristics of this natural order succinctly expressed. Some of the terms employed the reader will understand; but those which have not come under his notice before, we will explain before we proceed.

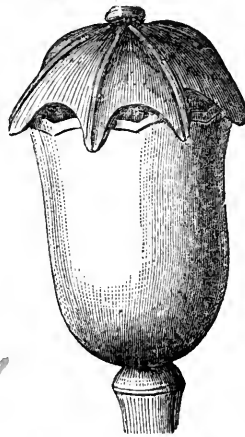
The first new word that requires explanation is *caducous*, used to describe the peculiarity of the sepals. These the reader will remember are the component parts of the calyx, and form the green envelope of the poppy-bud which bursts asunder when the flower is ready to open. Soon after the flower has opened the sepals fall off, and for this reason they are called *caducous*, from the Latin *caducus*, which is derived from *cado*, to fall. *Æstivation* is the manner in which the sepals and petals are fitted together before the flower expands, from the Latin *æstiva*, summer quarters. Here they overlap each other, as one tile laps over another on the roof of a house. The Latin for a gutter-tile or roof-tile is *imbrex*, so all that is meant by the term *imbricated in æstivation* is, that before the flower expands the sepals or petals overlap each other at the edges. The ovary or seed-vessel is termed *unilocular* because it is "one-celled," or has only one cell, from the Latin *unus*, one, and *loculus*, a cell, the diminutive of *locus*, a place. In the fruit are found the parts to which the seeds are

attached, which are called *placentas*. These *placentas* are flattened, and derive their name from the Greek *πλαξ*, genitive *πλακος* (*plax, plak'-os*), a term applied to anything flat, such as a plate or flat cake. They grow out or project from the inside of the ovary, or as it were from the wall of the ovary, therefore they are called *parietal*, from the Latin *paries*, a wall.

The reader may provide himself with a red corn-poppy as a specimen of the flower, and a white poppy-capsule, procurable at the druggist's, as a sample of the fruit. Like buttercups,

poppies will be seen on examination to have a great number of stamens; these stamens, moreover, are below the carpels, or are hypogynous. Thus far, the resemblance of the Poppy tribe to the *Ranunculus* tribe is complete. But when we come to examine the fruit, what a difference is there! In the *Ranunculaceæ* the carpels remain distinct, and the fruit is, owing to that circumstance, denominated *apocarpous*; in the *Papaveraceæ* the carpels unite together and constitute one capsule, the poppy-head of the shops. This, then, is the grand broad distinction between the two natural orders. The carpels have all grown into one common ovary, but what has become of the *stigma* or upper expansion of the styles? These may be seen at the extremity of the poppy capsule, as represented in the accompanying diagram (Fig. 126) where they may be observed forming a sort of crown. If the capsule be now opened it will be found to consist of one cell, into which numerous little flattened plates project; the latter are termed *placentas* or *placentæ*, a term of which a full explanation has already been given above; they are the parts of the fruit which give attachment to the seeds.

Such are the mechanical conditions, if we may so term them, in which the *Papaveraceæ* differ from the *Ranunculaceæ*; but there is a well-marked physiological difference also. Plants belonging to the *Ranunculus* tribe are supplied with a watery, acrid, poisonous juice; whereas in plants of the Poppy tribe the juice is milky, and usually contains opium. The substance known as opium in the shops is derived from the white poppy,



126. CAPSULE OF THE POPPY.



127. THE DOUBLE POPPY.

by making cuts on the ripe capsules, and allowing the juice to exude. After exposure for a while to the sun, the juice, at first milky, soon thickens into a dark waxy-looking mass. This is opium, the active principles of which are numerous, but that termed morphia is the chief.

Just as the characteristics of the *Ranunculus* tribe become veiled in the larkspur, anemone, clematis, and peony, so are the Poppy characteristics obscured in certain plants belonging to this natural order. For example, on some parts of the sea-coast there grows a plant termed the "horned poppy," on account of the peculiar appearance of its fruit, which, instead of being round like the fruit of a common red or white poppy, is shaped something like a horn. The form may be partially explained as follows. In the fruit of the ordinary poppy numerous carpels are united together, and thus a globular body results, just as the orange presents a globular aspect on account of the assemblage of so many easily divisible sections; but supposing many of these sections removed, then the orange would no longer be globular, but elongated. It is thus with the horned poppy. Its fruit, like the ordinary poppy, is *syncarpous*; that is to say, compounded of carpels united together; but their number being fewer—only two—the resulting fruit is necessarily more elongated.

The Celandine (*Chelidonium majus*) is another plant of the Poppy tribe, in which the fruits are elongated. All these species of *Papaveraceæ* are characterised by having a milky juice, by the presence of which, taken in connection with hypogynous stamens and syncarpous fruits, the various members of this tribe may always be discriminated. The milky juice of the celandine will remove the excrescences called warts.

SECT. XXIII. — ROSACEÆ, OR THE ROSE TRIBE.

This is a very extensive natural order of plants, comprehending not only the roses proper, but almonds, strawberries, apples, pears, and many other plants.

Characteristics: Calyx monosepalous, usually in five divisions; sometimes adherent to the ovary; imbricated in aestivation; petals five, alternate with the sepals free, inserted on the calyx, imbricated in aestivation, sometimes absent; stamens almost always indefinite, inserted like the petals; pistil, various; ovule, reflected; seeds, dicotyledonous; leaves alternate, usually compound, with stipules. All these botanical terms have already been explained.

Perhaps the best specimen for affording the general characteristics of the Rose tribe is a strawberry flower. Supposing the reader to have provided himself with one of these, he will at first be struck with a general resemblance to a buttercup flower. In both the carpels and the stamens are numerous, but the following leading distinction between them may at once be seen. In the buttercup the stamens do not grow from the calyx, so that the latter may be altogether removed without in any respect disturbing the former. If, however, we attempt to dissect a

rose or a strawberry flower in this manner, we shall soon find it impossible to remove the sepals of which the calyx is composed without at the same time removing all the stamens. This distinctive characteristic was known to Linnaeus, and embodied by him in the distinction between his *Icosandria* and *Polyandria*, as the reader will observe if he turns to page 305.

This peculiarity in the insertion of the stamens in flowers of the Rose tribe is shortly indicated in botanical language by the term *perigynous*. We have already seen that the term *hypogynous* means below the carpel; therefore the reader will now be prepared to understand that *perigynous* means around the carpel; and this is expressive of the mode of growth of stamens in the Rose tribe. Had we not previously explained the nature of the strawberry fruit, that point would have to be explained now; but the reader is already aware that the real botanical fruits of the strawberry are those little seed-like things scattered over the surface of the part we eat.

Very nearly allied to the strawberry in their botanical aspect are the Cinquefoil or *Potentilla* plants. Their flowers are almost exactly like those of the strawberry, but strawberries, nevertheless, do not result. The torus, which becomes juicy and delicious in the strawberry, remains hard in the *potentilla*.

Raspberries and brambles are also members of the Rose tribe, with which they agree in the easily-recognised essential characteristic of perigynous stamens. There is a sort of general resemblance, too, between the fruits of the raspberry, blackberry, and the edible portion of the strawberry; yet the botanical distinction between raspberries and blackberries on the one hand, and strawberries on the other, is very clear. The very part we eat in the strawberry is the portion we throw away in the raspberry and blackberry. The fleshy and delicious torus or receptacle of the strawberry becomes in the latter white, insipid, spindle-shaped core, whilst the edible part is a real fruit, or rather

an assemblage of real fruits, matured ovaries. How are we to know this? the learner will ask. Simply thus:—Did he never observe that each of these little berry-like elevations is surrounded or terminated by a sort of hair? Now these hairs are nothing more than the styles of carpels, the lower portions or ovaries of which have expanded in order to become fruit.

In the illustration on this page the reader will find a good representation of the wild rose or dog-rose, the *Rosa canina* of Linnaeus, which is to be found in almost every hedge-row in the country, and which furnishes excellent stocks on which to engraft the different varieties of garden roses by budding. The smaller cuts, immediately below the engraving of the rose itself, with its flower-buds and glossy dark-green leaves, will help him in distinguishing the component parts of the flower when dissecting it, as No. 2 exhibits an accurate sketch of a vertical section of the flower, and Nos. 3, 5, and 4, the carpel, the seed within the carpel, and the outer envelope in which the carpels are contained.



123. THE WILD ROSE OR DOG-ROSE. (1.) THE FLOWER-BUDS AND LEAVES. (2.) VERTICAL SECTION OF FLOWER. (3.) CARPEL. (4.) FRUIT. (5.) SECTION OF CARPEL, SHOWING SEED.

READING AND ELOCUTION.—XII.

ANALYSIS OF THE VOICE (continued).

VIII.—CORRECT INFLECTIONS.

"INFLECTION" in elocution signifies an upward or downward "slide" of voice, from the average, or level, of a sentence.

There are two simple "inflections" or "slides,"—the upward or "rising," and the downward or "falling." The former is usually marked by the acute accent [^]; the latter, by the grave accent [`].

The union of these two inflections, on the same syllable, is called the "circumflex," or wave. When the circumflex commences with the falling inflection, and ends with the rising, it is called the "rising circumflex," marked thus [^ `]; when it begins with the rising, and ends with the falling, it is called the "falling circumflex," marked thus [` ^].

When the tone of the voice has no upward or downward slide, but keeps comparatively level, it is called the "monotone," marked thus [-].

Examples.—Rising Inflection.

"Intensive," or high, upward slide, as in the tone of surprise :—

Há! Is it p^ossible!

In the usual tone of a question, that may be answered by Yes or No :—

Is it réally so?

"Moderate" rising inflection, as at the end of a clause which leaves the sense dependent on what follows it :—

If we are sincerely desirous of advancing in knowledge, we shall not be sparing of exertion.

The "slight" rising inflection—marked thus [^ `], is used when the voice is suddenly and unexpectedly interrupted :—

When the visitor entered the room— * * * *

The last-mentioned inflection may, for distinction's sake, be marked as above, to indicate the absence of any positive upward or downward slide, and, at the same time, to distinguish it from the intentional and prolonged level of the "monotone."

Falling Inflection.

"Intensive," or bold and low downward slide, as in the tone of anger and scorn :—

D^own, ruthless insulter!

The "full" falling inflection, as in the cadence at a period :—

All his efforts were in vain.

The "moderate" falling inflection, as at the end of a clause which forms complete sense :—

Do not presume on wealth; it may be swept from you in a moment.

The horses were harnessed; the carriages were driven up to the door; the party were seated; and, in a few moments, the mansion was left to its former silence and solitude.

The "suspensive," or slight falling inflection, marked thus [^ `], as in the members of a "series," or sequence of words and clauses, in the same syntactical connection :—

The force, the size, the weight of the ship, bore the schooner down below the waves.

The irresistible force, the vast size, the prodigious weight of the ship, rendered the destruction of the schooner inevitable.

The "suspensive" downward slide is marked as above, to distinguish it from the deeper inflection at the end of a clause, or of a sentence.

TABLE OF CONTRASTED INFLECTIONS.

The Rising followed by the Falling.

Will you g^o, or stáy?
Will you ride, or wálk?
Did he travel for héalth, or for pléasure?
Does he pronounce corréctly, or incorréctly?
Is it the rising, or the falling inflection?

The Falling followed by the Rising.

I would rather g^o than stáy.
I would rather wálk than ride.
He travelled for héalth, not pléasure.
He pronounces corréctly, not incorréctly.
It is the falling, not the rising inflection.

Examples of Circumflex.

Tone of Mockery.—I've caught you, then, at last!

Irony.—Courageous chief!—the first in flight from pain!

Punning.—And though heavy to wéigh, as a score of fat sheep,
He was not, by any means, heavy to sléep.

Example of Monotone.—Awe and Horror.

I could a tále unfold whose lightest w^ord
Would hárrow úp thy sóul, fréeze thy young blóod,
Máke thy twó eyes, like stárs, start from their sphéres,
Thy knótted and combined locks to párt,
And éach particúlar háir to stánd on énd,
Like quills upon the frétful porcupine.

Rules on the Rising Inflection.

Rule 1.—The "intensive" or high rising inflection expresses surprise and wonder, as :—

Há! laugh'st thou, Lochiel, my vision to scórn?

Rule 2.—The "moderate" rising inflection takes place where the sense is incomplete, and depends on something which follows :—

As we cannot discern the shadow moving along the dial-plate, so we cannot always trace our progress in knowledge.

Note.—Words and phrases of address, as they are merely introductory expressions, take the "moderate rising inflection," as :—

Fríends, I come not hére to talk.
Sir, I deny that the assertion is corréct.
Sóldiers, you fight for home and liberty!

Exception.—In emphatic and in lengthened phrases of address the falling inflection takes place, as :—

On! ye bráve, who rush to glory or the grave!
Sóldiers! if my stándard falls, look for the plúmo upon your kíng's hélmét!*

My fríends, my fóllowers, and my children! the field we have entered, is one from which there is no retreat.

Gentlemen and knights—commoners and sóldiers, Edward the Fourth upon his throne will not profit by a victory more than you.

Rule 3.—The "suspensive," or slight rising inflection, occurs when expression is suddenly broken off, as in the following passage in dialogue :—

P^oet. The poisoning dáme—
Fríend. You méan—
P. I don't.
F. You do.

Note.—This inflection, prolonged, is used in the appropriate tone of reading verse, or of poetic prose, when not emphatic, instead of a distinct rising or falling inflection, which would have the ordinary effect of prosaic utterance, or would divest the expression of all its beauty.

Examples.

Here wátters, wóods, and wínds in concert join.
And flocks, wóods, streams áround, repose and peace impart.

The wild brook babbling down the mountain's side;
The lowing herd; the sheepfold's simple bell;
The pipe of early shepherd, dim deserted
In the lone valley; echoing far and wide,
The clamorous horn, along the cliffs above;
The hollow murmur of the ocean tide;
The hum of bees, the linnet's lay of lóve,†
And the full choir that wakes the universal grove.

White houses peep through the trees; cattle stand cooling in the pool; the casement of the farm-house is covered with jessamine and honeysuckle; † the stately greenhouse exhales the perfume of summer climates.

Rule 4.—A question which may be answered by Yes or No, usually ends with the rising inflection, as :—

Do you see y^ou clóud?

Exception.—Emphasis, as in the tone of impatience, of extreme earnestness, or of remonstrance, may, in such cases as the above, take the falling inflection, as :—

* Shouting tone.

† The penultimate inflection of a sentence, or a stanza, usually rises, so as to prepare for an easy cadence.

Can you be so infatuated as to pursue a course which you know will end in your ruin?

Will you blindly rush on destruction?

Would you say so, if the case were your own?

Rule 5.—The penultimate, or last inflection but one, is, in most sentences, a rising slide, by which the voice prepares for an easy and natural descent at the cadence, as:—

The rocks crumble, the trees fall, the leaves fade, and the grass withers.

Exception.—Emphasis may sometimes make the penultimate inflection fall, instead of rising; as the abruptness of that slide gives a more forcible effect:—

They have rushed through like a hurricane; like an army of locusts, they have devoured the earth; the war has fallen like a waterspout, and deluged the land with blood.

Rules on the Falling Inflection.

Rule 1.—The “intensive, downward slide,” or “low,” falling inflection, occurs in the emphasis of *vehement emotion*, as:—

‘ON! ‘ON to the just and the glorious strife!

Rule 2.—The “full” falling inflection usually takes place at the cadence, or close, of a sentence, as:—

No life is pleasing to God, but that which is useful to mankind.

Exception.—When the meaning expressed at the close of one sentence is modified by the sense of the next, the voice may rise, instead of falling, as:—

We are not here to discuss this question. We are come to act upon it.

Gentlemen may cry “peace, peace!” But there is no peace.

Rule 3.—The “moderate” falling inflection occurs at the end of a clause which forms complete sense, independently of what follows it, as:—

Law and order are forgotten: violence and rapine are abroad: the golden cords of society are loosed.

Exception.—Plaintive expression, and poetic style, whether in the form of verse or of prose, take the “slight” rising inflection, in its prolonged form:—

Cold o'er his limbs the listless languour grew;
Palleness came o'er his eye of placid blue;
Pale mourned the lily where the rose had died;
And timid, trembling, came he to my side.

The oaks of the mountains fall: the mountains themselves decay with years; the ocean shrinks and grows again; the moon herself is lost in heaven; * but thou art for ever the same, rejoicing in the brightness of thy course.

Rule 4.—The “suspensive,” or slight falling inflection, takes place in every member but one of the “series,” or successive words and clauses, connected by the same conjunction, expressed or understood.

Note 1.—A succession of words is termed a “simple series;” a succession of clauses a “compound series.” A succession of words which leave sense *incomplete* is termed a “commencing series;” that which leaves *complete* sense, a “concluding series.” A “commencing series” is read with the “suspensive,” or slight falling inflection, on every member but the last; a concluding series, with the “suspensive” slide on every member, except the penultimate, or last but one.

“Simple commencing series:”—

The air, the earth, the water, teem with delighted existence.

“Simple concluding series:”—

Delighted existence teems in the air, the earth, † and the water; ‡

“Compound commencing series:”—

The fluid expanse of the air, the surface of the solid earth, the liquid element of water, teem with delighted existence.

“Compound concluding series:”—

Delighted existence teems in the fluid expanse of the air, the surface of the solid earth, † and the liquid element of water. ‡

* Rising slide, for contrast to the following clause.

† “Penultimate” rising inflection, preparatory to the cadence, or closing fall of voice, at the end of a sentence.

‡ “Full” falling inflection, for the cadence of a sentence.

Exception 1.—Emphatic, abrupt, and disconnected series, may have the “moderate” or the “bold” downward slide on every member, according to the intensity of expression, as:—

His success, his fame, his life, were all at stake.

The roaring of the wind, the rushing of the water, the darkness of the night, all conspired to overwhelm his guilty spirit with dread.

Eloquence is action, noble, sublime, godlike action.

The shore, which, but a few moments before, lay so lovely in its calm serenity, gilded with the beams of the level sun, now resounded with the roar of cannon, the shouts of battle, the clash of arms, the curses of hatred, the shrieks of agony.

Exception 2.—Light and humorous description gives the “moderate” upward slide to all the members of a series, as:—

Her books, her music, her papers, her clothes, were all lying about the room, in “most admired disorder.”

Exception 3.—The language of pathos (pity), tenderness, and beauty—whether in verse or prose—takes the “suspensive,” or slight rising inflection, except in the last member of the “commencing” and the last but one of the “concluding” “series,” which have the usual “moderate” rising inflection, as:—

No mournful flowers, by weeping fondness laid,

No pink, no rose, drooped, on his breast displayed.

There wrapt in gratitude, and joy, and love,
The man of God will pass in Sabbath noon.

There (in the grave), vile insects consume the hand of the artist, the brain of the philosopher, the eye which sparkled with celestial fire, and the lip from which flowed irresistible eloquence.

Note 2.—All series, except the plaintive—as by their form of numbers and repetition, they partake of the nature of “climax,” or increase of signification—should be read with a growing intensity of voice, and a more prominent inflection on every member, as:—

The splendour of the firmament, the verdure of the earth, the varied colours of the flowers which fill the air with their fragrance, and the music of those artless voices which mingle on every tree; all conspire to captivate our hearts, and to swell them with the most rapturous delight.

This remark applies, sometimes, even to the rising inflection, but, with peculiar force, to cases in which the language is obviously meant to swell progressively in effect, from word to word, or from clause to clause, and which end with a downward slide, on every member, as in the following instance:—

I tell you, though you, though all the world, though an angel from HEAVEN, should declare the truth of it, I could not believe it.

Rule 5.—All questions which cannot be answered by *Yes* or *No* end with the falling inflection, as:—

When will you cease to trifle?

Where can his equal be found?

Who has the hardihood to maintain such an assertion?

Why come not on these victors proud?

What was the object of his ambition?

How can such a purpose be accomplished?

Exception.—The tone of real or affected surprise throws such questions, when repeated, into the form of the rising inflection, as:—

How can such a purpose be accomplished!

To the diligent all things are possible.

LESSONS IN ARITHMETIC.—XXII.

MEASURES OF SURFACE OR SUPERFICIES.

C. Definition.—A square is a four-sided figure, of which the sides are equal, and the angles right angles.

Surfaces are measured by means of *square inches, square feet, square yards, etc., i.e.,* by squares the sides of which are respectively 1 inch, 1 foot, 1 yard in length, etc.

7. To find the magnitude of a Square, the length of its side being given.

Raise the number expressing the number of linear units (inches or feet, etc.) in the side to the second power. This will give the number of square units of the same kind in the square.

For instance, a square, of which the side is 4 inches, contains

16 square inches; a square, of which the side is 5 feet, contains 25 square feet. The truth of this will appear from the following diagram:—

Draw a square, each of the sides of which suppose to be 4 inches long; divide the sides into lengths of 1 inch, and complete the figure by drawing parallel lines, as in the margin. This divides the square into small squares, each of whose sides is an inch in length. Now, in any one row, such as we have indicated by the figures, there are 4 such squares, and there are 4 rows. Hence, there are 16 square inches in the given square.

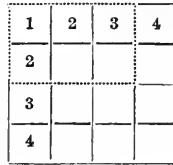


Fig. 1.

Suppose that two opposite sides be lengthened to 6 inches, so that the figure is no longer a square, but a *rectangle*. Dividing the figure as before into square inches, we see that there are necessarily six rows, each containing 4 square inches. Hence the number of square inches in a rectangle, two of whose sides are 4 inches long, and the other two 6 inches, is 6×4 , or 24 square inches. The same method is evidently true for any other rectangle, so that, to obtain the number of square units in any rectangle, we must multiply the number expressing the number of linear units in the length by the number expressing the number of linear units in the breadth.

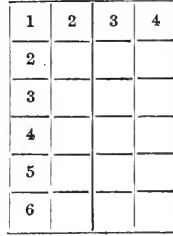


Fig. 2.

The same is true if the lengths of the sides be fractional parts of the unit of length. For instance, to find the area of a rectangle $\frac{3}{4}$ of a foot long and $\frac{1}{2}$ a foot wide. Referring back to Fig. 1, suppose now that it is a square, each side of which is 1 foot. Then, dividing, as in the figure, each foot into 4 parts, the square contains 16 square parts, each of which, therefore, is $\frac{1}{16}$ of a square foot. Now the dotted line encloses a rectangle, one side of which is $\frac{3}{4}$ and the other $\frac{1}{2}$ or $\frac{2}{4}$ of a foot, and this rectangle contains 6 of the 16 parts into which the square is divided; or the area of $\frac{6}{16}$ of a square foot, *i.e.*, $\frac{3}{4} \times \frac{1}{2}$ of a square foot.

Obs.—It must be observed that, in multiplying together the numbers, fractional or otherwise, which express the number of units in the sides of a rectangle, only *one* denomination must be used. The fact is, that we cannot talk of *multiplying* two geometrical magnitudes together. We cannot, for example, talk of *multiplying* 3 feet by an inch, or by 2 feet; but we can multiply *two numbers* together which indicate the lengths of the two lines, with reference to some one standard unit, and then deduce the geometrical result which corresponds to the numerical result thus obtained.

8. The following table of Square Measure is by the above principle deduced from that of the Measures of Length. The learner is recommended to do this for himself.

SQUARE MEASURE.		
144 square inches (sq. in.)	= 1 square foot	written 1 sq. ft.
9 square feet	= 1 square yard	„ 1 sq. yd.
30 $\frac{1}{2}$ square yards, or	} = 1 square rod, perch, or pole	„ 1 sq. p.
27 $\frac{1}{2}$ square feet		„ 1 rood
4 square perches	= 1 rood	„ 1 ro.
4 roods	= 1 acre	„ 1 ac.
640 acres	= 1 square mile	„ 1 sq. m.

The acre contains, as will be found by calculation, 10 square chains, or 100,000 square links, or 4,840 square yards.

Flooring, roofing, plastering, etc., are often calculated by a "square" of 100 square feet.

A *hide* of land is 100 acres.

MEASURES OF SOLIDITY OR VOLUME.—CUBIC MEASURE.

9. *Definitions.*—A solid figure is that which has length, breadth, and thickness. A *cube* is a solid contained by six squares, of which every opposite two are parallel. The sides of the squares are called the *edges* of the cube.

All solids, or spaces which could be filled by solids, are measured by means of the number of *cubic inches*, *cubic feet*, etc., which they contain, *i.e.*, by cubes, the edges of which are respectively 1 inch, 1 foot, etc., in length.

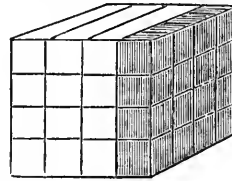
The magnitude of any solid figure is sometimes called its *volume*.

10. To find the magnitude of a Cube, the length of an edge being given.

Raise the number expressing the number of linear units in the edge to the third power. This will give the number of cubic units of the same kind in the given cube.

For instance, a cube of which the edge is 4 inches long contains 64 cubic inches; a cube of which the edge is 5 feet long contains 125 cubic feet.

The truth of this will appear from the following diagram:—



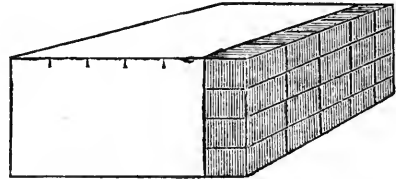
Take a cube, as in the diagram, of which the edge is supposed to be 4 inches long, and divide each edge into lengths of one inch. Then, by drawing parallel planes, as indicated in the figure, we can divide the cube into a number of cubes, each of which is a cubic inch. Now, any one slice such as that which is shaded clearly contains 4×4 , or 16 cubic inches, and there are 4 such slices. Hence the cube contains $4 \times 4 \times 4$, or 64 cubic inches.

11. *Definitions.*—A rectangular *parallelepiped* is a solid figure contained by six rectangular figures, of which every opposite two are parallel.

This differs from a cube in the fact that the length, breadth, and thickness are not equal.

The volume of (*i.e.*, the number of cubic units in) a parallelepiped is obtained by multiplying the numbers together which express the number of linear units in the length, breadth, and thickness respectively.

This will perhaps be sufficiently apparent from the accompanying diagram of a rectangular parallelepiped, of which the length, breadth, and height are supposed to be 6, 5, 4 inches respectively.



There will evidently be six such slices as that we have shaded, each containing 5×4 , or 20 cubic inches.

The volume of the solid will therefore be $6 \times 5 \times 4$, or 120 cubic inches.

CUBIC MEASURE.

1728 cubic inches = 1 cubic foot, written 1 c. ft.

27 cubic feet = 1 cubic yard „ 1 c. yd.

This measure is used in estimating the magnitude of timber, stone, boxes of goods, the capacity of rooms, ships, the solid mass of earth in railway cuttings, etc.

For example, 42 cubic feet are defined to be one ton of shipping.

For liquids and dry commodities other systems are adopted, which we will give after we have explained the measures of weight.

LESSONS IN PENMANSHIP.—XXIV.

ALTHOUGH it is not possible to give a detailed scheme of elementary forms of which the capital letters of the writing alphabet are composed, as was done with regard to the small letters, it may be as well, for the benefit and instruction of the self-teacher, to make a few remarks on the method of forming each of the capital letters.

In the capital letters of the writing alphabet the letter I is the key, and forms the principal part of most of the letters; it consists of a nicely tapering black stroke, commencing with a hair-stroke, and ending in a hair-stroke with a full point or a scroll. The head or top of this letter is variously made; a common form is seen in the capital letters in page 357; sometimes the head is formed like that of the capital J, which is the same letter in writing, with the black-stroke and the bottom hair-stroke carried below the level and terminated in a loop to the left.

The letter **A** is very like the printed **A**, with a loop or hair-stroke drawn across the middle; the hair-stroke generally begins with a full point, and the black-stroke tapering from the top terminates with a hair-stroke like a bottom-turn, or with a scroll; but it often terminates in a straight stroke, as it does in some printed forms (**A**).

The letter **B** consists of the letter **I** without its head, and a curved black-stroke to the right with a loop in the middle to the left; this curved black-stroke commences with a curved hair-stroke on the left of the middle stroke, and terminates with the same on the right of it, close to the bottom of the middle stroke.

The letter **C** is composed of a tapering black-stroke, beginning with a loop in hair-stroke, and ending with a scroll.

The letter **D** is composed of the letter **I** without its head, with the hair-stroke ending in a loop to the left at bottom, but carried round the top and made to terminate in a scroll.

The letter **E** commences with a scroll, which merges into a thick down-stroke after being carried to the left. The stroke which has been gradually narrowed to a hair-line is now carried

to the left and brought over the lower part of the down-stroke in a curved line towards the right.

The letter **M** is like two **A**'s joined together; but the middle down-stroke is generally made to taper gently to a sharp point at the bottom.

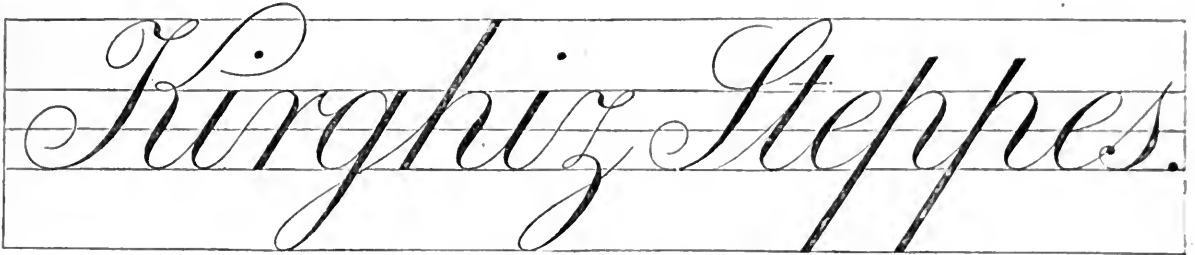
The letter **N** is anomalous; the middle is a black-stroke, tapering at both ends; it is joined at top by a hair-stroke like the hair-stroke of the letter **A**, and at bottom by a hair-stroke running up into a curve.

The letter **O** is like the small **o**, only it is left open at the top, and generally turned round in a loop at the end of the hair-stroke.

The letter **P** is like the letter **B**, wanting the latter part of the curved black-stroke from the loop downwards.

The letter **Q** is a curved tapering black-stroke, commencing at the top with a scroll, and ending in a loop to the left, of which the hair-stroke is carried across the black-stroke at the bottom in a waving curve.

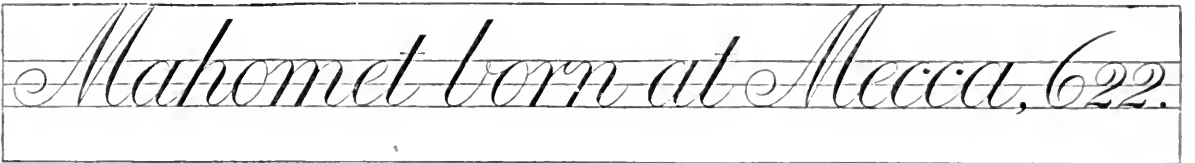
The letter **R** is like the letter **B**, with this difference, the



COPY-SLIP NO. 91.—KIRGHIZ STEPPES.



COPY-SLIP NO. 92.—LIMA, CAPITAL OF PERU.



COPY-SLIP NO. 93.—MAHOMET BORN AT MECCA, 622.

towards the right and looped, after which it is carried to the left again, deepened into a thick-stroke, and finally turned, as the letter was commenced, in a scroll.

The letter **F** is composed of the letter **I** with its head formed in a scroll and loop to the right at the top; it is also marked with a hair-stroke across the middle of the black-stroke, and terminating also in a small loop.

The letter **G** consists of a tapering black-stroke curved to the left, beginning in a loop at top, and ending in a hair-stroke, to which is attached a black-stroke like the letter **j** among the small letters.

The letter **H** is composed of the letters **I** and **C** joined together by a hair-stroke in the middle.

The letters **I** and **J** have been described. The letter **K** is like the letter **H**, with this difference, that the black-stroke of the **C** part has a small loop in the middle to the left; the first or **I** part is sometimes a mere black-stroke, tapering from top to bottom.

The letter **L** is commenced with a loop in hair-stroke. The fine line with which the letter is commenced is turned to the right, and brought downwards in a thick down-stroke. This down-stroke is again narrowed to a hair-stroke, which is looped

latter part of the curved and looped black-stroke is turned to the right with a scroll.

The letter **S** is the body of the letter **I**, with a hair-stroke loop to the right, at the top.

The letter **T** is like the letter **I** with a larger head, made exactly like the head of the letter **F**.

The letter **U** is a tapering black-stroke, commencing with a scroll, and ending in a hair-stroke, to which is attached the body of the letter **C**, with or without the head.

The letter **V** is like the first part of the letter **U**, but the hair-stroke terminates in a small loop at the top.

The letter **W** is like the letter **M** inverted; or rather, it consists of two tapering black-strokes, joined by a hair-stroke, and commencing and ending with peculiarly curved hair-strokes. Originally the letter **W** was just like two **V**'s put together, and frequently this letter is still made like the latter half of the letter **W**.

The letter **X** is formed very like the small **x**, only that it begins and ends with a scroll.

The letter **Y** is like the letter **U**, with the second black-stroke drawn below the line and terminated in a hair-stroke loop.

The letter **Z** is like the same letter in the small alphabet, but

it begins and ends with a scroll; sometimes the lower scroll is formed into a loop below the line.

The above description of the method of making the capital letters will prove of considerable assistance to the self-teacher in tracing out their varied forms, although we might reasonably suppose that he could not err in beginning each letter and ending it in the right place, after the experience that he has gathered in following carefully and sedulously the instructions given in our lessons on the formation of the small letters of the writing alphabet. The mode of shaping out each letter is the chief thing that each learner should aim at learning, and this he can do only by repeated practice. Our Copy-slips are arranged alphabetically, so as to give the student a sample of each letter in the alphabet.

LESSONS IN GERMAN.—XXII.

SECTION XLI.—PECULIAR IDIOMS—(continued).

SOMETIMES, as in English, a clause or sentence is made to supply the place of an adjective, as:—Die nie zu vergessene Schlacht bei Leipzig, the never-to-be-forgotten battle by (at) Leipsic. Der immer zu bewundernde Muth Luther's, the ever-to-be-admired courage of Luther (§ 150).

1. Anstatt, like the corresponding English word "instead," is compounded of a preposition and a noun, which components may be separated, as:—Anstatt seines Vaters, instead of his father; or, an seines Vaters Statt, in his father's stead.

2. The infinitive preceded by anstatt is, in German, used where we use the present participle preceded by "instead of," as:—Er spielt, anstatt zu arbeiten, he plays "instead of" working. When preceded by the preposition ohne, it is to be rendered by a participle governed by the corresponding preposition "without," as:—Er ist krank, ohne es zu wissen, he is sick, without knowing it. Er ist hier gewesen, ohne uns zu besuchen, he has been here without visiting us. The infinitive is also often used where we employ the present participle preceded by from, as:—Er verhindert mich, zu schlafen, he prevents me from sleeping.

3. The infinitive is also used substantively [without zu: § 146. (1) a], as:—Besehen ist leicht, Befolgen schwer, to command is easy; to obey, difficult. It is often preceded by the article, as:—Ich liebe das Schreiben, aber nicht das Zeichnen, I like writing, but not drawing.

4. After gehen, stehen [§ 146. (1) e], etc., the infinitive often answers to our present participle, as:—Er blieb sitzen, he remained sitting (literally, he continued to sit). Er bleibt stehen, he remains standing. Er ist fischen gegangen, he has gone a fishing. In a sentence which is employed as the subject of a verb, the infinitive frequently rejects the preposition zu (§ 146.), as:—Den Feind vertheidigen ist edel, or, den Feind zu vertheidigen ist edel, to defend an (the) enemy is noble. Zu is generally omitted before such verbs as lehren, to teach; lernen [§ 146. (1) c], to learn, etc., as:—Ich lehre ihn schreiben, I teach him to write. Er lernt sprechen, he learns to speak.

5. The past participle in German is sometimes used where we use the present, as:—Dort kommt ein Mann in voller Hast gelaufen [§ 149. (3)], yonder comes a man running at full speed (in full haste).

VOCABULARY.

Anstatt, instead of.	Gütig, kind, good.	Stelle, f. place.
Bemühen, to use, make use of.	Hassen, to hate.	Unansehen, dis-
Bett, n. bed.	Heulen, to howl.	approve of.
Beugen, to depress.	Höflich, polite, courteous.	Verwahren, to defend.
Brav, brave, gallant.	Kanone, f. cannon.	Vertreten, to take the place of.
Dagegen, on the contrary.	Kiste, f. chest.	Verlehen, lost.
Denken, to think.	Malen, to paint.	Verweilungsvoll, full of despair.
Desto. (Sect. XXX. 6.)	Mannschaft, f. crew, forces.	Verzichten, to prefer.
Entehren, to dishonour.	Nahrung, f. nourishment, food.	Welle, f. wave.
Erhöhen, to heighten.	Polen, n. Poland.	Widerstehen, to resist, withstand.
Geliegenheit, f. occasion, way.	Schlaglicht, n. war-song.	Wild, wild.
Gerecht, just.	Schredlich, frightful, terrific	Wurzel, f. root.
Glück, f. bell.	Singen, t. sing.	Ziehen, to draw.
		Zusammen, together.

RÉSUMÉ OF EXAMPLES.

Das Schreiben und Lesen ziehe ich allen andern Beschäftigungen vor.	I prefer writing and reading to all other employments.
Anstatt des Weines trinkt er Wasser.	Instead of wine, he drinks water.
Anstatt zu schreiben, liest er.	Instead of writing, he reads.
Er spricht, ohne zu denken.	He speaks without thinking.
Zwischen Sagen und Thun ist ein großer Unterschied.	Between saying and doing there is a great difference.
Zwischen dem Hin'gehen und Wie'erkommen verfloß' eine Stunde.	Between departing and returning an hour elapsed.
Während seiner Krankheit habe ich die Stelle eines Wächters vertreten.	During his sickness I took the place of a watcher.
Seine Weise zu handeln gefallt' mir nicht.	His mode of dealing does not please me.
Schweigen ist vernünftiger, als unvernünftig reden.	To be silent is more reasonable than unreasonable speaking (to speak unreasonably).

EXERCISE 78.

1. Anstatt mit einem Stöcke vertheidigte er sich mit einem Regenschirme. 2. Anstatt mit Fremden zu gehen, war er immer in Gesellschaft fremder Leute. 3. In der Stube hatte man, anstatt des Bettes, eine große Kiste. 4. In Deutschland ist man gegen Fremde sehr höflich. 5. Die Wurzeln des Baumes waren seine einzige Nahrung. 6. Das Wasser hat bei dieser Gelegenheit die Stelle des Weines vertreten. 7. Ein Schüler hat die Stelle des Lehrers vertreten. 8. Anstatt der Bieren genüßt man Meisbiste. 9. Das Reiten macht mir sehr viel Vergnügen. 10. Meine Kinder haben das Schreiben und Lesen von mir gelernt. 11. Wir wollen gehen; dies lange Warten ist mir unangenehm. 12. Man zieht gewöhnlich das Eigen dem Stehen vor. 13. Er hat das Arbeiten in seiner Jugend gelernt. 14. Wir haben zusammen das Schreiben gelernt. 15. Ich hasse das Schreiben, dagegen liebe ich desto mehr des Malen. 16. Er versteht das Zeichnen besser, als das Malen. 17. Wir hörten das Stürmen der Glocken und das Donnern der Kanonen. 18. Das Heulen des Sturmes und das wilde Toben der Wellen erhöhte noch den Muth des tapfern Kapitäns und seiner Mannschaft, anstatt ihn zu beugen. 19. Gott mehr gütig als gerecht denken, ist eben so viel, als Gott entehren (Gelfert). 20. Dies nicht zu entschuldigende Betragen des Schülers kränkte den Lehrer.

EXERCISE 79.

1. The never-to-be-penetrated almightiness of God. 2. I am here instead of my brother. 3. The opposition of the Poles was full of despair; terrific was the singing of their war-song: "Not yet is Poland lost." 4. The reading of instructive books enlarges the understanding. 5. To assist the poor is a Christian duty. 6. The changing of times and seasons and the removing and setting up of kings belong to Providence alone. 7. He defends this man without knowing him. 8. The danger heightened the courage of the soldiers, instead of depressing it. 9. The student learns drawing and painting from his brother. 10. This mode of life does not agree with me.

SECTION XLII.—SUBJUNCTIVE MOOD.

The subjunctive mood is employed both in indirect assertions and in indirect questions after verbs of speaking, thinking, wishing, hoping, etc., i.e., after all verbs of mental action, when the actual words of him who spoke, thought, etc., are not quoted, as:—Er sagte sein Freund sei krank, he said his friend was ill (he actually said, my friend is ill). Er fragte mich, wer ich sei, he asked me who I was (he asked, who are you?). Man sagt, daß er ein großes Vermögen habe, it is said that he has a great fortune. For further information on the subjunctive, see § 143; and for conjugation of haben and sein in the subjunctive, see § 72. 1. 2.

The subjunctive in German is often translated by the English indicative, as in the following examples:—

Man sagt, er sei reich.	They say he is very rich.
Er meint, es sei besser, hier zu bleiben.	He thinks it is better to stay here.
Sie sagten mir, er wäre mein Freund.	You told me he was my friend.
Ich meinte, es wäre ein Spaß.	I thought it was a jest.
Man glaubte, er wäre auf dem Berge.	It was thought he was on the mountain.
Er sagt, der Kaiser habe ihn begnadigt.	He says the emperor has pardoned him.

Man glaubt, er sei gefallen. It is thought he has fallen.
 Sie glaubten, ich sei krank gewesen. They thought I had been sick.
 Man glaubte, ich wäre nie da gewesen. It was thought I had never been there.
 Er glaubt, er werde nie wieder glücklich werden. He believes he shall never be happy again.
 Man sagt, sie werde bald die Oberhand haben. It is said she will soon have the ascendancy.

VOCABULARY.

Allgemein', universal, universality.	Fallen, to fall.	Rufen, to call.
Barbarisch, barbarously.	Geschicht'e, f. history.	Tot, n. death.
Beschaup'ten, to assert, allege.	Grenze, f. frontier.	Uebersteh'ten, to cross, pass over.
Dreißigjäh'rig, of thirty years.	Herbeiföhren, to produce, bring on.	Ungarn, n. Hungary.
Ein'gernt, mindful.	Langsam, slow, slowly.	Vorföhrt'en, to act, proceed.
Er'bern, to conquer.	Melden, to announce, state.	Verst'el'ung, f. dissimulation.
Erzäh'len, to tell, narrate.	Nerven'fieber, n. nervous fever.	Verwant't, related.
	Ober, upper.	Wahr, indeed, it is true.
	Rom, n. Rome.	

RÉSUMÉ OF EXAMPLES.

Er behaupt'et, daß es war sei. He asserts that it is true.
 Ich will, daß Du sparsamer seiest. I will that thou be more frugal.
 Es scheint mir, daß er traurig ist. It appears to me that he is sorrowful.
 Man glaubt, daß wir reich seien. It is supposed that we are rich.
 Obgleich' ich seitdem seit, so seid ihr doch willkommen. Although you are strangers you are nevertheless welcome.
 Es scheint mir, daß sie Amerikan'er sind. It appears to me that they are Americans.
 Es sieht aus, als ob er nicht gesund' wäre. He appears as though he were not healthy.
 Ich glaube, daß er krank gewesen ist. I think that he has been sick.
 Man sagt, daß er schon hier gewesen sei. They say that he has already been here.
 Ich hoffe, daß du glücklich gewesen sein wirst. I hope that you will have been fortunate.
 Er sagte mir, daß du das Buch des Lehrers habest. He told me you had the teacher's book.
 Ich beweise, daß der Jäger die Kinte hat. I doubt that the hunter has the gun.
 Man vermutet, daß ihr viel Geld habt. It is supposed that you have much money.
 Man weiß, daß sie Freude an dieser Sache haben. It is known that they have pleasure in this affair.
 Ich hörte, daß er ein großes Vermögen hätte. I heard that he had a large fortune.
 Der Onkel erzähl'te, daß er eine angenehme Reise gehabt' habe. The uncle said (narrated) he had had a pleasant journey.

EXERCISE 80.

1. Haben Sie auch gehört, ich sei vom Berge gefallen? 2. Nein, ich hörte, Sie seien aus dem Wagen gefallen. 3. Die Geschichte meldet, daß Tilly, welcher Magdeburg im dreißigjährigen Kriege eroberte, sehr barbarisch verfahren sei. 4. Mein Bruder sagte, Sie seien sehr gelebt worden. 5. Die Franzosen behaupten, sie seien die Gelehrtesten in der Welt. 6. Ihre Schwester glaubte, Sie wären in der Stadt gewesen. 7. Die Engländer sind der Meinung, sie seien die Herren des Meeres. 8. Dieser Reisende erzählte, er sei zweimal in Rom gewesen. 9. Er hofft, er werde in acht Tagen in Dresden sein. 10. Sie fürchten, Sie seien zu langsam im Handeln gewesen. 11. Wir glaubten, Sie wären auf dem Rande. 12. Ich glaube, wir wären gestern zu Euch gekommen, wenn das Wetter schöner gewesen wäre. 13. Ich glaube, er wäre der warmsten Stimme seiner Eltern eingetretet gewesen. 14. Er sagte zwar, er sei krank, aber viele behaupten, es sei Verstellung von ihm gewesen. 15. Seine Verwandten sagen, sein Glück habe sein Unglück herbeigeführt. 16. Ich hörte mit Bedauern, Sie hätten das Nervenfieber gehabt. 17. Da ich in dem ebenen Zimmer war, hörte ich Sie nicht rufen. 18. Man erzählt, der Ungar habe bis in den Tod sein Vaterland treu vertheidigt. 19. Ich hörte, dieser junge Franzose werde ein großes Vermögen erben. 20. Ich glaube, daß viele Menschen hier auf Erden ihr Gutes gehabt haben werden.

EXERCISE 81.

1. People say these gentlemen have been tippy, but they are mistaken. 2. They say that residence in Paris is more agreeable than in London. 3. We could not believe that this was true. 4. It is universally believed that the enemy has crossed

the frontier. 5. He asserted that it was better to stay at home than to go out. 6. I wish that he may be treated with more kindness. 7. He tells every one that you are a very rich man; but if you were, you would not be so penurious. 8. Have you heard, too, that your friend has fallen from his horse? 9. No, but I have heard that he has fallen out of the coach. 10. I hope that you will be with your parents in a fortnight. 11. I doubt that he can be so ungrateful. 12. This stranger says that he has been twice to India, and was very sick on his last voyage.

LESSONS IN GEOMETRY.—XII.

As the next lesson will put the learner in possession of the last of the problems that we intend to give on the construction of figures contained by three and four straight lines—namely, the triangle, the square, the rectangle, and the parallelogram—we would recommend him to go carefully over the whole of the present series of problems from the commencement, constructing as many figures as he possibly can, to meet the requirements of the data in each case. And in doing this we advise him to try to construct figures different in form to those which we have given in these pages, as, if he can do this, he may be sure that he has gained a thorough knowledge of the various methods of construction set forth in the different problems.

The problem in practical geometry that was brought before the notice of the student in the last lesson, showing him how to construct a square that shall be equal in superficial area to the sum of two squares described on two given straight lines, has given him the key to the construction of squares, rectangles, and parallelograms, equal in superficial area to the sum or difference of any two or more squares, rectangles, or parallelograms, as the case may be; and it has also shown him that the main principle on which their construction depends, is the relation between the triangle, the figure contained by the least possible number of straight lines (since two straight lines cannot enclose a space, although one curved line can, as in the case of the circle), and all regular figures contained by straight lines—namely, the square, the rectangle, and the parallelogram. It may be as well to repeat that this principle is, that when a square, rectangle, or parallelogram is upon the same base and between the same parallels, the area of the square, rectangle, or parallelogram (as the case may be), is double the area of the triangle.

Now supposing we have a square, rectangle, or parallelogram before us, and we wish to construct a triangle equal in area to either of these figures, what have we to do? Manifestly nothing more than to draw one of the diagonals of the figure in question, produce the base indefinitely in the necessary direction, and, after setting off on it a straight line equal in length to the side of the square, rectangle, or parallelogram, that serves as its base, to join the extremity of the line thus set off with the upper end of the diagonal. This will be evident on an inspection of Fig. 42, where, in the square (rectangle or parallelogram) $ABCD$, the diagonal AC is drawn; the base CD , on which the square (rectangle or parallelogram) $ABCD$ stands, is produced indefinitely in the direction of F ; a straight line, DE , set off along it from the point D , equal to DC ; and the straight line EA drawn, joining the points E and A , and completing the triangle AEC , which is equal in superficial area to the square (rectangle or parallelogram) $ABCD$.

And, conversely, when we wish to draw a rectangle or parallelogram equal to a given triangle, all we have to do is to bisect the base of the triangle, and on either half of the base construct the required rectangle or parallelogram, after drawing through the apex of the triangle a straight line parallel to the base. In the case of the rectangle, after bisecting the base of the triangle—as, for example, in Fig. 43, where the base of the triangle ABC is bisected in D —and drawing a straight line, PQ , of indefinite length, through the apex A of the triangle ABC parallel to its base BC , a rectangle equal in superficial area to the triangle ABC is formed by drawing the straight lines CE , DF through the extremities C and D of CD , one-half of the base BC , perpendicular to BC , and meeting PQ in E and F ; or by drawing the perpendiculars DE , BF , through the extremities D and B of BD , the other half of the base meeting PQ in F and G .

In the case of the parallelogram, if it be required to make two of its opposite sides equal to a given straight line, as the straight line x in Fig. 43, or two of its opposite angles equal to a given angle, as the angle y , we must from the extremity of one-half

of the base of the triangle—say, for example, the extremity D of the half CD of the base—with a radius equal to x, describe an arc cutting PQ in H; join DH, and through C draw CK parallel to DH, and meeting P Q in K, thus completing the parallelogram HDCK; or, at the point C in the straight line DC we must

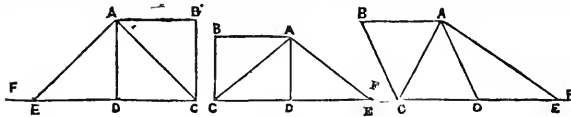


Fig. 42.

make the angle DCK equal to the given angle Y, and through D draw DH parallel to CK in order to complete the parallelogram as before.

This process will only be found practicable for the construction of a square equal in area to a triangle when the triangle is a right-angled isosceles triangle; but for any other description of triangle it will be found necessary first to construct a rectangle equal in superficial area to the given triangle, and then to draw a square equal to the rectangle thus obtained. How to do this will be shown presently in Problem XXXI.

By Problem XXX. we are enabled to construct a square equal in area to any number of given squares. Thus, suppose we wish to construct a square equal in superficial extent to the five squares of which the length of the sides of each is represented by the straight lines A, B, C, D, E respectively (Fig. 44). Draw any straight line, FG, equal to A, and at its extremity, G, draw GH at right angles to it equal to B. Join FH: the square described on FH is by Problem XXX. equal to the squares described on FG and GH. Next draw HK equal in length to the given line C, at right angles to HF. Join KF. The square described on FK is equal to the squares described on KH, HF, or to the squares described on FH, HG, GF, since the square described on HF is equal to the squares described on HG, GF. By continuing this process we at last obtain the straight line MF. The square described on this line is equal to the sum of the squares described on the given straight lines, A, B, C, D, E. Now let us see how far this is of practical value to the artisan. Let us suppose that a cabinet-maker has a number of small squares of veneering of several kinds of choice wood, each square being of a different size, and he wishes to use up this wood in veneering a table or the panel of a cabinet without wasting a single scrap of it. By following the process just described it is manifest that he possesses the means of readily ascertaining the exact area of the square that these pieces will cover, and after finding this, he can, if it be desirable, by Problem XXXI. draw a rectangle equal in area to the square if he prefer this form for using up his squares of veneering, and then arrange his pattern

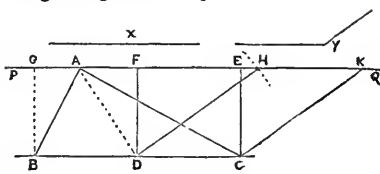


Fig. 43.

in such a manner that his squares may be worked up without waste. It is also a process that is useful to the maker of floors in parquetry, or to a stonemason who wishes to know how large a square he can pave with a number of smaller squares of stone or slate of different sizes. Of course in such cases the operator would work to a given scale, and the process might be used as a test of the correctness of the result of the operation by which the whole content of the squares may be found arithmetically, or as one which is far more certain and involves far less trouble than the arithmetical operation, which would be a long and tedious one.

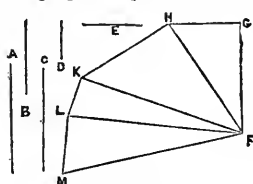


Fig. 44.

might be used as a test of the correctness of the result of the operation by which the whole content of the squares may be found arithmetically, or as one which is far more certain and involves far less trouble than the arithmetical operation, which would be a long and tedious one.

PROBLEM XXXI.—To draw a square that shall be equal in superficial area to a given rectangle.

Let ABCD (Fig. 45) be the given rectangle; it is required to draw a square equal in superficial area to the rectangle ABCD. Produce CD indefinitely in the direction of E,

and on the straight line DE set off DF equal to the side DA, or BC of the rectangle ABCD. Bisect CF in G, and from G as centre with the radius GC or GF describe the semicircle CHF. Produce DA until it meets the arc CHF in K. Then along the straight line DC set off DL equal to DK, and through the points K, L, draw the straight lines KM, LM parallel to CF, DK respectively, and meeting in the point M. The figure DLMK is a square, and it is equal in area to the given rectangle ABCD. If FNO L had been the given rectangle, the same process would have been followed. FL would have been produced in the direction of L, and LC set off on it equal to the side LO of the rectangle LONF; CF bisected in G; the semicircle CHF described as before, and LO produced to meet the circumference CHF in P. The square drawn on LP is equal in area to the rectangle FLO N.

If it be required to draw a square equal in area to a given parallelogram, we have only to construct a rectangle equal to the given parallelogram, and proceed as above. This will be seen from Fig. 45, in which the rectangle ABCD is equal to the parallelogram DCQR.

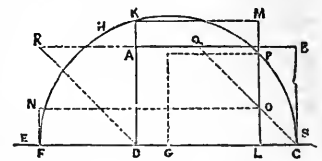


Fig. 45.

PROBLEM XXXII.—To draw a rectangle that shall be equal to a given square, and have one of its sides equal to a given straight line.

Let ABCD (Fig. 46) be the given square, and x the given side of the required rectangle, and in this case let x represent the shorter of the two pairs of sides by which the rectangle is enclosed. First produce CD indefinitely both ways towards E and F, and along CE set off CG equal to x, and also along CB set off CH equal to x. Join BG, bisect it in K, and through K draw KL perpendicular to BG, meeting EF in L. Then from the point L as centre, with the radius LG, describe the semicircle GBM. Through the point M draw MN parallel to AD or CB, and through H draw HN parallel to AB or EF, and let the lines HN, MN meet in N. The rectangle CHNM is equal in area to the square ABCD.

When the longer of the two pairs of sides that enclose the rectangle is given, as y in Fig. 46, produce CD indefinitely both ways as before, and set off CM along CF equal to y. Join BM, bisect BM in O, and through the point O draw OL at right angles to BM, meeting EF in L. Then from L as centre, with the distance LM, describe the semicircle MBG. Set off along CB the straight line CH equal to CG, and complete the rectangle CHNM by drawing HN, MN through the points H and M parallel to CM and CH respectively.

The learner must remember that the side of a square is a mean proportional between the sides of any rectangle that is equal to it in superficial area; and, therefore, that to find the length of the side of a square equal to a given rectangle, we must set off on the same straight line, but in opposite directions, two lines equal in length to the sides of the given

rectangle, bisect the line thus obtained, describe a semicircle on it, and find the mean proportional to the two lines of which it is composed, by drawing a perpendicular from their point of junction to meet the semicircle, as in Problem XIII. (page 192); while, to find the lengths of the sides of a rectangle that shall be equal to a given square, we must draw a straight line at right angles to a line equal in length to the side of the square, and from a point in this line on either side of the line that represents the side of the given square, draw a semicircle with a radius equal to the straight line joining the point that is used as the centre of the semicircle and the more remote extremity of the line that represents the length of the side of the given square. The lines intercepted between the other extremity of this line and the extremities of the arc of the semicircle will be equal in length to the sides of a rectangle, having a superficial area equal to that of the given square.

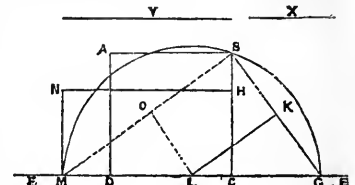


Fig. 46.

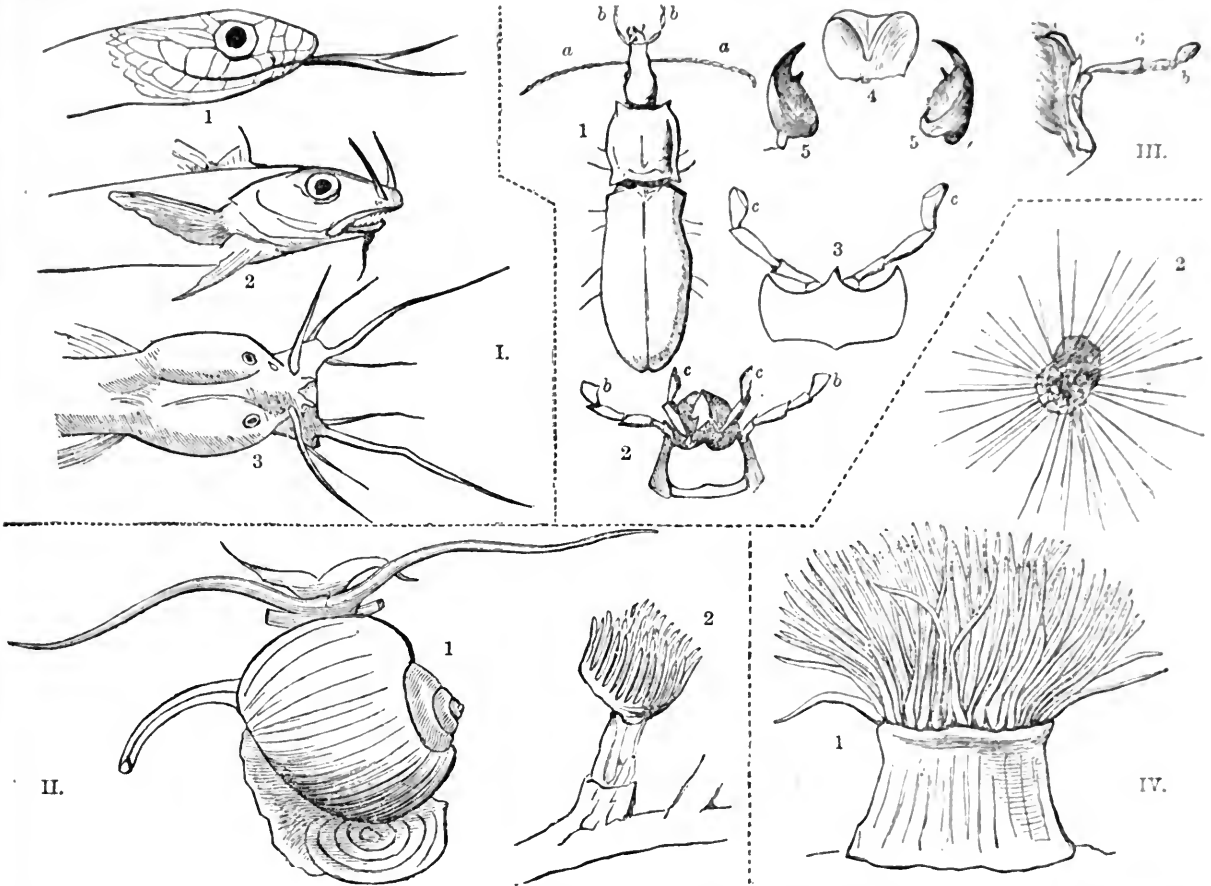
ANIMAL PHYSIOLOGY.—XII.

THE ORGAN OF TOUCH (concluded).

It has been shown in the previous lesson that the sense of touch, in its wider sense, is of a highly intellectual character. As an informant of the mind it is second only to the sense of sight, and in the suggestion of abstract ideas it is, perhaps, superior even to vision itself. There is no fundamental conception in relation to matter which it cannot impart. Though devoid of every other sense, a man possessed of this can pursue the study of every science, if he will but surmount the diffi-

managed that the eye is completely imposed upon, and it is almost impossible to believe that the surface is flat. A rapid sweep of the hand, however, at once dispels the illusion; and so effectually that when you move back to gaze again, it is difficult to regain the impression of an embossed surface. The unbelieving Thomas, however reprehensible his scepticism might be, expressed it both with force and delicacy; for he at once recognised that his own sense of sight might be deceived, and expressed a doubt, not of the truthfulness of the other disciples, but of their correctness of vision.

That this sense, when combined with the muscular sense, is



I. ORGANS OF TOUCH OF VERTEBRATA:—1, HEAD OF A SNAKE; 2, HEAD OF AN OSSEOUS FISH—MOTELLA; 3, HEAD OF A FISH—GYMNOLABES, SHOWING THE TENTACLES. II. ORGANS OF TOUCH OF MOLLUSCA:—1, AMPULARIA (APPLE-SNAIL), SHOWING TENTACLES; 2, PLUMATELLA REPENS, SHOWING THE TENTACLES. III. ORGANS OF TOUCH OF ARTICULATA:—1, CARABUS VIOLACEUS (THE VIOLET CARNIVOROUS BEETLE)—(a) ANTENNÆ, (b) MAXILLARY PALPI; 2, ENLARGED VIEW OF UNDER PART OF HEAD, (c) LABI PALPI; 3, ENLARGED VIEW OF LABI PALPI; 4, LABRUM, OR UPPER LIP; 5, MANDIBLES, UPPER OR BITING JAW; 6, MAXILLA, WITH ITS PALPI OR LEFT LOWER JAW WITH ITS FEELER. IV. ORGANS OF TOUCH OF CELERENTATA AND PROTOZOA:—1, ANTHEA (SEA-ANEMONE), SHOWING TENTACLES; 2, ACTINOPHYRS, SHOWING THE PSEUDOPODIA.

culties which oppose themselves to his acquisition of the results of the experience of other men. Thus, blind men have taken to the study of mathematics, and by the aid of the figures of Euclid, conic sections, etc., given in relief, have acquired a knowledge which has placed them in an honourable position in the examinations at Cambridge. The very theory of light and all its laws are quite comprehended by such blind students. The sense of touch is absolutely bounded by the surface of the body, but it makes amends for being less far-reaching than other senses by being the most real of all the senses. We make our ultimate appeal to it when the eye gives false or confusing indications. In the King's Palace at Amsterdam there is a wainscot painted to express figures as if they projected from, and were carved, upon its surface. The shading is so well

of a highly intellectual character, does not at all contradict the statement that it is also the simplest and most rudimentary of the senses. That it is simple and rudimentary agrees well with the fact that satisfactory evidence may be found of its existence in most animals. The possession of this sense reaches far lower down in the animal scale than that of the other special senses. Definite organs of touch are well developed in animals in which no other organs of sense are found: and the power of extemporising feelers, or prolongations of the body into fingers or filaments, is a character of the very lowest animals with which we are acquainted. Reflection would tell us that this surface sense is almost essential to animal life. How necessary must it be for every animal that moves or feeds to know the exact limits of its body—the confines of the domain over which

it has control; what is part of itself, and therefore has to be nourished, cherished, and defended—what is foreign, and therefore may be got or avoided, as it is wholesome or noxious. Indeed, the sense seems indispensable to all animals that are not plunged and fixed, through every stage of their life, in the midst of a medium which is both air and food to them—to all animals, it might be said, if it were not tautological, whose life is not purely vegetable.

In the higher animals, and in all those whose means of defence lie more in their active powers than in defensive armour, the sense of touch is distributed over the surface of the skin, as in man. Every such animal may be compared to an island. The boundary of its body is the coast-line. Along the whole of this are placed, at various intervals, places of out-look, just as our own tight little island has been surrounded with Martello towers. These stations are few and far between where the coast is rocky, abrupt, and inaccessible, but nearer together at those parts where a descent could be easily made, and crowded together at the outlets of ports, creeks, and river-mouths, through which an active commerce is carried on. The comparison of the extremities of the tactile nerves to Martello towers is the more appropriate, because these have ceased to be of any use in defence, and have become stations of out-look for the coast-guard. So the tactile nerves are, *in themselves*, no protection, but rather, being delicate organs, they need protection; for they act as alarmists, awakening and calling up the active powers to fight in defence of the common country. These two functions of the skin—namely, that of passive defence and active alarm—are complementary to one another: where one is very efficient, the other is less needed. In the scaled and mailed fishes, and in such forms as the tortoise among reptiles, and the armadillo among animals, the function of sensation is sacrificed to that of defence; but in the naked skinned animals the sense of touch had need be very acute. In comparing man with the lower animals of that class to which he belongs, we find that his sense of touch is, perhaps, better developed than that of any other animal. The lower animals have to sacrifice a certain amount of their surface sensibility to the paramount necessity of being shielded from the cold; or, to put it more truthfully, to the retention of their animal heat. Man has neither the continuous thick coating of hair of the ox, the thick skin of the rhinoceros, nor the dense accumulation of fat below it which is found in the pig and in the whale. He is only cosmopolitan because his superior intellect enables him to clothe and house himself. His nearest relatives among beasts, though much better supplied with hair than himself, are confined to the tropics. Man makes himself at home everywhere, but only by becoming a "clothes philosopher." His triple investment of ordinary, nether, and over clothing, prove him to be an exotic species. He supplements by art the line of defence at those points where nature has left him exposed. The main use of the coating of hair is, no doubt, to defend the brute from the winter's cold, but that which will keep in the heat will keep it out, so that it may also be considered as a defence against the excessive heat of the sun also. Doubtless the universal presence of hair on the heads of both sexes of the human species indicates that in his native home man had more to fear from sun-stroke than from the cold of winter. Besides this, the hair is sometimes a real defence against the rough usage of the outer world. Thus the manes of the lion and the buffalo are real shields both against trenchant blows and the worrying of the teeth of hostile animals. Even the matted hair of the negro is said to be able to resist a tolerably forcible sabre cut. The principal use, however, is, doubtless, to defend from cold; and it is remarkable how this main object is arrived at without *much* prejudice to the function of touch.

Few solid substances are lighter than hair, even when pressed close; and few substances are worse conductors of heat—so that brutes retain their heat by the aid of a substance which costs them but little in the way of carriage. Beyond this, the springy, stiff, yet soft texture of hair, makes it always permeable to the air; and air, when *motionless*, is a bad conductor of heat, and adds, absolutely, to weight. Hence on the coldest day, when the thermometer stands below zero, the beast is still surrounded with a layer of warm air, almost equal in temperature to its body. So much to prove its efficiency for its main purpose. Now we have to show how it leaves the sense of touch, if not unimpaired, at least not obliterated. The reader must refer back to the

illustration in Lesson XI. (page 353) to understand the structure and relation of each hair to the skin in which it is developed and fixed. The hair is essentially a tubular projection of the cuticle, firmer and denser in its composition, being made up of closely-pressed, elongated, spindle-shaped cells, instead of scale-like, easily-detached ones. It is not, however, produced from the level of the surface of the body, but from a bag or follicle, which is always narrow, and more or less deep as the hair is long or short. This horny tube dilates at the bottom of its bag to enclose a vascular papilla, similar in every respect to those papillæ which lie immediately under the surface of the superficial cuticle. The hair itself, like the rest of the cuticle, is without sensation, as indeed it must be for the comfort of the animal; but the papilla has not only blood-vessels but nerves, and is very sensitive, so that the hair cannot be pulled or moved in any direction without affecting the sensitive part. Though a furred animal cannot precisely tell the exact point at which it is touched, on account of the length and flexibility of its individual hairs, yet the sensation of touch is as truly conveyed to the true skin, as it is when the pressed ridges of the forefinger of man cause feeling to be excited in the papillæ beneath them. In one respect hairs are even advantageous to the sense of touch, inasmuch as they reach considerably beyond the surface, and thus the range of the sense is extended. This advantage is so far recognised by nature that certain hairs are specially developed which have no other use than that of touch. These may fairly be described as tactile organs. These hairs are usually, and almost exclusively, situated in the upper lip, projecting from the most prominent part of the muzzle. In quadrupeds the snout is of course the most salient part of the body, and is most used in investigation. These whiskers, as they are called (though they would be better named moustaches), are remarkable for their length and stiffness, the depth to which their large bulbs run into the skin, and even protrude in the internal surface, and also for the large nerves that enter the papillæ of the bulbs. Those coming from the whiskers of a seal as they run together look like the strands of small cords as they become woven into a rope of tolerable thickness. The animals in which these whiskers are most developed are the carnivora and the rodentia. This is not improbably associated with the fact that these are for the most part nocturnal animals. Moreover, many of the rodentia inhabit holes in the ground, trees, etc.; and many of the smaller carnivora are always poking about in holes and crannies for prey. It certainly would be an advantage to a fox on a dark night to be able to gauge with his whiskers the size of the aperture in a hen-roost before he tried to force his way through it; and thus it has been thought that there is a relation between the width of the body and the extreme extent of the whiskers.

In birds the place of hairs is supplied by feathers. The structure of these is very wonderful and beautiful, but a description of it would be out of place here, because they are certainly less efficient tactile organs than hairs. Birds' feathers are coarser than hairs; they are less flexible; they are inserted only on certain parts of the body; and since there must be provision made for moulting, they are more definitely cut off from the sensitive skin below. For all these reasons they are not good organs for transmitting the sense of touch, although they are formed in the same manner as hairs. Probably on account of this inaptitude to transmit impressions, they are sometimes replaced by hairs in certain parts of the body; but as a rule the whole of the bird's body is encircled with feathers, which lie overlapping one another, and turned in one direction towards the tail of the bird, in the same manner as tiles on a house-roof. A bird's jaws, instead of being covered with soft, flexible and sensitive lips, are covered with a hard, horny bill, and its legs, though often devoid of feathers, have to be defended by scales or scutes, to prevent the long tendons of their leg muscles being severed. Under these circumstances, a bird enjoys little advantage from its sense of touch. Indeed, it is only in the padded under-surface of the foot and toes, and sometimes in the beak and tongue—when the former is leathery, and the latter not capped with horn—where there can be any provision for the exposure of a sensitive surface. It has sometimes been stated that the heron, as he stands in shallow, muddy water, is guided by feeling the eels twisting in and out, or even sucking his toes. This statement seems rather suited for a fable of the biter bitten than to be regarded as a scientific fact. That the sense is pre-

sent in some birds is shown by the fondness of parrots for tickling; but it may be stated that the great activity of birds makes them rely on their far-ranging senses rather than on the circumscribed indications of the sense of touch.

The cold-blooded animals (reptiles and fish) differ from the warm-blooded (mammals and birds), in having for the covering of their bodies no non-conducting or heat-retaining substances. Hairs and feathers are admirable retainers of heat; but scales and scutes, though good to resist blows and pressure, allow heat to pass out or in without much resistance. This, of course, is associated with the fact that reptiles and fish have but little heat to lose. It does not follow, however, that because the body of a fish or lizard is entirely defended by scales, whose free edges overlap the insertions of those next behind them in a manner which is called "imbricated," that therefore they are entirely without the sense of touch. The scales are developed much as the human nails are, and we know that these are themselves insensible; yet they are so intimately connected with the sensitive parts by which they are formed, that the nails are the conductors of acute, and even morbid sensation. The *quick* of the nail is proverbially sensitive to pain; witness the common phrase of being wounded, or cut to the quick. Reptiles, however, slough at certain seasons, and the old skin, dis severed from the cutis, adheres to them for some time—in fact, until a new and complete armour is formed below. During such periods, and inferentially at all times, the sense of touch cannot be acute. Scaled reptiles may be alive to blows or pressure, but hardly to those sensations of soft touch which convey the most distinct impressions of all to us. These remarks apply with yet more force to the hard, stony, surface of the backs of crocodiles. The under side of the body of crocodiles is leathery rather than stony, and has fewer stony masses on its surface, and this is therefore sensitive. Sir Emerson Tennent gives an amusing account of a cayman, which he surprised before it could make its retreat. The Ceylon crocodile threw itself on its side, and feigned death; but when it was tickled under its arm it found the process too much for its gravity, and finally got up and hobbled away. As we before remarked in the article on taste, the tongue is made use of by serpents and lizards to touch objects with; and this is probably its main, if not its only use. In conformity with the assertion that nocturnal animals often have specially modified organs of touch, we find that certain nocturnal tree-snakes have their snouts prolonged into tactile organs.

The large majority of fish are completely closed in by plates and scales. With few exceptions even the lips are hard and dry, so that they need to have some special organs of touch. Sometimes certain rays of the fins are detached from the oar-like parts, and become long styliform organs of touch. When this is the case, they are clothed with soft parts, which are well supplied with nerves. Thus, in the gurnet three soft rays are told off from the front of the pectoral fin, to form feeling fingers. It is curious that in a creature so far removed from man we have the same parts modified to the same use, though in almost all the intermediate animals this part has a different function. In the angler two rays detached from the back fin, and situated on the top of the head, have this function, but the use to which he puts these feelers is remarkable. One of the feelers has at its end a flattened, shining, and flexible adjunct, and this is used as a bait, just as a silver strip is used by the troller. The angler is rapacious, but sluggish; he therefore lies on the bottom, with his huge, ugly mouth wide open, and stirs up the mud with his fins to conceal himself, while he drops his sensitive bait before his mouth and keeps twitching it about, until he feels some hapless fish begin to nibble, when he makes a forward rush and closes his mouth upon him. The whole of each of the four limbs of the lepto-siren are converted into organs of touch. For the most part, however, the limbs of fish which correspond to our legs and arms are entirely devoted to locomotion, while quite new structures are developed for them to feel with. These special tactile organs are called barbules. They are placed on the head, and generally at the fore part of the jaws. When on or under the lower jaw they may be single; but they are more often, and when on the upper jaw always, in pairs. Two instances are given in the illustration: the one shows how they occur in an eel-like fish, and the other in an ordinary-limbed fish. The single medial barbule under the jaw of the cod is a familiar example. It is supposed that a cod

which was blind when caught had obtained its food so well by the aid of this that it was quite in good condition. Barbules are well adapted to the purpose of touch. If in any other way nerves were conveyed through the scaly covering and exposed, these delicate structures would be liable to be injured by the impact of hard external bodies, which would be crushed between them and the hard and underlying scales; but since the main nerve of these barbules accompanies a cartilaginous core, and since it springs from a single point to be spread upon a flexible pillar which hard bodies would drive before them, the chance of having the nerve crushed is much reduced. Barbules are for the most part found on the jaws of grovelling fishes like sturgeons and barbels, which feel along the bottom for all kinds of garbage which may have sunk there.

The mollusca have received their name from their general character of softness; *mollis* being the Latin adjective for soft. This name was given them by Cuvier to contrast them with the hard-coated insects and crustacea which belong to the sub-kingdom articulatæ. Hence in those species which are not provided with a shell, and in the exposed parts of those species which have this protection, there is a soft, sensitive skin. The skin, however, in this sub-kingdom has often superadded to the functions which it possesses in vertebrata the functions of respiration and of locomotion. Even those parts where the sense is more or less localised have so many other offices to which the sense is secondary or subservient, that it would lead us too far from our subject to describe them. It is true that the gastropoda have horns as special tactile organs; but we find in the cephalopods the sense of touch is intimately combined in the arms with the elaborate apparatus for grasping and holding their prey; and in the brachiopods the sense is united with the organs for breathing and keeping up currents in the water. We must, therefore, avoid going into details in reference to them. It may be stated generally, that the slower an animal moves, and the more fixed its station, the more will its sense of touch be developed in proportion to the other senses. Hence the sense of touch is well developed throughout this sub-kingdom. Soft bodies are ill-suited to energetic motion; but soft bodies are well adapted to receive tactile impressions. In those animals of this sub-kingdom which are wholly fixed, the organs of touch are multiplied; and in the lowest class of all there is a horse-shoe-shaped or circular series of tentacles round the mouth, which are extremely sensitive. This arrangement of feelers around the mouth is so general a character of fixed animals, that there is a striking similarity between the outward form of these lower molluscs and the fixed animals of the sub-kingdom coelenterata, although the essential organs are quite different.

The articulatæ (though some of them are soft-skinned) are for the most part covered with a hard, horny covering, which is as resisting as plate-armour. It is therefore necessary that these animals should have special organs of touch. We have already referred to those of the lobster and its tribe in a former number. Insects have, developed from their heads and mouth-organs, jointed rods, which have nerves of touch running to them and up into them. These jointed rods are covered with hard, horny matter, like the rest of the body; but sometimes the last joint exposes a naked membrane, and where this is not the case, the jointed and therefore flexible nature of the organs make them capable of receiving impressions of touch, and of measuring the dimensions and resistance offered by external objects. The normal number and position of these organs will be seen in the illustration. There are two long, many-jointed ones jutting from the head; these are called the antennæ. Another pair (or pairs) spring from the lower lateral jaws; they are called the maxillary palpi. Another pair (or pairs) spring from the sides of the lower lip; these are called the labi palpi. The soft-skinned spiders have no antennæ or labi palpi, but their maxillary palpi are so long and large as to look like legs.

The cœlinoderms, or sea-urchins, are so enclosed in their more or less spherical boxes of hard shell, that a casual observer would suppose them to be unfeeling wretches, capable of inflicting wounds with their long spines, but insensible to softer emotions. This is not the case, however, for they can protrude through the small holes which perforate the shell and occupy five double meridional bands of their globular boxes, a multitude of soft, tubular, sucking feet, to each of which there runs a nerve.

The sea-anemone, with its streaming feelers, lives by feeling; and the whole sub-kingdom to which it belongs is

characterised by animals with largely developed and multitudinous feelers.

Finally, those animals which we call protozoa, on account of the simple condition of their bodies, can manufacture, from their jelly-like substance, any number of long feelers. These they often render so branched and long as to give to the animals the name of "rhizopods," or "root-footed," because the feelers, which also perform the function of feet, look like the branching roots of a tree.

We have now set before our readers the principal facts connected with what are called in popular phraseology the "five senses;" and we have given, as far as the discoveries of physiological science extend in the present day, a description of the organs with which an all-wise and beneficent Creator has furnished his creatures, from the protozoa, the first link in the great chain of the animal kingdom, up to man, who stands but "a little lower than the angels," to enable them to see, hear, smell, taste, and touch—five great powers wonderfully contrived to administer to our pleasure and gratification, as well as to enable us to discharge the several functions that form the work which He has allotted to each on earth.

To enable the unscientific reader, and those even who can do little more than read, to follow us step by step, and appreciate and understand all that has been advanced, the description of each organ, its difference of formation in man and the lower animals, and the various purposes for which it serves, has been given in language which we have carefully sought to render as plain and clear, and as free from technical terms as possible. When, however, it has been found absolutely necessary to use technical names, which are applied by scientific men for the sake of brevity of expression, and a ready means of distinguishing one animal or organ from another, by reference to some peculiarity that it possesses, the explanation of these terms has been supplied directly or indirectly in the papers in which they occur. The illustrations, too, that accompany the description of each organ of sense, will be found as useful by our readers in enabling them to understand all that has been said of their formation, etc., as the map of a country, or the chart of a sea is to him who would become acquainted with the physical configuration of the former, or the heights and abysses that lie hid from view beneath the waters of the latter. It may be as well to remind our readers that, in order to arrive at a thorough comprehension of everything that is advanced in our lessons on Animal Physiology, they should be studied and mastered consecutively from the first to the last. Under the diagrams that accompany the lessons are given the technical names of the different parts of each organ under consideration.

In future lessons we shall enter on other branches of this great subject as interesting and important in every respect as that which has been treated in the present series.

LESSONS IN LATIN.—XIII.

DEGREES OF COMPARISON.

WHEN two objects are compared together, the ideas involved in the words *more* and *most* come into prominence. Thus we say, "the father is *more* learned than the son;" "Cicero was the *most* learned of the Romans." The question which we have to answer is, how are such forms of thought expressed in the Latin? Observe that at the bottom of *more learned* and *most learned* is the quality *learned*; for no one can be *more learned* or *most learned* without being *learned*. This ground quality is something positive, a real definite quality. Hence in grammar it is called the *positive degree*. It is the first step. A higher step is indicated by our word *more*; and the highest by *most*. You thus see that besides the positive there are two other degrees, of which the one is the higher, and the other the highest of the three. The higher is called the *comparative degree*, and the highest is called the *superlative degree*. Accordingly, there are three degrees of comparison, the *positive*, the *comparative*, the *superlative*. It has been denied that the positive is a degree of comparison. The term may not be rigidly correct, but it is in use, and no better substitute has been offered. Our business is not so much to criticise as to explain; and consequently only then must we enter into criticism when it smooths the way to explanation.

Now these three forms of speech which I have just given stand in Latin, thus:—

Positive	}	Pater est doctus
Comparative		Father is learned.
Superlative		Pater est doctior
		Father is more learned.
		Pater est doctissimus
		Father is most learned.

Look at the terminations of the adjective. In the first case it is *us*; that is the *positive*, or ordinary form of the adjective. In the second case, it is *ior*; that is the *comparative*. In the third case, it is *issimus*; that is the *superlative*. You thus see that what in the English is expressed by *more* is in Latin expressed by *ior*; and what in the English is expressed by *most* is in Latin expressed by *issimus*. Remember, then, *ior* is the form of comparison, *issimus* is the superlative form. You might thus obtain for yourself the rule, and say that to the stem of the positive add *ior*, and you have the *comparative*; and to the stem of the *positive* add *issimus*, and you have the *superlative*. Such in reality is the rule. These two endings, *ior* m. and f., *ius* n.; and *issimus*, a, *um*, are to be added to the stem of adjectives and participles, in order to convert the *positive* degree into the *comparative* and the *superlative*. I subjoin some instances:—

Positive.	Comparative.	Superlative.
Læt-us, joyful	læt-ior, more joyful	læt-issimus, most joyful.
Pudic-us, modest	pudic-ior, more modest	pudic-issimus, most modest.
Imbecill-us, weak	imbecill-ior, weaker	imbecill-issimus, weakest.
Lev-is, light	lev-ior, lighter	lev-issimus, lightest.
Fertil-is, fruitful	fertil-ior, more fruitful	fertil-issimus, most fruitful.
Dives	} divit-ior, richer	divit-issimus, richest.
Divit-is } rich		
Prudens	} prudent-ior, more prudent	prudent-issimus, most prudent.
Prudent-is } dent		
Amans	} amant-ior, more loving	amant-issimus, most loving.
Amant-is } loving		
Felix	} felic-ior, happier	felic-issimus, happiest.
Felic-is } happy		

If, however, the adjective ends in *er*, *rimus* is used instead of *issimus*, for the sake of sound, as:—

Miser, unhappy, miserable; miser-ior, more unhappy; miser-rimus, most unhappy; pulcher (pulchr-i), beautiful; pulchr-ior, more beautiful; pulcher-rimus, most beautiful.

In like manner, *vetus* (gen. *veter-is*), old; *veter-rimus*, oldest (the comparative *veter-ior* is rarely used); also *nuper-us*, late (no comparative); *nuper-rimus*, latest.

The six adjectives which follow take *limus* in the superlative, namely:—

Facil-is, easy.	[facult.]	Simil-is, like.	} Gracil-is, thin.
Difficil-is, not easy, dif-		Dissimil-is, unlike.	

In full, thus:—

Facil-is, easy; facil-ior, easier; facil-limus, easiest, etc.

There are some compound adjectives which form their comparatives and superlatives by endings different from these. Such adjectives are those which in the positive end in *dicus*, *ficus*, and *völus*; for instance, *maledicus*, *magnificus*, *benevölus*. I have called these compound adjectives, because they are composed each of two words. *Maledicus* is formed from *male*, badly (in an evil manner), and *dico*, I speak; and consequently denotes an *evil-speaker*; *magnificus* is formed from *magnus*, great, and *facio*, I do, and consequently denotes a *great doer*; *benevölus* is formed from *bene*, well, and *volo*, I wish, and consequently denotes a *well-wisher*. To form the comparative of these, add to the stem *entior*; and to form the superlative, add *entissimus*; thus:—

Positive.	Comparative.	Superlative.
Maledic-us, abusive	maledic-entior, more abusive	maledic-entissimus, most abusive.
Magnific-us, magnificent	magnific-entior, more magnificent	magnific-entissimus, most magnificent.
Benevöl-us, benevolent	benevöl-entior, more benevolent	benevöl-entissimus, most benevolent.*

* These comparatives and superlatives are evidently formed in the regular way, from such nouns as *maledicens*, *magnificens*, and *benevolens*, two of which, at least, are in use in the language, and have the same meaning as the other positives above given.

In Latin as well as in English, some adjectives depart from the usual modes of comparison. As we say, positive, *good*; comparative, *better*; superlative, *best*; so the Romans said, *bonus*, good; *melior*, better; *optimus*, best. Carefully learn by heart the following

IRREGULAR FORMS OF COMPARISON.

Positive.	Comparative.	Superlative.
<i>Bonus</i> , good	<i>melior</i> , better	<i>optimus</i> , best.
<i>Malus</i> , bad	<i>pejor</i> , worse	<i> pessimus</i> , worst.
<i>Magnus</i> , great	<i>major</i> , greater	<i>maximus</i> , greatest.
<i>Parvus</i> , little	<i>minor</i> , less	<i>minimus</i> , least.
	{ plus (n), more plures (m. and f.) (plura and plura (n))	{ plurimus, most. plurimi, very many.
<i>Multus</i> , much		

Many Latin adjectives do not take any of these forms of comparison. Such are adjectives which have *e* before the termination *us*; as *idone-us*, fit. These are formed by prefixing *magis*, more; and *maxime*, most; as, *magis idoneus*, more fit; *maxime idoneus*, most fit; so, *pious*, *pius*; *magis pius*, more pious; *maxime pius*, most pious. In the same way, form nearly all adjectives and participles ending in *icus*, *imus*, *inus*, *ivus*, *orus*, *undus*, *andus*, and *bundus*.

In the English meanings added to *facilis* above, I have given the forms *easy*, *easier*, *easiest*. Here you see changes made at the end of the positive, similar to those you have just been instructed to make in the Latin. First, the positive *easy* is changed into *easi*, and then to this, as the stem, we add *er* for the comparative, like the Latin *ior*, and *est* for the superlative, like the Latin *issimus*. This similarity of forms indicates in the two languages a sameness of origin. As too, in English, we use *more* and *most*, so do the Latins use *magis* and *maxime*, to denote the comparative and superlative. *Magis* and *maxime* must be used for this purpose, in the case of adjectives which do not admit the termination forms.

Besides expressing the formal degree of comparison, the Latin superlative signifies a *very high degree* of the quality involved in the positive, as *doctissimus*, *very learned*; *pater tuus est doctissimus*, *thy father is very learned*. So in English, Milton uses *wisest*:—

"The wisest heart
Of Solomon he led by fraud, to build
His temple right against the temple of God."

Latin comparatives are declined like adjectives of two terminations, and according to the third declension. Thus, positive *altus*, *high*, makes comparative *altior*, *higher*; *altior* is masculine and feminine, the neuter is *altius*.

EXAMPLE OF A COMPARATIVE.—THIRD DECLENSION.

	Singular.		Plural.		
Cases.	M. F.	N.	Cases.	M. F.	N.
N.	altior	altius	N.	altiōres	altiōra
G.	altiōris		G.	altiōrum	
D.	altiōri		D.	altiōribus	
Ac.	altiōrem	altius	Ac.	altiōres	altiōra
V.	altior	altius	V.	altiōres	altiōra
Ab.	altiōre (i)		Ab.	altioribus.	

VOCABULARY.

<i>Accommodatus</i> , -a, -um, suited (E. R. accommodate, commodious).	<i>Hirundo</i> , <i>hirundinis</i> , f., a swallow.
<i>Adulatio</i> , -ōnis, f., flattery (E. R. adulation).	<i>Homērus</i> , -i, m., Homer.
<i>Affinitas</i> , -atis, f., relationship (E. R. affinity).	<i>Humilis</i> , -e, humilis, low.
<i>Amabilis</i> , -e, worthy to be loved (E. R. amiable).	<i>Labor</i> , -ōris, m., labour [nian.
<i>Amor</i> , -ōris, m., love (E. R. amorous).	<i>Lacedæmonius</i> , -i, m., a Lacedæmo-
<i>Beatus</i> , -a, -um, happy.	<i>Liberalitas</i> , -atis, f., liberality.
<i>Benevolentia</i> , -æ, f., well-doing, kind action (E. R. beneficence).	<i>Luna</i> , æ, f., the moon (E. R. lunar).
<i>Benefficus</i> , well-doing, beneficent.	<i>Lux</i> , lucis, f., light.
<i>Brevis</i> , -e, short (E. R. brevity).	<i>Mos</i> , moris, m., custom; in the plural, character (E. R. morals).
<i>Celeber</i> , -bris, -bre, sought after, visited (E. R. celebrity).	<i>Munificens</i> , -a, -um, free in giving, liberal (E. R. munificent).
<i>Contemno</i> , 3, I despise, contemn.	<i>Murus</i> , -i, m., a wall (E. R. mural).
<i>Corvus</i> , -i, m., a raven.	<i>Natura</i> , -æ, f., nature.
<i>Crus</i> , <i>cruris</i> , n., the leg (from the leg to the ankle).	<i>Niger</i> , <i>nigra</i> , <i>nigrum</i> , black (E. R. negro).
<i>Garrulus</i> , -a, -um, talkative (E. R. garrulity).	<i>Nihil</i> (not declined), nothing.
	<i>Non nunquam</i> , adv., sometimes.
	<i>Odium</i> , -i, n., hatred (E. R. odious).
	<i>Pauper</i> , <i>pauperis</i> , a poor man (E. R. pauper).
	<i>Quam</i> , conj., than.

<i>Ratio</i> , -ōnis, f., reason (E. R. ratio).	<i>Simplex</i> , <i>simplicis</i> , simple.
<i>Res secundæ</i> , favourable things, that is, good fortune.	<i>Simulatio</i> , -ōnis, f., simulation, pretence, hypocrisy.
<i>Sapientia</i> , -æ, f., wisdom (E. R. sapient).	<i>Sol</i> , <i>solis</i> , m., the sun (E. R. solar).
<i>Secundus</i> , -a, -um, favourable (E. R. to second).	<i>Soultus</i> , -ūs, m., a sound.
	<i>Syracusanus</i> , -arum, f., Syracuse.
	<i>Valens</i> , 2, I am strong, I am worth (E. R. valid).
<i>Similitudo</i> , -ōnis, likeness (E. R. similitudo).	<i>Velox</i> , <i>velocis</i> , or <i>fl</i> (E. R. velocity).

EXERCISE 45.—LATIN-ENGLISH.

1. Nihil est naturæ hominibus accommodatius quam beneficentia. 2. Nihil est amabilius quam virtus. 3. Lux est velocior quam sonitus. 4. Nihil est melius quam sapientia. 5. Multi homines magis garruli sunt quam hirundines. 6. Paupères sæpe sunt munificentiores quam divites. 7. In adversis rebus sæpe sunt homines prudentiores quam in secundis. 8. Divitissimorum vita sæpe est miserima. 9. Simulatio amonis pejor est quam odium. 10. Nihil est melius quam ratio. 11. Sol major est quam terra. 12. Luna minor est quam terra. 13. Omnium beatissimus est sapiens. 14. Homērus omnium Græcorum poetarum est veterimus. 15. Adulatio est pessimam malum. 16. Urbs Syracusanæ maxima et pulcherrima est omnium Græcorum urbium. 17. Pessimis homines sunt malefici. 18. Omnium hominum maleficientissimi sunt fratres tui. 19. In amicitia plus valet similitudo morum quam affinitas. 20. Soror tua amabilior est quam mea.

EXERCISE 46.—ENGLISH-LATIN.

1. Nothing is worse than the pretence of love. 2. The sun is very great. 3. The sun is greater than the moon. 4. The life of men is very short. 5. The richest are often the unhappiest. 6. The poorest are sometimes the happiest. 7. The labour is very easy. 8. My labour is easier than yours. 9. The customs (character) of men are very unlike. 10. The king is very free in giving. 11. The worst men are not often happy. 12. Good men are happy. 13. Very good men are happiest. 14. God is the happiest of all. 15. The best men are sometimes despised by the worst. 16. The health of my friend is very weak. 17. Thy father's garden is very beautiful. 18. Thy son's garden is more beautiful. 19. The labour is very difficult. 20. The walls of the city are very low. 21. Most (plurimi) men love their native country. 22. Nothing is better than virtue. 23. The port is very much visited. 24. God is the greatest, best, and wisest of all. 25. The customs (or character) of the Lacedæmonians were very simple. 26. The horse is very swift. 27. Ravens are very black. 28. Thy father is very benevolent and very liberal. 29. Thy brother builds a very beautiful house. 30. A very beautiful house is built by thy brother. 31. Virgins must (debeo) be very modest. 32. Thy sister is more modest than thy brother. 33. The ape is like men. 34. Is the ape very much like men? 35. Of all animals the ape is most like men. 36. Nothing is sweeter than friendship. 37. The Lacedæmonians were very brave. 38. Light is very quick. 39. Light is quicker than sound.

* * The Key to Exercises in Lessons in Latin, XII., will be given in No. 23.

LESSONS IN GEOGRAPHY.—XIII.

EXPLORATIONS AND DISCOVERIES IN AFRICA, 1830-1868.

To give a detailed account of the additions that have been made year by year to our stock of information respecting Africa by travellers and explorers in all parts of the continent since the discovery of the principal embouchure of the Niger by the brothers Richard and John Lander, would require more space than that which we have at our command, as it is necessary now to bring our sketch of the progress of geographical discovery to a close, and proceed with those portions of the subject which treat of the earth's position in space as one of the members of our solar system; the great physical features of its surface; and its political division into states, empires, kingdoms and republics, and their various subdivisions. All we can do is to touch briefly on the principal expeditions that have been set on foot to effect explorations in Africa since 1830, and to mention the discoveries that have been made, first in Soudan or Nigritia, and secondly, in the interior of Southern Africa, by Dr. Livingstone and his companions; and thirdly, in the eastern part of the belt of land that extends ten degrees north and south of the equator, by Burton, Speke, Grant, Baker, and Petherick.

In 1841, the British Government having resolved to effect a further exploration of the great river of Western Africa, the Niger, and the densely populated countries through which it flows, sent out an expedition consisting of three steamers, the *Albert*, *Soudan*, and *Wilberforce*. The vessels reached the principal mouth of the Niger in August, and the ascent of the river was commenced forthwith. The malaria, however, arising from

the marsh lands and tangled jungle by the river-side, combined with the intense heat of the climate, proved fatal to the success of the expedition. Fever broke out among the crews of the vessels, and they were compelled to return and abandon the enterprise after going northwards up the stream as far as Egga, a large and populous town on the right bank of the Niger, about 325 miles from the sea, measuring in a direct line from the mouth of the river Nun, the principal channel by which the waters of the Niger enter the Gulf of Guinea.

Since that period the most notable journeys of exploration that have been undertaken on the western side of Africa have been the travels of M. Paul B. du Chaillu in 1856-59 in the equatorial tract watered by the Gaboon River, in which is the country of the cannibal Fans and the powerful gorilla; and in 1863-4 in Ashango Land and the country of the Ashiras, where he met with a race of dwarf negroes measuring from four feet to four feet and a-half in height, and having skin of a light-brown colour.

In 1845-46 the great desert Sahara, which forms the barren centre of Northern Africa, bordered on the north and south by a broad fringe of fertile country, teeming with luxuriant vegetation, was explored by James Richardson, who visited the Touaricks and other wandering tribes of the people of Sahara, and has given a full account of the cities of Ghat, Ghadames, and Mourzuk, and the fruitful, well-watered oases in which they stand. In 1849 he again set out to explore Central Africa, as the leader of an expedition fitted out by the Foreign Office. To this expedition Drs. Barth and Overweg were attached. Having reached Tripoli towards the close of the year, they spent some time in making the necessary preparations for the journey, starting on their passage across the Sahara on March 23, 1850. In the fall of the year they reached Damerghu, and at this point they separated, each traveller to pursue his explorations alone, and to meet his companions once more at Kukawa, the capital of Bornou, in the following year. Richardson died on his way thither, at Unguratura, and Barth and Overweg were left to continue their explorations alone. This they did with considerable success, but often at great personal risk, exploring Lake Tchad and the rivers Shary and Yeou that enter it on the south and west, and traversing Bornou, Baghirmi, Kanem, and other districts that lie grouped around the lake. On September 27, 1852, Dr. Overweg died, and Dr. Barth proceeded by way of Sockatoo to Timbuctoo, which he reached on September 7, 1853. Here he remained until May in the following year, making inquiries into the resources, commerce, and statistics of the surrounding country, when he quitted the city, in which he had spent eight months, and travelling along the left bank of the Niger as far as Say, he made his way once more by Sockatoo to Kukawa, and thence across the desert to Tripoli, arriving in England in 1855, after an absence of six years. A young German, Dr. Edward Vogel, who was sent out in 1853 to join Dr. Barth, was not so fortunate. He did not fall in with Dr. Barth, and while pursuing his explorations in Waday, a district lying to the east of Lake Tchad, he is supposed to have been assassinated by order of the Sultan of that country.

Few travels in Africa, in the present century, have been attended with such important results, by way of extension of our geographical knowledge of that continent, as the journeys of Dr. Livingstone in South Africa, from 1849 to the present time, although it may be many years before our trade and commerce may derive any perceptible benefit by the establishment of commercial relations with the natives of those countries through which he has passed. Some years previous to commencing his explorations Dr. Livingstone had been residing at Kolobeng, on one of the head-streams of the river Limpopo, as a missionary among the Bechuanas; and his visit to Lake Ngami, in 1849, seems to have created in him that zest for travel which has led him to traverse so large a portion of South Africa on foot, undeterred by the perils that beset the explorer on all sides, or the long years that he must frequently pass without meeting a single human being who speaks the same language, or is even of the same colour as himself. Two years afterwards he pushed his way northwards as far as Linyanti, the chief city of the district inhabited by the Makololo, situated on the Chobe, one of the southern affluents of the river Zambesi. On his return from this journey he determined to send his wife and children to England, and having accompanied them as far as Cape Town he once more turned his steps towards the interior. Starting from

Linyanti in June, 1853, accompanied by Sekeleu, the chief of the Makololo, and a number of his people, Dr. Livingstone proceeded to explore the upper course of the Zambesi, which is called the Leeambye above the Victoria Falls, a cataract not far from its junction with the Chobe. In his first journey from Linyanti he went northwards as far as the junction of the Leeba and the Leeambye, passing on his way Narielo, the chief town of the Barotse. In his second expedition from Linyanti, in November, 1853, he ascended the Leeba, reaching its source, a small lake called Dilolo, in February, 1854. This lake is also one of the sources of the river Congo, or Zaire, whose principal head-stream is the Kasai. From this point Livingstone struck out in a north-west direction for St. Paul de Loanda, on the west coast of Africa, which he reached at the end of May.

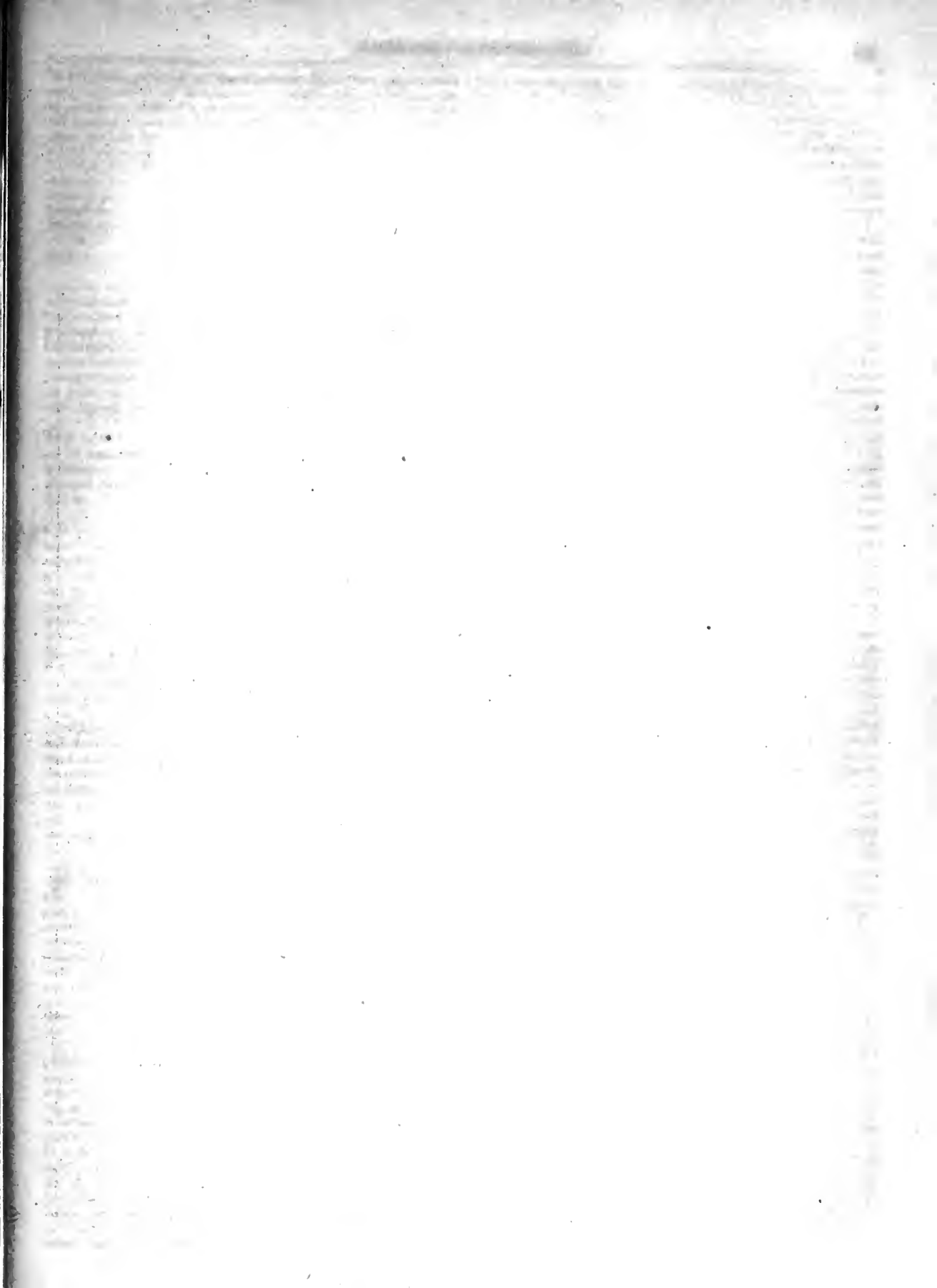
Leaving St. Paul de Loanda at the commencement of autumn, and following the course of the Coanza for a considerable distance, Livingstone and his party of Makololo arrived once more in the neighbourhood of Lake Dilolo in June, 1855, and reached Linyanti in the following September. From this point he resolved to make his way down the course of the Zambesi to the coast, and he started on his new journey on November 3, 1855, and arrived at Quilimane, on the north mouth of the river, in May, 1856, after travelling for nearly four years through the heart of Southern Africa from coast to coast.

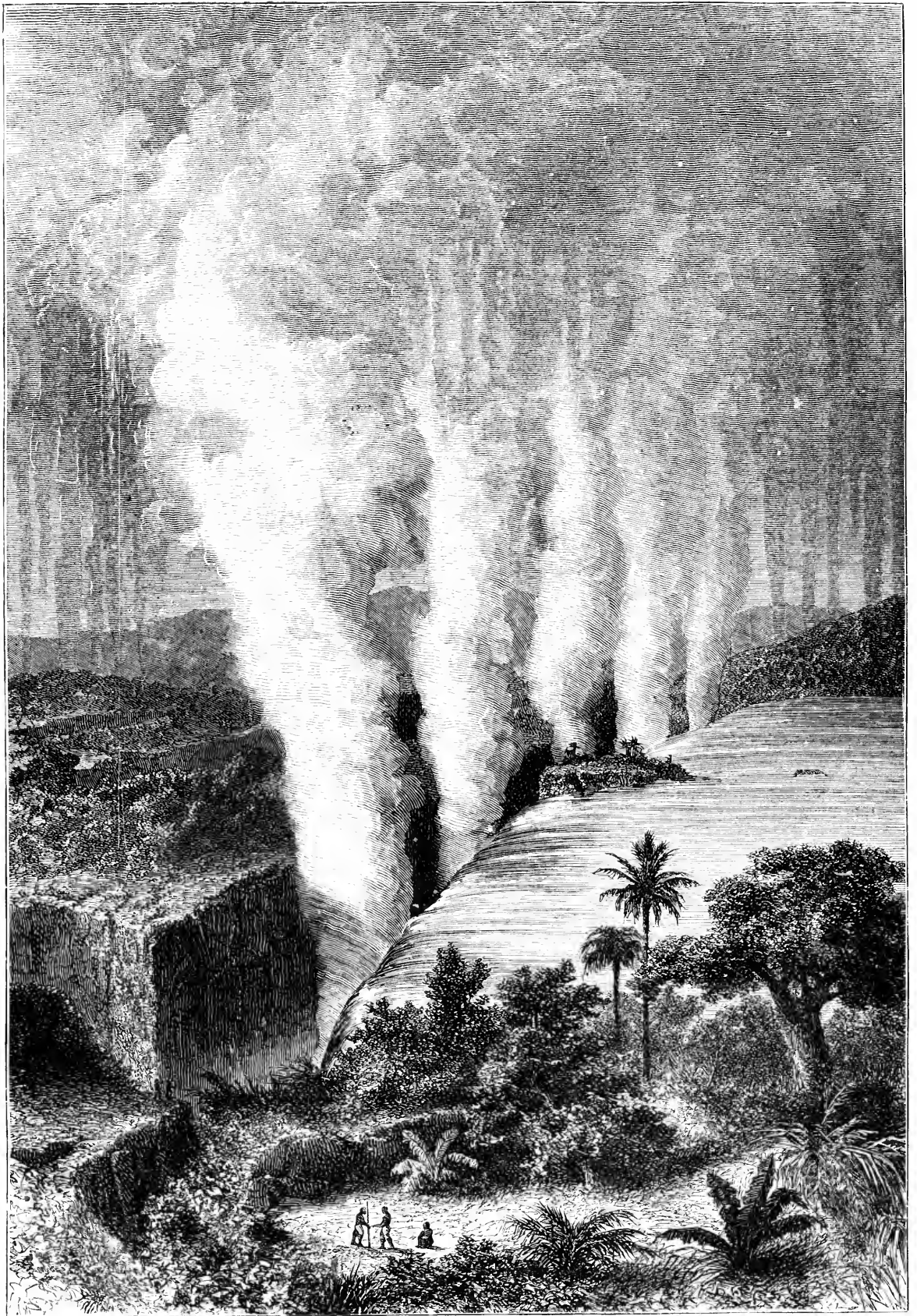
Dr. Livingstone then repaired to England, but after a brief rest he returned to Africa once more, to take command of an expedition that had been set on foot for the purpose of exploring more thoroughly the country watered by the Zambesi and its tributaries. In this expedition he was accompanied by his brother, Charles Livingstone, Dr. Kirk, Mr. Thornton, Mr. T. Baines, and other Europeans. The chief result of their explorations was the discovery of the lakes Shirwa and Nyassa, from the latter of which issues the river Shire, one of the northern tributaries of the Zambesi. After traversing the country watered by the Shire, and proceeding up the stream of the Zambesi as far as Victoria Falls, an attempt was made to explore the Rovuma, a river a little to the north of Cape Delgado, which failed. A second attempt to ascend the river in September, 1861, was more successful, some rocky rapids being reached, about 160 miles from the mouth of the river, which prevented further progress. After spending some time in retracing his steps over districts that he had already traversed, Dr. Livingstone returned to England in 1864.

While Livingstone had been busily engaged in South Africa, other travellers, as we will show presently, had discovered the large fresh-water lakes Albert Nyanza and Victoria Nyanza on the equator, and Lake Tanganyika, the northern extremity of which is about 100 miles to the south of the first named of these lakes. As it is doubtful whether Lake Tanganyika may not be the most southern of the great reservoirs which discharge their surplus waters into the Mediterranean through the channel of the Nile, Dr. Livingstone set out on another expedition in order to discover whether this were really the case or not, and to explore the country between Lakes Nyassa and Tanganyika, leaving the coast on his way inland in March, 1866. In the following year some deserters from his party spread a report that he had been murdered on the west side of Lake Nyassa, near its northern extremity. The researches of an expedition sent out from England for the purpose of making inquiries into his fate, have disproved the assertions of the men who abandoned him; and it is possible that the traveller has been engaged in exploring the coasts of Lake Tanganyika and following the course of the Nile northwards from its southernmost head-stream through the chain of huge lakes that form such conspicuous features of the country in Eastern Equatorial Africa.

In 1854, about the time when Livingstone was at St. Paul de Loanda, the first of a series of journeys was taken, that resulted in the discovery of the great lakes about which we have just been speaking. This was an expedition to Harar, a town in the country of the Somauli, about 200 miles south-west, as the crow flies, from Berbera, on the south coast of the Gulf of Aden. The party was composed of Lieutenant (now Major) Burton, of the Indian army, Captain Speke, the discoverer of the Lake Victoria Nyanza, and Lieutenants Stroyan and Herne. A few days after their return to Berbera, in 1855, they were attacked by a party of Somauli, and in the conflict Stroyan was killed and Captain Speke severely wounded.

This, however, did not prevent Burton and Speke from prose-





cutting their explorations; and in June, 1857, they set out on an expedition inland from the coast of Zanzibar, having received instructions from the Royal Geographical Society to proceed westward along the 6th parallel of south latitude, in search of some of the great lakes in the interior that were said to be in or near that latitude. Eight months later, in February, 1858, they stood on the shore of Lake Tanganyika, about 600 miles from the coast; and from the report of a native, who said there was a large river running northwards out of the northern extremity of the lake, they believed they had reached the source of the Nile. This fact, however, they were not in a condition to prove, and finding themselves exhausted by illness, fatigue, and privations, and harassed by the natives, they were compelled to leave the question in doubt, and retrace their steps to the coast. On their way back to Zanzibar, Speke left Burton at Kazeh, and travelled northwards. His solitary journey resulted in the discovery of the Victoria Nyanza, and to Speke belongs the honour of being the first Englishman whose eyes had rested on the broad expanse of the lake which is perhaps the largest, though not the only lake that helps to swell the waters of the Nile.

In 1860-63 Captain Speke, accompanied by a brother officer, Captain Grant, travelled along the northern coast of the lake Victoria Nyanza and countries in its vicinity, and found a large stream, now known as the river Somerset, issuing from the lake at a point situated nearly in the middle of the north coast, and falling at a short distance from its point of exit from the lake over a broad ledge of rocks, forming a cataract which has been named Ripon Falls. Had the travellers been able to trace the Somerset northwards through the whole length of its course, they would have found that it was only a head-stream of the Nile, and not the Nile itself; and they would have discovered the Albert Nyanza, the lake from which the Nile really issues, about forty miles northward of the point where the Somerset enters the lake. Satisfied, however, that the sources of the Nile were discovered, they quitted the course of the river and proceeded northwards to Gondokoro, where they met Sir Samuel and Lady Baker on their way to the south.

It was Sir Samuel Baker that ascertained in 1864 that the main stream of the Nile issued from the north of Lake Albert Nyanza, of which he is the discoverer. Worn out by illness and fatigue, he reached the edge of a precipitous line of cliffs towering above the lake, one bright and beautiful morning, and beheld its waters spreading before him in every direction, with a background of blue mountains in the western distance. "It was impossible," he writes, "to describe the triumph of that moment. Here was the reward for all our labour; for the years of tenacity with which we had toiled through Africa. England had won the sources of the Nile!"

With a brief mention of Mr. Petherick (who has resided for some years as consul at Gondokoro, and has explored a considerable part of the country west of the Nile between Gondokoro and the Albert Nyanza) and Dr. Charles Beke (who has travelled through Abyssinia, and who must be considered, for the present at all events, the chief authority on that country), as an intimation to the reader of sources from which he may derive much useful and accurate information on the Nile countries, we close our historical sketch of the progress of geographical discovery from the earliest years to the present date.

LESSONS IN DRAWING.—XIII.

OUR next subject in these lessons will be the theory and practice of drawing foliage; by this we do not mean merely the leafage of trees, but we include all herbs and plants that enrich the ground, and add so materially to the effect of a picture by their variety of form, their colour, and wild luxuriant growth; all combining to make the meanest subject interesting. It is not in the forest alone that we must look for beauty; a common without a single tree has its charms; its uncultivated and undulating surface varied with patches of purple heath, yellow furze, and ferns, its many irregular gravel-pits, over the sides of which grow untrained and uncared-for the bramble, the wild rose, the honeysuckle, the foxglove, with the broad-leaved dock-plant, will compose a picture in which all lovers of nature must delight. Each season of the year makes its own demands upon our attention, each brings with it the changes of condition to which the vegetable world is subject, so that the mind

of the observer must be fully prepared at all times to note down the peculiarities which influence the growth of trees and vegetation of all kinds and under all circumstances. When trees are stripped of their leaves we have the advantage of studying the course of their growth. Trees in winter are not to some such interesting objects as they are when clothed with their summer foliage, but to the student they offer, perhaps, even a stronger claim to his attention, as they present many features which an uninterested eye would pass over as less worthy of regard. It is at this season that we have before us the *skeleton* or *framework* upon which depends the strength and proportion of the whole; to understand a tree thoroughly we must be fully acquainted with its anatomy, that is, the character and disposition of its branches. Trees individually differ as much in this respect as they do in their foliage, and therefore we are equally capable of distinguishing any particular tree in winter as we are in summer. Compare the branches of the oak with those of the poplar, the willow, or the cedar. The disposition of the oak, in a general way, is to send out its branches at right angles with the parent stem from which they spring (Fig. 96); the poplar collects its branches closer together, and lifts them upwards parallel with the main trunk; the willow droops; and the cedar spreads out its branches horizontally. In short, each tree has its own marked characteristics in its ramifications, and is worthy of as much attention and study in winter as when covered with its fresh summer leaves. To draw a tree successfully we must divide our attention between two important considerations. First, the trunk and its branches; second, the foliage. We repeat, that the first lesson to be received from nature is at the time when the branches are totally bare of leaves, as then we can study to very great advantage the dispositions of the trunk and boughs of every kind of tree separately, which, as we have remarked, may be called the skeleton framework of the tree, and it is evident, therefore, that the disposition of the foliage very materially depends upon the disposition of the branches. We must now again recommend our pupils to follow out the first instructions we gave respecting the drawing of a line, by first *marking in* with a point the place where the tree rises from the ground; then observe the inclination of the trunk, and place another point at that part of the main trunk from which the first, and in most cases the largest branches start off; then observe the proportion that the remainder of the tree, as a whole, bears to the part already marked in, and with a few additional points determine the general size of the tree and the space it has to occupy upon the paper; then return to the points which are arranged for the commencement of the branches from the trunk, and mark in their courses and extent; join these points by lines, and lastly go through the same process with regard to the minor branches. All this is a preparation for the completion of the drawing, and for where it will be necessary to follow out the method still further for the more receding branches; in short, we must allow nothing to pass unnoticed in the arrangement that has the stamp of individuality upon it; after this the *drawing* will prove to be comparatively easy. When the *places* for the trunk, the most prominent boughs, and other branches are settled, the attention will only have to be directed to the *form* that each successive part presents. We will remind our pupils that there is a good moral maxim which we must follow in arranging the characteristic parts of a tree, as well as in anything else, as it contains a principle applicable to drawing that should not be disregarded: let each line *individually* be so placed that it may afford every advantage to its neighbour, and not take up the smallest space which does not belong to it, or cause an adjoining line to be pushed out of its proper place, or appear to claim for itself greater consideration than it justly deserves. The next important step towards drawing a tree is the foliage: in this we must be guided principally by the *light and shade*; when we look at a tree, the eye does not rest upon leaves *singly*, but upon foliage *collectively*. The pupil may have remarked—if not, the observation we are about to make will induce him to consider it—that when we look at any object, but at trees especially, the eye first rests upon the part in *light*. They are the first to attract the eye, and therefore, with regard to trees, it is the branches in *light* upon which the eye rests, and it requires an effort to look into the shadows; it consequently follows that in drawing a tree we must be especially careful to distinguish the *lights*, and of course this is done by adding the shadows, but the shadows



Fig. 88.

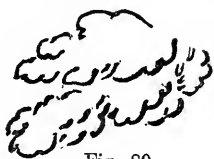


Fig. 89.



Fig. 94.

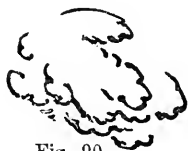


Fig. 90.



Fig. 91.



Fig. 92.



Fig. 93.



Fig. 95.

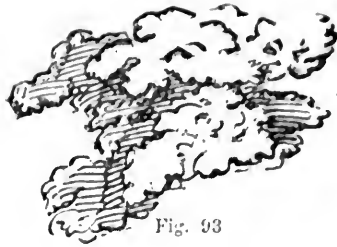


Fig. 93.



Fig. 96.



Fig. 97.



Fig. 99.

must be made subservient to the lights, that is, they must be worked about the lights in such a way as to relieve them, and throw out their forms clearly. The first practical example we will give is Fig. 98, and relates to the drawing of the trunk and branches. As we have already given the principles which are to guide the pupil in first *arranging* the trunk and branches, and afterwards *drawing* them, we will proceed to the foliage; and here we advise him to practise many times the examples from Fig. 88 to Fig. 97. The first four are merely *masses* of foliage, and it will require a considerable amount of repetition to secure a free and flowing manner of accomplishing this first difficulty in drawing foliage. Each example must be done, not by continued lines, but by broken touches, the only way to arrive at that light appearance peculiarly characteristic of foliage. The pencil may be allowed to press a little heavier on the under parts on the opposite side to the light, and it must be held almost perpendicularly, because in that position the pencil can be guided upwards, downwards, or to the right and left with equal ease and freedom; a tolerably soft pencil, say a B, will be the most suitable. To relieve the lights straight lines may be drawn at first, as in Figs. 92, 94, and afterwards the manner of Fig. 96 may be employed for the parts of the tree in shadow; but before attempting Fig. 96 let Fig. 97 be mastered, as the former is but a combination of the latter. Fig. 98 is the same tree as Fig. 99; one represents the branches as in winter, the other when covered with foliage, as in summer; and we advise the pupil to make his drawing of the branches first from Fig. 98, and then arrange the foliage from the other example. We again repeat, all this will require a great deal of patient perseverance, for no one can expect to overcome the difficulties without making many failures; but we particularly recommend the pupil to execute slowly and carefully the first trials, and not on any account to attempt a sleight-of-hand kind of treatment, from a supposition that a rapid movement of the pencil is necessary to accomplish the task.

LESSONS IN FRENCH.—XXV.

SECTION XLIV.—USES OF REFLECTIVE AND UNIPERSONAL VERBS [Sect. XXXV.].

1. THE reflective or pronominal verb always takes être as its auxiliary [§ 46].

Votre cousin s'est promené, Your cousin has taken a walk.
Nos amis se sont flattés, Our friends have flattered themselves.

2. Although the past participle of a reflective verb be conjugated with être, it agrees with its direct regimen when that regimen precedes it, and is invariable when the regimen follows it. The student should be careful to see if the reflective pronoun be a direct or an indirect regimen [§ 135].

Vous vous êtes flattées, Mesdemoiselles, You have flattered yourselves, young ladies.
Elles se sont donné la main, They have given (to) each other the hand.

It will be easily perceived that *vous* in the first sentence is a *direct* regimen, and that the word *se* in the second represents an *indirect* object.

3. Verbs essentially unipersonal, *i.e.*, verbs which cannot be conjugated otherwise, take avoir as an auxiliary.

Il a plu, il a neigé, il a gelé, It rained, it snowed, it froze.

4. Verbs occasionally unipersonal take être as an auxiliary.

Il lui est arrivé un malheur, A misfortune has happened to him.

5. Faire [4, ir.] used unipersonally, and *y avoir*, to be there, take the auxiliary avoir.

A-t-il fait beau temps le mois passé? Was it fine weather last month?

Y a-t-il eu beaucoup de monde? Were there many people there?

6. The past participle of a unipersonal verb is always invariable [§ 135 (6)].

Les pluies qu'il y a eu cet été, The rains which we have had this summer.

RÉSUMÉ OF EXAMPLES.

Les Italiennes se sont-elles promenées? Did the Italian ladies walk?

Oui, Monsieur, elles se sont promenées. Yes, Sir, they have taken a walk.

Nous nous sommes aperçus de cela. We perceived that, or we took notice of that.

Votre mère s'est-elle bien portée? Has your mother been well?
Vos sœurs se sont-elles assises? Did your sisters sit down?
Cette marchandise s'est-elle bien vendue? Did that merchandise sell well?
Vos enfants ce sont-ils appliqués à l'étude? Did your children apply to study?
Il s'y sont appliqués. They applied to it.
Nous nous sommes donné de la peine [§ 135 (1)]. We gave (to) ourselves much trouble.
Quel temps a-t-il fait ce matin? What weather was it this morning?
N'a-t-il pas fait beau temps? Was it not fine weather?
Quel malheur vous est-il arrivé? What misfortune has happened to you?
Vous est-il arrivé quelque chose? Has anything happened to you?
Il ne m'est rien arrivé. Nothing has happened to me.

VOCABULARY.

Acier, m., steel.	S'ennuy-er, 1, peculiar [§ 49], to grow weary.	Plume, f., pen.
S'adress-er, 1, reflective, to apply.	Erreur, f., error.	Se port-er, 1, ref., to be or do.
S'aperce-voir, 3, ref., to perceive.	Grêler, 1, pec., to hail.	Se tromp-er, 1, ref., to be mistaken.
S'asse-oir, 3, ir., ref., to sit down.	Hollandais, -e, Dutch.	Se serv-ir, 2, ir., ref., to use.
Beaucoup, adv., much.	Neig-er, 1, pec., to snow.	Se vend-re, 4, ref., to sell.
Canif, m., penknife.	Peine, f., trouble.	
	Plu, from pleuvoir, rained.	

EXERCISE 83.

1. À qui vos sœurs se sont-elles adressées? 2. Elles se sont adressées à moi. 3. Ne se sont-elles pas trompées [Sect. XXXVII. 1].; 4. Elles se sont trompées. 5. Vous êtes-vous aperçu de votre erreur. 6. Je ne m'en suis pas aperçu. 7. Vous êtes-vous ennuyés à la campagne? 8. Nous nous y sommes ennuyés [Sect. XXXVII. 4]. 9. Ces demoiselles se sont-elles ennuyées chez vous? 10. Elles s'y sont ennuyées. 11. De quoi vous êtes-vous servie pour écrire, Mademoiselle? [Sect. XXXVIII. 2.] 12. Je me suis servie d'une plume d'or. 13. Ces écolières ne se sont-elles pas servies de plumes d'acier? 14. Elles se sont servies de plumes d'argent. 15. La Hollandaise s'est-elle assise? 16. Elle ne s'est point assise. 17. Lui est-il arrivé un malheur? 18. Il ne lui est rien arrivé, elle ne se porte pas bien. 19. Ne s'est-elle pas donné [§ 135 (1)] de la peine pour rien? 20. Cette soie ne s'est-elle pas bien vendue? 21. Elle s'est très-bien vendue. 22. N'a-t-il pas fait beau temps toute la journée? 23. Non, Monsieur, il a plu, il a neigé et il a grêlé. 24. N'est-il rien arrivé aux deux dames que nous avons vues ce matin? 25. Non, Madame, il ne leur est rien arrivé.

EXERCISE 84.

1. Has it rained to-day? 2. It has not rained, but it has hailed and snowed. 3. Has anything happened to your little boy? 4. Nothing has happened to him, but he is sick to-day. 5. Did your sister sit down at your house? 6. She did not sit down, she was sick. 7. Did that cloth sell well? 8. It sold very well, we have sold it all. 9. Did you perceive your error? 10. We perceived it. 11. Were not your sisters mistaken in this affair? 12. They were not mistaken. 13. Were not your cousins weary of being in the country? 14. They were weary of being at my brother's. 15. What have you used to write your exercises? 16. I used a gold pen, and my brother used a silver pen. 17. Have you used my penknife? 18. I have used it. 19. What has happened to you? 20. Nothing has happened to me. 21. Has your mother been well? 22. She has not been well. 23. Did your brothers apply to their studies at school? 24. They applied to their studies, and have finished their lessons. 25. What weather was it this morning? 26. It was very fine weather. 27. Has your sister taken much trouble in this affair? 28. She has taken much trouble for nothing. 29. Did the Dutch ladies walk? 30. They walked this morning. 31. How far did they walk? 32. They walked as far as your brother's. 33. Have you given each other the hand? 34. We shook hands. 35. Those ladies flattered themselves very much.

LESSONS IN ARITHMETIC.—XXIII.

THE MEASURES OF WEIGHT.

12. THE smallest weight in use is called a grain, and by Act of Parliament is defined in the following manner:—A vessel, of which the capacity is a cubic inch, when filled with distilled water at a temperature of 62°. (Fahrenheit's thermometer), has

its weight increased by 252·458 grains. Of the grains thus determined, 7,000 are a *pound Avoirdupois*, and 5,760 a *pound Troy*.

TROY WEIGHT.

13. The derivation of the word *Troy* is doubtful. One theory is that it comes from the town Troyes, in France, because the pound Troy is said to have been first used there. Another derivation is "Troynovant," the prehistoric name of London; a third derives it from *trois* (three), because it is the money weight, and that money and money weight have each *three* denominations—penny, shilling, pound; pennyweight, ounce, pound. Troy weight is used in weighing gold, silver, precious stones, etc., and also in scientific investigations.* The *fineness* of gold—that is, the ratio of the weight of pure gold in any given mass to the weight of the whole—is generally estimated by the number of *carats* (about $3\frac{1}{2}$ grains) of pure gold contained in 24 carats of the given substance. *Standard* gold—that is, the gold of our coinage—is "22 carats fine." This means that out of 24 carats of sovereign gold 22 are pure gold. Sometimes this is also expressed by saying that standard gold is $\frac{11}{12}$ fine, this being the ratio of the pure to the alloyed metal. Diamonds and other precious stones are weighed by carats.

The following are the different denominations in Troy weight:

24 grains (24 grs.)	make 1 pennyweight	written 1 dwt.
20 pennyweights	" 1 ounce	" 1 oz.
12 ounces	" 1 pound	" 1 lb., or lb.

APOTHECARIES WEIGHT.

14. The weights used by apothecaries are aliquot parts of the pound Troy, and are as follow:—

20 grains (grs.)	make 1 scruple,	written 1 s.
3 scruples	" 1 dram	" 1 ℥.
8 drams	" 1 ounce	" 1 ℥.
12 ounces	" 1 pound	" 1 lb.

APOTHECARIES FLUID MEASURE.

	1 minim	written mj.
60 minims	make 1 fluid dram	" fʒj.
8 drams	" 1 fluid ounce	" fʒj.
20 ounces	" 1 pint (octavus)	" Oj.
8 pints	" 1 gallon (congius)	" cong. j.

This is calculated for pure water. Hence (in avoirdupois weight),

"A pint of pure water
Weighs a pound and a quarter."

AVOIRDUPOIS WEIGHT. †

15. The pound avoirdupois contains 7,000 grains, and a cubic foot of distilled water, 62° Fahrenheit, weighs 62·321 pounds avoirdupois very nearly.

The following are the subdivisions:—

16 drams	make 1 ounce	written 1 oz.
16 oz.	" 1 pound	" 1 lb.
28 lbs.	" 1 quarter	" 1 qr.
4 qrs. (112 pounds)	" 1 hundredweight	" 1 cwt.
20 cwt.	" 1 ton	" 1 ton.

A *stone* is the name given to the weight of 14 pounds.

A *sack* of coals is 2 cwt.

A *ton* of shipping is 42 cubic feet.

A *load* of rough timber is 40 cubic feet.

A *load* of squared timber is 50 cubic feet.

IMPERIAL LIQUID AND DRY MEASURE.

16. The gallon contains 277·274 cubic inches, and contains 10 pounds avoirdupois of distilled water at a temperature of 62° Fahrenheit.

4 gills	make 1 pint	written 1 pt.
2 pints	" 1 quart	" 1 qt.
4 quarts	" 1 gallon	" 1 gal.

For measuring dry goods, such as grain, fruit, etc., we have, further, the following denominations:—

2 gallons	make 1 peck	written 1 pk.
4 pecks (8 gallons)	" 1 bushel	" 1 bu.
8 bushels	" 1 quarter	" 1 qr.

In measuring liquids, the gallon is the largest measure recognised by legal enactment. There are, however, besides the

* In scientific calculations and measurements, a decimal system is most generally now used, as being much more convenient.

† The weight used for weighing heavy goods, goods of weight (*avoir du poids*).

above, many denominations still used in trade, which are derived from the names of the casks themselves.

For instance, in measuring wine—

31½ gallons	make	1 hogshead.
42 gallons	"	1 tierce.
2 hogsheads	"	1 pipe, or butt.
2 pipes	"	1 tun.

Also for spirits—

10 gallons	make	1 anker.
18 gallons	"	1 runlet.
2 tierces (84 gallons),	"	1 puncheon.

And in measuring ale or beer—

9 gallons	make	1 firkin.
2 firkins	"	1 kilderkin.
2 kilderkins	"	1 barrel.

And in dry measure we have also—

2 quarts	make	1 pottle.
2 bushels	"	1 strike.
2 strikes	"	1 coomb.
2 coombs	"	1 quarter.
5 quarters	"	1 load.
2 loads	"	1 last.

MONEY. — COINAGE.

MONEY OF ACCOUNTS.

17.	4 farthings	make 1 penny	written 1d.
	12 pence	" 1 shilling	" 1s.
	20 shillings	" 1 pound	" 1ℓ.

A farthing is indicated either as a fractional part of a penny—thus, $\frac{1}{4}$ d.—or by the letter "q"—thus, 1q.

The symbols £, s, d, q, are the initials of the Latin words *Libra, solidus, denarius, quadrans*.

These are the subdivisions of money in which accounts are always kept. Besides these, however, we have several coins representing other subdivisions, which are used to facilitate traffic. From this they are called *current* coins. The following is a list of our

CURRENT COINS.

Copper	{	A Farthing.
		A Halfpenny.
		A Penny.
Silver	{	Threepenny piece.
		Fourpenny piece.
		Sixpence.
		Shilling.
		2-shilling piece, or Florin.
Gold	{	2½-shilling piece, or Half-crown.
		5-shilling piece, or Crown.
		Half-Sovereign.
		Sovereign (the pound piece, equivalent to 20 shillings).

It has already been explained, under the head of *Troy weight* (Art. 13), that standard gold (that is, the gold of the coinage) is $\frac{11}{12}$, or 22 carats fine. Out of a pound Troy are coined 40 $\frac{2}{3}$ sovereigns, so that, by dividing this by 12, we find the price of standard gold per ounce to be £3 17s. 10½d., no charge being made at the Mint for coining gold.

Standard silver is $\frac{3}{4}$ fine, and out of a pound Troy 66 shillings are coined; so that the Mint price of standard silver is 5s. 6d. an ounce. The market price of silver bullion is less than this—generally about 5s. 1½d. an ounce. The advantage which the Mint thus gains is called *seigniorage*.

In the new bronze coinage 48 pence are coined out of a pound avoirdupois. The bronze consists of 95 parts copper, 4 tin, and 1 zinc.

The *standard* of our coinage is gold. By this is meant that any amount of gold coin can be legally paid in liquidation of a debt, the creditor being obliged to take it. This is expressed by saying that gold to an unlimited amount is the only *legal tender*. No one is obliged to take more than 40s. worth of silver, or more than 12d. worth of copper.

Other coins besides the above were formerly in use. The guinea (21s.), the half-guinea, the 7-shilling piece, the noble (6s. 8d.), mark (13s. 4d.), the pistole (16s. 10d.), moidore (27s.).

ANGULAR MEASURE.

18. The circumference of a circle being divided into 360 equal parts, straight lines drawn to the centre will divide the four

right angles at the centre into 360 equal angles. Each of these subdivisions, therefore, is equal to the 90th part of a right angle. It is called a degree, and written thus—1°. A degree is divided into 60 minutes, one of which is written thus—1'; each minute into 60 seconds, one of which is written 1" (*vide* Art. 3, "Division of Time," page 366). The arcs of the circle which subtend at the centre an angle of 1°, 1', 1" respectively, are also called a degree, a minute, and a second respectively. To know their actual magnitude, we must know the size of the circle (see Note on page 367).

MISCELLANEOUS TABLE.

19.	12 units	are called	1 dozen (doz.).
	12 dozens	"	1 gross.
	20 units	"	1 score.
	24 sheets of paper	"	1 quire.
	20 quires	"	1 ream.
	2 reams	"	1 bundle.
	5 bundles	"	1 bale.
A sheet folded in two leaves forms a folio.			
"	"	four	"
"	"	eight	"
"	"	twelve	"
"	"	eighteen	"
"	"	thirty-six	"
			quarto (4to).
			octavo (8vo).
			duodecimo (12mo).
			eighteen-mo (18mo).
			thirty-six-mo (36mo).

LESSONS IN ENGLISH.—XIII.

DERIVATIONS: PREFIXES (*continued*).

Præter, of Latin origin (*præter*, *against*), is found in *præternatural*, *contrary to nature*.

Pro, of Latin origin, *fore*, *forward*, as in *produce* (Latin, *duco*, *I lead*), to *bring forward*. *Pro* appears in *proceed* (Latin, *cedo*, *I go*), in *procreate* (Latin, *creo*, *I beget*), in *proffer* (Latin, *fero*, *I bear*), in *prolepsis*, an anticipation, etc.

"We have evinced (proved) that the generality of mankind have constantly had a certain *prolepsis* or anticipation in their minds concerning the actual existence of a God."—*Cudworth*, "*Intellectual System*."

Pro becomes in French *pour*, which again becomes *pur*, as in *purport* (Latin, *porto*, *I carry*), *signification*. *Purchase* is given by Richardson as from a fancied French word, namely, *purchasser*; and *purchase*, he says, means to chase, and so to obtain. Such derivations are enough to bring etymology into disgrace. *Purchase* is from a low Latin word, *perchauchare* (*per-calcare*), which meant to *tread over*, and to mark out, the limits of a piece of land, the necessary preliminary to the purchase of it. See Ducange on the word, who gives the noun *purchacia* (*purchase*), as something acquired. *Purchacia* is common in old legal documents, and is the origin of the obsolete French word *pouchasser* (*perchauchare*), which has nothing whatever to do with *chasser*, to *chase* or *hunt*. *Purchas*, in old French, signifies *labour*, and suggests the derivation which involves labour as the price paid in the acquisition of land, etc. This idea of *purchase*, as founded on labour, is in unison with the meaning of purchase. Whence it signifies a point for a lever to act upon, or the power which hence ensues, as in these words:—

"A politician, to do great things, looks for a power, which our workmen call a *purchase*; and if he finds that power in politics as in mechanics, he cannot be at a loss to apply it."—*Burke*.

Proto, of Greek origin (*πρωτος*, *pro'tos*, *first*), occurs in *protomartyr* (*martyr*, *a witness*), the first witness or martyr: applied to Stephen, in Church history.

"With Hampden, firm assertor of her laws,
And *protomartyr* in the glorious cause."—*Boyse*.

Also in *prototype*. We have already had *antitype* and *archetype*: here we have *prototype*, which means the first or original form or model.

Pseudo, of Greek origin (*ψευδος*, *su'dos*, *a falsehood*), signifies what is *not genuine*, *false*; as, *pseudo-prophet*, a false prophet.

"Out of a more tenacious cling to worldly respects, he stands up for all the rest to justify a long usurpation and convicted *pseudopiscopacy* (Greek, *επισκοπος*, *a bishop*) of prelates."—*Milton*.

Pusill, of Latin origin, comes from *pusillus* (*little*) or *pusillus* (E.R. *pupili*), the diminutive form of *pusus* or *pupus*, *a boy* (*pupa*, *a girl*), which is the source of our word *puppet*, in the French *poupée*, *a baby*, *a doll*. *Pusill* is found in union with *annus*,

mind, forming *pusillanimous*, *small in mind*, applied particularly to a want of spirit or courage.

Putri, of Latin origin (*putris*, *rotten*, E.R. *putrid*), enters into the composition of a class of words, namely, *putrefy* (Latin, *facio*, *I make*), *putrefaction*, *putrescent*, *putrescence*, etc.

"It is such light as *putrefaction* breeds
In fly-blown flesh, whereon the maggot feeds,
Shines in the dark, but ushered into day,
The stench remains, the lustre dies away."—*Cowper*.

Quadr, *quadra*, of Latin origin (*quatuor*, *four*), is found in *quadrangle*, *four-angled*; *quadruped* (Latin, *pes*, *a foot*), *four-footed*; *quadruple* (Latin, *plica*, *a fold*), *fourfold*; also *quater*, as in *quaternion* (*quaternion*, *the number four*), etc.

"Aire and ye elements, the eldest birth
Of Nature's womb, that in *quaternion* run,
Perpetual circle, multiform; and mix
And nourish all things."—*Milton*, "*Paradise Lost*."

The *four* elements of the ancients were fire, air, earth, and water.

"I have chosen to write my poem (*annus mirabilis*) in *quatrains* or stanzas of *four* in alternate rhyme, because I have ever judged them more noble and of greater dignity both for the sound and number than any other verse in use amongst us."—*Dryden*.

Quinque (*quint*), Latin, *five*, occurs in *quinquennial* (Latin, *annus*, *a year*), *happening every five years*; in *quintessence* (Latin, *essentia*, *essence*); and in *quintuple*, *fivefold*.

"Aristoteles of Stagira hath put down for principles these three, to wit, a certain forme called *entelechia*, matter, [and] privation: for elements *four*; and for a fifth, *quintessence*, the heavenly body which is immutable."—*Holland*, "*Plutarch*."

Re (*red*), of Latin origin, primarily signifies *back*, *backward* (and has nothing to do with *ere*, nor does it mean *before*, as Richardson states), as *return*, to *turn back*; hence *opposition*, as *resist*, to *stand against*; also *repetition*, as *revive*, to *live again*; *reform*, to *make again*.

Re, denoting back:—

"To desire there were no God, were plainly to unwith their own being, which must needs be annihilated in the subtraction of that essence which substantially supported them, and restrains them from regression into nothing."—*Broune*, "*Vulgar Errors*."

Re, denoting opposition:—

"To this sweet voyce a dainty musique fitted
Its well-tuned strings, and to her notes consorted;
And while with skilful voice the song she ditted,
The babbling echo had her words rertored."—*Spenser*.

Re, denoting repetition, as in *rehearse*, *recapitulate*, *remove*, etc.:—

"The land of silence and of death
Attends my next remove."—*Watts*.

Re sometimes merely strengthens the word, as in *receive*, *reception* (Latin, *capio*, *I take*), and *recommend* (Latin, *mando*, from *manus*, *a hand*; and *do*, *I give*).

Rect, of Latin origin (*rectus*, *straight*), appears in *rectify* (Latin, *facio*, *I make*), to *make straight*; in *rectangular* (Latin, *angulus*, *a corner*), *right-angled*; *rectilinear* (Latin, *linea*, *a line*), *straight-lined*; and *rectitude*, *uprightness*.

Retro, Latin, *backward*, as in *retrogradation* (Latin, *gradior*, *I walk*), *going backward*. It is found, also, in *retroactive* (Latin, *ago*, *I do*, *act*), *acting in a backward direction*.

"A bill of pains and penalties was introduced, a *retroactive* statute, to punish the offences which did not exist at the time they were committed."—*Gibbon*, "*Memoirs*."

Se, of Latin origin, the base of *sine*, *without*, denotes separation, *apart from*, *without*; as, *seclude* (Latin, *claudio*, *I shut*), to *shut out*; *secede* (Latin, *I go*, *yield*), to *withdraw from*; *seduce* (Latin, *duco*, *I lead*), to *lead from duty*.

"From the fine gold I separate the alloy,
And show how hasty writers sometimes stray."
Dryden, "*Art of Poetry*."

Sept, of Latin origin (*septem*, *seven*), appears in *septennial* (*annus*), *occurring every seven years*; and in *septentrion*, the seven stars, the Great Bear, Charles's Wain, the north.

"Thou art as opposite to every good
As the antipodes are unto us,
Or as the South to the *Septentrion*."
Shakespeare, "*Hen. VI.*" (3rd pt.)

Sex (Latin, *six*) is found in *sexangular*, six-angled; *sexennial*, every six years; *sextuple*, sixfold; *sexagenary*, threescore, etc.

"These are the *sexagenary* fair ones, who, whether they were handsome or not in the last century, ought at least in this to reduce themselves to a decency of dress suitable to their years."—*Chesterfield*, "Common Sense."

EXERCISES.

1. Parse the following sentences:—

April is come. The birds sing. The trees are in blossom. The flowers are coming out. The sun shines. Now it rains. It rains and the sun shines. There is a rainbow. Oh, what fine colours! I

cannot catch the rainbow. The rainbow is going away. It fades. It is quite gone. I hear the cuckoo. It is August. Let us go into the corn-fields. Is the corn ripe? This is a grain of corn. This is an ear of corn. This stalk makes straw. Now the corn must be tied up in sheaves.

2. Write a theme on each of the following subjects:—

- | | |
|---------------------------------------|--------------------------------|
| 1. Moses found by Pharaoh's daughter. | 3. The Discovery of America. |
| 2. The Norman Conquest. | 4. The Death of Prince Albert. |

3. Write and carefully correct an account of the last sermon, speech, or lecture you heard.

Nelson won the battle of the Nile 1798.

COPY-SLIP NO. 94.—NELSON WON THE BATTLE OF THE NILE, 1798.

Otaheite an island in the Pacific Ocean.

COPY-SLIP NO. 95.—OTAHEITE, AN ISLAND IN THE PACIFIC OCEAN.

Pekin in China.

COPY-SLIP NO. 96.—PEKIN IN CHINA.

Quebec, founded 1608.

COPY-SLIP NO. 97.—QUEBEC FOUNDED, 1608.

Romulus, first king of Rome.

COPY-SLIP NO. 98.—ROMULUS, FIRST KING OF ROME.

LESSONS IN PENMANSHIP.—XXV.

THE capital letters in the present series of copy-slips, which have been inserted to enable the self-teacher to acquire a knowledge of the shape and mode of formation of each, will serve as models for every variety of handwriting—for large-hand as well as small-hand, and each of the intermediate sizes. It is necessary, however, for us to remind our readers that in using the letters that are affixed to our Copy-slips in angular writing, as in Copy-slip No. 95, as capitals for copies in hands in which the strokes are rounded at the top and bottom, as in Copy-slips Nos. 94, 96, 97, and 98, care must be taken to substitute a well-rounded curve for the angles or points that form so conspicuous a feature in angular hand; and, *vice versa*, in using the round-hand capitals for angular hand, the writer must substitute points for the rounded curves.

As we have said before, angularity is for the most part the

distinguishing feature of a lady's hand; while roundness is, generally speaking, the chief characteristic of men's handwriting; and having proceeded thus far in acquiring a sound knowledge of the formation of the large and small letters of the writing alphabet from our copy-slips and instructions, we would recommend all self-teachers, in practising writing, to direct their attention more particularly to those copies which present the characteristic features of the writing of the sex to which they belong; that is to say, that men and boys should copy our copy-slips in round and commercial hand in preference to those in angular hand, while girls and women should pay more attention to copies in the latter hand than to those in the former.

In drawing towards the conclusion of our present series of copies and instructions in the formation of letters, we cannot urge too strongly on our learners the necessity of unremitting practice if they wish to write a clear and legible hand with a

fair degree of rapidity. It is, however, a wearisome matter to be always copying the same copy-slips over and over again. There is nothing, indeed, that is more calculated to destroy the learner's interest in what he is doing than to be, as it were, always "harping upon one string;" and to prevent this, as well as to save him the trouble of ruling lines for his copies, we have prepared a series of cheap ruled copy-books, based on the method which has been taught in our lessons on Penmanship, and furnished with suitable head-lines, which will answer the double purpose of providing the reader with a variety of subjects for copying, and save him the trouble of ruling his paper.

In "Cassell's New Copy-books for the Million," the learner will find everything that can be required for practice. The series, the contents of which we append, comprises thirteen books, price 2d. each, or the thirteen for 2s., and may be procured direct from the publishers of the POPULAR EDUCATOR, and from all booksellers.

- | | |
|-----------------------------|-----------------------------------|
| 1. Initiatory Exercises. | 7. Round Hand. |
| 2. Letters and Combinations | 8. Round and Small Hands. |
| 3. Short Words. | 9. Small Hand. |
| 4. Capitals. | 10. Text, Round, and Small Hand. |
| 5. Text Hand. | 11. Introduction to Ladies' Hand. |
| 6. Text and Round. | 12. Ladies' Hand. |
13. Commercial Sentences.

ESSAYS ON LIFE AND DUTY.—IV.

TEMPERANCE.

THE success of life and the happiness of life, as well as the usefulness of life, depend to a very large extent upon the cultivation of the spirit of temperance. Men of intemperate speech and judgment, of intemperate likes and dislikes, are apt to risk alike reputation and influence. The counsel to be temperate does not, indeed, suit those whose passions predominate over their judgment, but all wise and thoughtful persons will see at once that there is no virtue which has so much to do with the force and excellency of character as temperance. It is a word difficult strictly to define, but it is evidently a holding of the mean between extremes in lawful things. Temperance implies the right in the thing itself, as there are some things which it would be wrong, under all circumstances, to be in any way connected with. To be temperate in swearing, stealing, or lying, would be manifestly a caricature of the word; there can be no temperance in that which is essentially evil. Can it then, the reader may say, be possible to be temperate in right? is it not counselling us to stop short in that course of duty which must get more right as we go on? Strange as it may seem at first sight to the student, there is a temperateness needed even in the virtues themselves, without which their very existence as virtues must be endangered. Amiability is one of the most beautiful excellences of character; and yet, if amiability is pushed to the extreme, there may be no righteous indignation at wrong, no earnest hatred of oppression, and no practical effort to remove it. Contentment is another praiseworthy grace of character; but content may run into indifference and sloth, and the God-given powers of the mind may be suffered to lie fallow, and even to rot.

These instances are only adduced as illustrations of a law which applies to all the virtues; push any one of them, however honourable in itself, to an extreme, and it becomes a vice. It will thus be seen what a careful nurseryman each man ought to be of the vineyard of his own nature; and also what the Scriptures mean when they say, "Drunken, but not with wine." It is easy to be intoxicated with pride and ambition: either of these two powers has, indeed, its proper sphere, and their elimination from human life cannot take place without serious detriment to character. In all ages of the world men have been found to love and advocate extremes; some have been Epicureans, denying themselves no pleasure, and some Stoics, denying themselves all; and, doubtless, the disciples of extremes attract more notice, and are often credited with greater earnestness; whereas it should be remembered that, as it is more difficult to preserve the just balance, so is it more honourable and worthy of praise.

One of the clearest American thinkers says, "Men undertake to be spiritual, and they become ascetic; or, endeavouring to hold a liberal view of the comforts and pleasures of society, they are soon buried in the world and become slaves to its fashion; or, holding a scrupulous watch to keep out every

particular sin, they become legal, and fall out of liberty; or, charmed with the noble and heavenly liberty, they run to negligence and irresponsible living. So the earnest become violent, the fervent fanatical and censorious, the gentle waver, the firm turn bigots, the liberal grow lax, the benevolent ostentatious. Poor human infirmity can hold nothing steady."

The more true we feel this to be, the more necessary will be seen to be the exercise of a spirit of temperance, and how difficult its application to the manifold aspects of human life and duty. In no respect is mankind more in danger of becoming intemperate than in speech; for to lay an embargo upon the tongue is among the most trying efforts of the spirit of temperance. It is difficult to deny ourselves what often gratifies our own pride, and, at the same time, damages the prestige of another. From this propensity have sprung family feuds, prolonged law-suits, and party divisions innumerable. It would be out of the province of this essay to specify all the evils which have resulted to society from intemperance in other provinces of character, but it must surely be admitted that no moral code can be perfect which does not inculcate temperance as well as justice. True, indeed, it is, that there is nothing high-sounding in it, and it is not likely to enlist in its advocacy those who are nothing, if not extreme. But it had of old amidst its advocates the wisest and most illustrious of the philosophers; and it is made more authoritative on us by its enforcement on the page of Inspiration. The pleasures of temperance are steady in their development, but they are very lasting and real. When nature is kept in proper equipoise of action, there is freedom from those nervous depressions which are incident to excitements of any and every kind. Instead of keen sensational pleasures, succeeded by times of leaden indifference and dulness, there is a quiet glow of interest and energy in the exercises of the mind, which bring with them a cheerful sense of healthful recreation. As experienced travellers prefer, after all, the temperate zone—neither the frigid cold of the far North, nor the glaring light and heat of the tropics—so the most experienced student of life will prefer the temperate zone of character as the one most conducive to the health and longevity of the virtues.

Temperance keeps the body cool and the mind clear, and is thus related to the other virtues in a vast variety of ways, presenting to us that which is of inestimable value—a sane mind in a sound body. There is an insanity which results not only from the excessive use of ardent spirits, but from the intemperate exercises of pride and passion, and multitudes would have been preserved in health and reason if they had received and acted on the maxim, "Be temperate!" It must be seen that the exercise of this virtue is related to varieties and differences of temperament. Some are in little danger of excess of anger; others need fear no excess of pride. Solon's celebrated maxim, "Know thyself," should be well pondered; for then, when the danger is clearly apprehended, the remedy can be best applied, according to the specific difficulties of each separate constitution. As the subject becomes clearly understood, it will be seen that, instead of temperance being the mere negation of things, it is rather the right enjoyment of them. The dangers incidental to human character do not come in one direction only; and in the multitudinous aspects of life and duty it is as wise as it is right to be temperate in all things.

OUR HOLIDAY.

CRICKET.—II.

THE following are the Laws of the game of Cricket, including the latest revisions by the Marylebone Club, which is the recognised authority on the subject. Besides forming the standard of appeal in disputed cases, they will be found by the learner to throw light on points which were but briefly touched upon in our previous paper:—

THE LAWS OF DOUBLE-WICKET.

1. The Ball must weigh not less than five ounces and a half, nor more than five ounces and three quarters. It must measure not less than nine inches, nor more than nine inches and one quarter in circumference. At the beginning of each innings either party may call for a new ball.
2. The Bat must not exceed four inches and one quarter in the widest part. It must not be more than thirty-eight inches in length.
3. The Stumps must be three in number, twenty-seven inches out of the ground; the bails eight inches in length; the stumps of equal and of sufficient thickness to prevent the ball from passing through.

4. The Bowling Crease must be in a line with the stumps, six feet eight inches in length; the stumps in the centre; with a return crease at each end, towards the bowler, at right angles.

5. The Popping Crease must be four feet from the wicket, and parallel to it; unlimited in length, but not shorter than the bowling crease.

6. The Wickets must be pitched opposite to each other by the umpires, at the distance of twenty-two yards.

7. It shall not be lawful for either party during a match, without the consent of the other, to alter the ground by rolling, watering, covering, mowing, or beating, except at the commencement of each innings, when the ground shall be swept and rolled. This rule is not meant to prevent the striker from beating the ground with his bat near the spot where he stands during the innings, nor to prevent the bowler from filling up holes with sawdust, etc., when the ground is wet.

8. After rain the wickets may be changed, with the consent of both parties.

9. The Bowler shall deliver the ball with one foot on the ground behind the bowling crease, and within the return crease, and shall bowl four balls before he change wickets, which he shall be permitted to do only once in the same innings.

10. The ball must be bowled. If thrown or jerked, the umpire shall call "No ball."

11. He may require the striker at the wicket from which he is bowling to stand on that side of it which he may direct.

12. If the bowler shall toss the ball over the striker's head, or bowl it so wide that, in the opinion of the umpire, it shall not be fairly within the reach of the batsman, he shall adjudge one run to the party receiving the innings, either with or without an appeal, which shall be put down to the score of "wide balls." Such ball shall not be reckoned as one of the four balls; but if the batsman shall by any means bring himself within reach of the ball, the run shall not be adjudged.

13. If the bowler deliver a "no ball," or a "wide ball," the striker shall be allowed as many runs as he can get, and he shall not be put out except by running out. In the event of no run being obtained by any other means, then one run shall be added to the score of "no balls" or "wide balls," as the case may be. All runs obtained for "wide balls" to be scored to "wide balls." The names of the bowlers who bowl "wide balls," or "no balls," in future to be placed on the score, to show the parties by whom either score is made. If the ball shall first touch any part of the striker's dress or person (except his hands), the umpire shall call "Leg bye."

14. At the beginning of each innings the umpire shall call "Play." From that time to the end of each innings no trial ball shall be allowed to any bowler.

15. The Striker is Out if either of the bails be bowled off, or if a stump be bowled out of the ground;

16. Or if the ball, from the stroke of the bat, or hand, but not the wrist, be held before it touch the ground, although it be hugged to the body of the catcher;

17. Or if, in striking, or at any other time while the ball shall be in play, both his feet shall be over the popping crease, and his wicket put down, except his bat be grounded within it;

18. Or if, in striking at the ball, he hit down his wicket;

19. Or if, under pretence of running, or otherwise, either of the strikers prevent a ball from being caught, the striker of the ball is out;

20. Or if the ball be struck, and he wilfully strike it again;

21. Or if, in running, the wicket be struck down by a throw, or by the hand or arm (with ball in hand), before his bat (in hand) or some part of his person be grounded over the popping crease. But if both the bails be off, a stump must be struck out of the ground;

22. Or if any part of the striker's dress knock down the wicket;

23. Or if the striker touch or take up the ball, while in play, unless at the request of the opposite party;

24. Or if with any part of his person he stop the ball, which, in the opinion of the umpire at the bowler's wicket, shall have been pitched in a straight line from it to the striker's wicket, and would have hit it.

25. If the players have crossed each other, he that runs for the wicket which is put down is out.

26. A ball being caught, no runs shall be reckoned.

27. A striker being run out, that run which he and his partner were attempting shall not be reckoned.

28. If a "Lost ball" be called, the striker shall be allowed six runs; but if more than six shall have been run before "Lost Ball" shall have been called, then the striker shall have all which have been run.

29. After the ball shall have been finally settled in the wicket-keeper's or bowler's hand, it shall be considered dead; but when the bowler is about to deliver the ball, if the striker at his wicket go outside the popping crease before such actual delivery, the said bowler may put him out, unless (with reference to the 21st law) his bat in hand, or some part of his person, be within the popping crease.

30. The striker shall not retire from his wicket and return to it to complete his innings after another has been in, without the consent of the opposite party.

31. No substitute shall in any case be allowed to stand out or run between wickets for another person without the consent of the oppo-

site party; and in case any person shall be allowed to run for another, the striker shall be out if either he or his substitute be off the ground in manner mentioned in laws 17 and 21, while the ball is in play.

32. In all cases where a substitute shall be allowed, the consent of the opposite party shall also be obtained as to the person to act as substitute, and the place in the field which he shall take.

33. If any fieldman stop the ball with his hat, the ball shall be considered dead, and the opposite party shall add five runs to their score; if any be run, they shall have five in all.

34. The ball having been hit, the striker may guard his wicket with his bat, or with any part of his body except his hands; that the 23rd law may not be disobeyed.

35. The Wicket-Keeper shall not take the ball, for the purpose of stumping, until it have passed the wicket; he shall not move until the ball be out of the bowler's hand; he shall not by any noise incommode the striker; and if any part of his person be over or before the wicket, although the ball hit it, the striker shall not be out.

36. The Umpires are the sole judges of fair or unfair play; and all disputes shall be determined by them, each at his own wicket; but in case of a catch which the umpire at the wicket bowled from cannot see sufficiently to decide upon, he may apply to the other umpire, whose opinion shall be conclusive.

37. The umpires in all matches shall pitch fair wickets, and the parties shall toss up for choice of innings. The umpires shall change wickets after each party has had one innings.

38. They shall allow two minutes for each striker to come in, and ten minutes between each innings. When the umpire shall call "Play," the party refusing to play shall lose the match.

39. They are not to order a striker out unless appealed to by the adversaries;

40. But if one of the bowler's feet be not on the ground behind the bowling crease, and within the return crease, when he shall deliver the ball, the umpire at his wicket, unasked, must call "No ball."

41. If either of the strikers run a short run, the umpire must call "One short."

42. No umpire shall be allowed to bet.

43. No umpire is to be changed during a match, unless with the consent of both parties, except in case of violation of the 42nd law; then either party may dismiss the transgressor.

44. After the delivery of four balls, the umpire must call "Over," but not until the ball shall be finally settled in the wicket-keeper's or bowler's hand; the ball shall then be considered dead; nevertheless, if an idea be entertained that either of the strikers is out, a question may be put previously to, but not after, the delivery of the next ball.

45. The umpire must take especial care to call "No ball" instantly upon delivery; "Wide ball," as soon as it shall pass the striker.

46. The Players who go in second shall follow their innings if they have obtained eight runs less than their antagonists, except in all matches limited to only one day's play, when the number shall be limited to sixty instead of eighty.

47. When one of the strikers shall have been put out, the use of the bat shall not be allowed to any person until the next striker shall come in.

NOTE.—Complaints having been made that it is the practice of some players when at the wicket to make holes in the ground for a footing, the committee are of opinion that the umpires should be empowered to prevent it.

THE LAWS OF SINGLE WICKET.

1. When there shall be less than five players on a side, bounds shall be placed, twenty-two yards each, in a line from the off and leg stump.

2. The ball must be hit before the bounds to entitle the striker to a run, which run cannot be obtained unless he touch the bowling stump or crease in a line with his bat, or some part of his person, or go beyond them, returning to the popping crease as at double wicket, according to the 21st law.

3. When the striker shall hit the ball, one of his feet must be on the ground and behind the popping crease, otherwise the umpire shall call "No hit."

4. When there shall be less than five players on a side, neither byes nor over-throws shall be allowed, nor shall the striker be caught out behind the wicket, nor stumped out.

5. The fieldman must return the ball so that it shall cross the play between the wicket and the bowling stump, or between the bowling stump and the bounds. The striker may run till the ball be so returned.

6. After the striker shall have made one run, if he start again he must touch the bowling stump and turn before the ball cross the play, to entitle him to another.

7. The striker shall be entitled to three runs for lost ball, and the same number for ball stopped with hat, with reference to the 25th and 3rd laws of double wicket.

8. When there shall be more than four players on a side, there shall be no bounds. All hits, byes, and overthrows shall then be allowed.

9. The bowler is subject to the same laws as at double wicket.

10. Not more than one minute shall be allowed between each ball.

We come now to the practical part of the game, concerning which a few hints will be useful to the beginner. A good cricketer can only be made by practice, but it will assist the learner to have right principles before him at the outset.

The Batsman, at starting, should stand in the position shown in Fig. 1—his right foot firmly planted on the ground, and his



Fig. 1.—THE BATSMAN IN POSITION.

left in readiness to move freely either to the one side or the other, as may be required in striking the ball. He grounds the end of his bat at a spot within the popping crease, and about the length of the bat from the wicket; and, in order that he may guard his wicket well, he is entitled to ask the umpire stationed near the opposite wicket to give him the correct line for the middle stump; that is, to inform him when his bat is so placed as to cover this stump, looking from the bowler's end. He marks this spot by an indentation with the bat, and is then in readiness for the ball. One general rule must be laid down for playing either fast or slow balls. If they appear to be coming straight into the wicket, they must be blocked, or stopped, and the player should not attempt to strike them.

In blocking, the bat is lifted only a short distance from the ground, and the ball is struck downward, so as to bring it to a dead stop if possible. For this purpose the handle of the bat should be sloped well forward, by which means the front of the bat is made to cover the ball, and prevent its rising from the ground. Otherwise, in blocking, the ball may receive just such a tip as will cause it to pass from the edge of the bat into the hands of "point" or "cover-point," who will be on the look-out for it.

The position known as "the draw," which is engraved in our second figure, is something between a block and a hit, partaking of the nature of both. It is the mode of meeting a ball when, after being pitched, it rises from the ground and is apparently coming straight in towards the top of the wicket or the balls. The bat is held straight before the wicket (Fig. 2), but the surface of the bat, instead



Fig. 2.—"THE DRAW."

of meeting the ball full, is turned slightly to one side, so that the ball, when it meets the bat, is turned off at an angle, and a run is frequently the result.

If the ball, when delivered, appears to be coming somewhat wide of the wicket, the batsman may play it freely, either by a "hit," a "cut," or a "drive." But it is frequently difficult to tell what line the ball is really taking, for, if you are playing against an expert bowler, you will probably find the balls come towards the wicket with a twist from the spot at which they were pitched, and, instead of pursuing a straight course, turning in to the stumps. The great art of bowling, indeed, is to be able to give this twist to the ball, as well as to direct it straight at the wicket. Nothing but practice, and quickness both of eye and hand, will teach the young bats-

man to guard effectually against this danger.

In striking, hit the ball, if possible, between the line of the fielders, or wherever you see the field most open and unprotected. Strike low, so that you may not afford the opportunity of a catch to one of your watchful opponents. Do not be too eager to make runs; let your object rather be to protect your wicket as long as possible, waiting your opportunity for a good hit now and then at a ball delivered with less care than usual. Do not attempt a run after the ball is in the hands of one of the fielders,

otherwise the ball may reach your stumps before you can return to the wicket, and you will be "run out."

If practice is necessary to the batsman, it is still more essential to make an expert Bowler. The learner should practise bowling at a mark, either in a field or in an outhouse. He should acquire both the fast and the slow styles, for it is of the greatest service in actual play to be able to vary the character of the bowling—to deliver a slow ball after a fast one, and *vice versa*. Nothing is more embarrassing to the batsman than the uncertainty this causes as to the kind of ball he is about to receive. The bowler should acquire, also, the knack of twisting the ball in its delivery, to which we have previously alluded. The ball should be held in the fingers only, and not grasped in the palm of the hand.

It matters not whether the style of delivery be "round-arm," or "under-hand"—that is, whether with a swing of the arm from the shoulder, or bowled in the ordinary meaning of the word. The learner should adopt that mode which gives him the greatest command of the ball and its direction. The round-arm style is more generally suited to fast, and the under-hand to slow bowling; but this rule has its individual exceptions. A few years ago, very little bowling other than in the round-arm style was seen in the cricket field. The under-hand fashion was regarded with some degree of contempt. Now, however, it has come again into vogue, and may be seen practised almost, if not quite, as frequently as the more modern



Fig. 3.—THE BOWLER.

round-arm delivery. Fig. 3 represents the attitude of the bowler when about to deliver the ball in round-arm style.

Next in importance to batsman and bowler, in the duties he has to perform, comes the Wicket-keeper. His duty is to stop the ball, if he can, immediately it passes the wicket, and, if the batsman be not sufficiently guarded, or within his bounds, to knock the balls off before the striker can recover his proper position. He should also receive the ball after the fielders have secured it, and it is his place to throw it at the stumps before the batsman can complete his intended run. Therefore, the fielder who may stop the ball, instead of throwing it at once to the wicket, should deliver it as quickly as possible into the hands of the wicket-keeper; otherwise, if he miss his aim and the ball pass by the wicket, the batsman may run again, and make as many more towards the score as if the ball had been again hit. The hands of the wicket-keeper should be protected by padded gloves, especially if the bowling be of the fast order. The watchful and ready attitude of the wicket-keeper are depicted in Fig. 4.

Balls which pass the wicket-keeper should be secured by Long-stop, who is stationed at some distance behind him for that purpose, as indicated in the diagram of the relative positions of the players, given in our previous paper. The other duties of long-stop and the rest of the fielders may be described in general terms. They must be on the vigilant look-out when the ball is delivered, that they may catch it or stop it as soon as possible, if it should chance to be struck that way. Quickness of eye, a firm hand for a catch, and good legs, the power to throw a ball straight to the wicket-keeper, and judgment not to *over-throw* it, are the essentials to a good fielder. Such a player is often able to render his side quite as good service as either the expert bowler or the batsman.



Fig. 4.—THE WICKET-KEEPER.

LESSONS IN BOTANY.—XIII.

SECTION XXIV.—ROSACEÆ, OR THE ROSE TRIBE (*continued*).

Let us now examine a rose, not so much for the sake of learning any new points respecting the flower, as for the sake of gradually making ourselves acquainted with the structure of such fruits as apples and pears.

Perhaps we had better commence with the fruits, as a rose flower has little to teach us. After the petals of a rose have all fallen away, there remains, as everybody knows, a flask-shaped

Here, then, the calyx, not being adherent, the fruits or carpels, although surrounding them, can readily be separated. But after the examples of botanical transformation which we have already seen, the reader will not be surprised at the information that, in certain members of the *rosæ* order, the calyx not only surrounds the carpels, but actually attaches itself to them; thus becoming, what we should term in ordinary language, a portion of the fruit. This is the case with apples and pears, which are composed each of five carpels, recognisable by the five seed-vessels closely enveloped in a fleshy calyx. What we term the



129. BLOSSOM, BUDS, AND LEAF OF THE BLACKBERRY (*RUBUS FRUTICOSUS*). 130. PEAR BLOSSOM. 131. SWEET BRIAR OR EGLANTINE (*ROSA RUBIGINOSA*). 132. APRICOT BLOSSOM (*ARMENIACA VULGARIS*). 133. BLOSSOM OF THE PEACH (*PERSICA VULGARIS*). 134. SCARLET BENNET, OR AVENS (*GEUM COCCINEUM*). 135. LADY'S MANTLE (*ALCHEMILLA*).

body, which contains little hairy prominences termed seeds in ordinary language. In reality, these are fruits, each containing a seed, and the external envelope in which they are contained is nothing more than the calyx. This peculiar conformation will be readily demonstrated by considering the various parts of a rose flower, and the changes which these parts undergo. If we open a rose flower, we see numerous stamens but no pistils. On looking still more attentively, the tops of pistils become evident, that is to say, their stigmas, but their styles are hidden. If a vertical section of the flower be now made, the stigmas will be seen to proceed from ovaries affixed, as already described, to the inside of the calyx, and hidden by the envelopment of the latter, which surrounds them on all sides, only a narrow throat-like opening being left at the top.

eye of an apple is nothing but the remains of the free part of the calyx enclosing withered stamens.

A precisely similar structure is observable in the pear (Fig. 130), the quince, and the mountain ash; the fruit of the last-named, indeed, resembles common apples in every respect except size and colour. The hawthorn is also a rosaceous plant, belonging to the sub-order *Pomeæ*; hence the structure of the fruit, *haws*, should resemble the structure of an apple. On a casual examination this does not seem to be the case, for whereas the apple contains internally some parchment-like cavities, the fruit of the hawthorn contains seeds covered by a hard strong investment, this is no other than a thickened condition of the parchment-like compartments of the apple.

The apple tribe (sub-order *Pomeæ*) is thus seen to be nearly allied to the roses proper; the almond tribe (sub-order *Amygdaleæ*), containing almonds, peaches, apricots, nectarines, plums, etc., is still more nearly allied, however little one might anticipate such resemblance from a casual examination of the fruit. The reader will remember that in the sub-order *Pomeæ*, the ovary, or lower portion of the united carpels, is inferior; that is to say, the calyx grows around it, adheres to it, and appears above it. In the rose proper no such adherence takes place; hence the ovary may be said to be *superior*; in *Amygdaleæ*, or the sub-order of *Rosaceæ*, containing almonds, plums, nectarines, etc., the ovary is also superior; hence the truth of our remark, that this sub-order was more nearly allied to roses proper than is the sub-order *Pomeæ*. If the flowers of peaches, plums, nectarines, etc., be examined, they will be found to be made up of a corolla of five petals, a calyx of five sepals, and numerous stamens arising from the sides of the calyx; these are all characteristics of the rose tribe. Instead, however, of many carpels, like the roses proper, the members of the almond tribe have each only one, which ripens into the sort of fruit termed by botanical writers a *drupe*, a term which has been fully explained. For another specimen of the rose tribe we refer the reader to Fig. 131.

Let us now examine the chemical and physiological characteristics of the *Rosaceæ*. The sub-order *Rosææ*, containing the roses proper, does not include one noxious plant. On the contrary, the strawberry yields us a delightful article of food, and the fruit of some species of rose is made into conserves. The leaves of this sub-order are usually astringent, and so in like manner are the petals; those of the garden roses are frequently used by medical men for the preparation of astringent draughts. Need we call attention to the fragrance of roses? That fragrance depends on the presence of a volatile oil, which admits of being extracted from the flower petals. It constitutes the otto or attar of roses.

The sub-order *Pomeæ* is also harmless, if we except the seeds and flowers of certain species which contain a minute amount of prussic acid; not sufficient, however, to be injurious. The fleshy part of pomaceous fruits is frequently an agreeable article of food, containing much sugar in the sweet varieties, and various acids, of which the malic is the principal. In the sub-order *Amygdaleæ* (Figs. 132 and 133), the amount of prussic acid, which becomes accumulated for the most part in the leaves, petals, and seeds, is often very great; nevertheless, the poisonous principle rarely extends to the fleshy pericarp or edible portion of the fruit. The seeds of the bitter almond, and the leaves of the common cherry laurel, furnish examples of a great accumulation of prussic acid in certain members of this beautiful sub-order, which is also further distinguished from *Rosææ* and *Pomeæ* by yielding gum, which the two latter never do.

Other plants belonging to the order *Rosaceæ* are represented by Figs. 134 and 135.

LESSONS IN GERMAN.—XXIII.

SECTION XLIII.—IDIOMATIC PHRASES.

1. Gern, gladly, freely, fain, etc. (comparative lieber, rather; see § 106. 1), with an appropriate verb, forms the equivalent of our phrase, "to be fond of, to like," etc., as:—Er trinkt gern Wein, he is fond of (drinking) wine. Er raucht gern, he is fond of smoking; or, he likes to smoke. Er trägt gern schöne Kleider, he likes (to wear) fine clothes. Ich möchte* gern wissen, ob mein Freund noch lebt, I would fain know whether my friend is still living. Ich möchte lieber gehen, als bleiben, I would rather go than stay. With haben it may often be rendered by "dear," as:—Ich habe meine Freunde gern, I hold (have) my friends "dear."

2. Nöthig haben signifies "to need, to have need of," as:—Haben Sie dieses Buch nöthig? do you need (have you need of) this book? Er hat Geld nöthig, he needs money; or, has need of money.

3. Im Stante sein signifies "to be able;" literally, "to be in the position or situation," as:—Sind Sie im Stante, zu schreiben? are you able to write? In this construction the verb dependent upon im Stante sein is often omitted, and the pronoun es is introduced (Sect. XXXV. 6), as:—Ich bin es nicht im Stante, I am not able.

4. Several words, as *sch, ja, schon, vielleicht, wohl, and zwar, etc.*, are often used with a signification different from their primary one, or where no corresponding one is employed in English, as:—Sind Sie vielleicht krank? are you (perhaps) sick? Werten Sie wohl morgen abreisen? is it true, shall you depart to-morrow? Er wird uns schon finden, he will already (doubtless) find us. Wenn er krank ist, so kann er nicht kommen, if he is sick, (then) he cannot come. Er liest nicht, und zwar, weil er kein Buch hat, he does not read, (and indeed) because he has no book. Gehen Sie ja nicht, do not go by any means. Es dürfte (see note) wohl so kommen, it might indeed so happen (come). Wollen Sie schon gehen? are you going already? Ja wohl, yes (certainly); or, yes, indeed. Ich glaubte, er könnte uns schon heute besuchen, I thought he could (already) visit us to-day. Er glaubte, er könnte sich wohl jetzt an ihm rächen, he thought he could now (indeed) avenge himself upon him.

5. The causative adverbs, *deßhalb* or *darwegen* (therefore), *dadurch* (thereby), etc., are frequently introduced into a leading sentence, where the corresponding English word is omitted, as:—Er ist deßhalb unzufrieden, weil sein Freund nicht hier ist, he is (therefore) discontented because his friend is not here.

6. *Schuldig* with *sein* signifies "to be indebted, to owe;" the word denoting the amount being put in the accusative (§ 132. 3), as:—Er ist mir nur einen Gulden schuldig, he owes me but one florin. Veranfen also signifies "to owe," but only in the sense of "to be obliged for, to ascribe to," as:—Ich veranfe meine Genesung der reinen Luft der Schweiz, I owe my recovery to the pure air of Switzerland.

VOCABULARY.

Abgeben, to deliver.	Führen, to conduct.	Sicher, safe, safely.
Ausführen, to carry out.	guide.	Stant, m. position (3).
Befehl, m. command.	Gegenstand, m. sub-ject.	Stuiren, to study.
Beherrschen, to govern, rule.	Gern, willingly (1).	Uebersetzen, to translate.
Erwart, m. Edward.	Grunt, m. ground.	Ungeu, unwillingly.
Erfahrung, f. experience, knowledge.	Heilen, to heal.	Unnüt, useless, fruitless.
Erklärung, f. explanation.	Leiden, to lend.	Verlesen, to finish, complete.
Fähig, able.	Nachen, m. boat, skiff.	Vorschlag, m. proposal.
Fam'lie, f. family.	Nöthig, necessary.	Warm, warm.
Folgen, to follow.	Nun, now.	Wunde, f. wound.
	Rauh, rough.	Zeichnung, f. drawing.

RÉSUMÉ OF EXAMPLES.

Er kommt nicht, und zwar, weil er krank ist.	He does not come (and indeed) because he is sick.
Mein Onkel s'ißt und mein Neffe jagt gern.	My uncle is fond of fishing, and my nephew of hunting.
Ich möchte gern wissen, wie viel Uhr es ist.	I would like to know what o'clock it is.
Freiheit, Gerechtigkeit, und Wahrheit sollten alle Menschen gern haben.	Liberty, righteousness, and truth all men should love.
Wieviel bin ich Ihnen schuldig?	How much do I owe you?
Er veranft sein Leben der Schnelligkeit seines Pferdes.	He owes his life to the fleetness of his horse.
Es ist Niemand im Stante, die Dauer seines Lebens voraus zu bestimmen.	There is no one able to predetermine the duration of his life.
Wohl läßt der Pfeil sich aus dem Herzen ziehen, doch nie wird der Verletzte mehr gesunden.	The arrow may indeed be drawn out of the heart, yet the injured (one) will never recover.
Wohl bessere Männer thun's dem Tell nicht nach. (Schiller.)	Better men do it not after the manner of Tell (as Tell did) (Schiller.)

Es war ein gutes Jahr, der Bauer kann schon wieder geben. (Schiller.) It has been a good year; the peasant can even (now) give again. (Schiller.)

EXERCISE 82.

1. Gehen Sie meinen Schwager gern? 2. Ja, ich sehe ihn gern. 3. Der Oheim möchte gern Gure Zeichnungen sehen. 4. Ich habe gern Freunde in meiner Nähe. 5. In meiner Jugend studirte ich sehr gern, aber nun thue ich es ungern. 6. Er spricht gern von seinen Reizen und seinen Erfahrungen. 7. Wenn Sie die Bücher nöthig haben, so leihe ich Ihnen dieselben von Herzen gern. 8. Er trennt sich ungern von seiner Familie. 9. Ich habe gern ein warmes Zimmer. 10. Kömmt ihr uns sicher über diesen Strom fahren? 11. Nein, wir sint es nicht im Stante, denn tiefer

* For conjugation of dürfen, können, mögen, etc., in the subjunctive, see § 83 (2). See also remarks connected with these conjugations.

Nachen ist zu klein. 12. Wenn sie fähig sind, viele Zeitungen zu übersetzen, so thun Sie es. 13. Da ich die englische Sprache vollkommen verstehe, so will ich gern Ihren Vorschlag annehmen. 14. Wenn er fähig ist, die Arbeit gut zu machen, so soll er zu mir kommen; ist er es aber nicht im Stande, so wäre es unnütz. 15. Er glaubte nicht, daß ich im Stande sein könnte, all seine Besuche auszuführen. 16. Wenn du keine Leuten schaffst ganz zu beherzigen weißt, so bist du zu beneiden. 17. Mein Freund Eduard war so schwach, daß er nicht im Stande war, allein zu gehen, und er bat mich deswegen, daß ich ihn führen möchte. 18. Er glaubte, daß Niemand im Stande sein könne, auf diesem rauhen Variere zu schreiben. 19. Er hatte gestern Geld nöthig, deshalb bat er mich, daß ich ihm welches geben möchte. 20. Er ist mir zwar schon einige Thaler schuldig, aber da er Geld nöthig hatte, so gab ich ihm welches. 21. Es ist Niemand im Stande auszugehen, weil es zu stark regnet. 22. Er wird bald im Stande sein, sein Werk zu vollenden. 23. Er kann sein Wort nicht halten, und zwar aus folgenden Gründen.

EXERCISE 83.

1. If he had not been able to perform the work, he would not have undertaken it. 2. Will he be able to fulfil his promise? 3. He has not been able. 4. We ought not to promise more than we are able to perform. 5. Are you able to deliver a better explanation upon this subject? 6. I am indeed able, but I have no time now. 7. Does the boy go for my stick freely? 8. If he goes, (then) he does it unwillingly; I would rather go myself. 9. Do you like to see your relations? 10. Yes, I do like to see them. 11. When you have need of those books, then I will lend you them freely. 12. He needed money yesterday, therefore he desired me that I would give him some. 13. Therefore, it is useless to ask for more, when you already own so much. 14. Who would not freely heal the wounds of a wounded heart?

SECTION XLIV.—CONDITIONAL MOOD.

The conditional mood is used, where a condition is supposed which may or may not be possible. It is also sometimes used in exclamation and interrogation, as:—Wenn sie noch lebte, wäre ich glücklich, if she were still living, I should be happy. Ich hätte die Sache anders gemacht, I should have arranged the matter differently. Wäre er doch noch am Leben! oh, that he were still alive! Wäre es möglich, Vater? could it be possible, father? (See § 144.)

VOCABULARY.

Anforderung, f. claim, demand.	Ersparen, to spare, avoid, save.	Schwierigkeit, f. difficulty.
Angelegenheit, f. transaction, affair.	Ferne, f. distance.	Strand m. strand, shore.
Anhaltend, persevering, continual.	Fest, n. feast.	Unannehmlichkeit, f. disagreeableness.
Ansicht, f. view, opinion.	Fortreißen, to carry (tear) away.	Verruß, m. vexation.
Auftreten, to step forth, appear.	Gegenwart, f. presence.	Verfeinern, to embellish, improve.
Befahren, to keep, retain.	Besuchen, to visit.	Verpflichten, to oblige.
Brücke, f. bridge.	Bleiben, to remain here.	Verwinnen, to vanish.
Einlassen, to engage.	Mittheilen, to impart, communicate.	Widerstreben, to contradict.
Entsprechen, to answer.	Schweigen, to be silent.	Zeltner, m. toll-gatherer.
	Schwerlich, hardly.	

RÉSUMÉ OF EXAMPLES.

Ich würde das Buch noch haben, wenn ich es nicht verloren hätte.	I should still have the book if I had not lost it.
Du würdest jetzt Freude empfinden, wenn Du deine Schuligkeit gethan hättest.	Thou wouldst now feel pleasure if thou hadst done thy duty.
Er würde bessere Freunde haben, wenn er aufrichtiger wäre.	He would have better friends if he were more sincere.
Wir würden Geld haben, wenn wir sparsamer wären.	We should have money if we were more economical.
Ihr würdet Trauer statt Freude haben, wenn das Kind gestorben wäre.	You would have sorrow, instead of joy, if the child had died.
Sie würden klüger handeln, wenn sie mehr Verstand hätten.	They would act more prudently if they had more understanding.
Er würde ein großes Vermögen besitzen, wenn er we'niger träge gewesen wäre.	He would possess a large fortune if he had been less slothful.

EXERCISE 84.

1. Ich hätte mir schon manchen Vertrau' erspart, wenn ich, statt zu widersprechen, geschwiegen hätte. 2. Ich möchte wissen, was Sie gethan hätten, wenn Sie an meiner Stelle gewesen wären. 3. Wenn das Capital mich nicht beunruhigt hätte, würde ich schwerlich zu diesen Ansichten gekommen sein. 4. Er hätte glücklich sein können, wenn er die Gelegenheit zu benutzen verstanden hätte. 5. Hätte das Wasser die Brücke mit fortgerissen, so wäre der Keller verloren gewesen. 6. Hätte ich zu Dir kommen können, so würde ich gewiß nicht hier geblieben sein. 7. Es wüßten Sie große Männer aufgetreten sein, wenn sie sich durch Schwierigkeiten und Unannehmlichkeiten hätten aufhalten lassen. 8. Wenn ich das hätte erreichen wollen, was ich wünschte, so hätte ich fleißiger und anhaltender arbeiten müssen. 9. Wenn er gewesen hätte, würde ich ihn gebitt haben. 10. Wir wollen nicht ausgehen; es möchte regnen. 11. Wenn Sie mir etwas Näheres über diese Angelegenheiten mittheilen wollten, so würden Sie mich verpflichten. 12. Es wäre meine größte Freude, alle Menschen glücklich zu sehen. 13. Ich hätte ohne Verstand sein müssen, wenn ich mich auf diese Sache hätte einlassen wollen. 14. Verschwinden ist der Strand in der Ferne; O wie gerne wär, ich noch im Vaterland! 15. Wenn er wäre, wie ich ihn wünsche, und wenn er allen meinen Anfechtungen entgegen hätte, so würde ich ihn behalten haben.

EXERCISE 85.

1. Had your friend not become ill, he would certainly have embellished the feast by his presence. 2. If you were more prudent you would not have met with this inconvenience. 3. I would have settled your business if you had mentioned it to me. 4. His brother would have been better received if he had had letters of recommendation. 5. He would have better friends if he were more agreeable. 6. You would have had more difficulties if you had not followed the advice of your friends. 7. I should not have the least doubt that you would have succeeded if you had acted more prudently. 8. We should set sail for Holland if we had a fair wind. 9. He would be the first among our merchants if he were more sociable. 10. If I had had the power, I should have acted in another manner, because I should not have had so much patience. 11. What would be the felicity of man if he always sought his happiness in himself? 12. You would be richer if you were more enterprising. 13. If I had not lost my purse I should still have it. 14. He would not have so much money if he had been idle. 15. The greater the difficulty, the greater pleasure there is in overcoming it. 16. If he had not crossed the bridge, the toll-gatherer would not have demanded payment.

LESSONS IN MUSIC.—VII.

EVERY art is best taught individually. It is true that there are some advantages to the singer in collective teaching. The "sympathy of numbers" both aids and encourages him. But his progress will depend entirely on individual attention and endeavour. In most classes the few make progress and lead, while the many—some from timidity, and others from idleness and inattention—hang upon the leaders, and soon begin to clog their movements. As, however, singing for schools and congregations must be generally taught in classes, the object of the teacher must be to combine the spirit and sympathy of numbers with as careful an attention to individual progress as possible. He should also occasionally separate the lagger from the more forward, and (without blaming or discouraging them) cause them to retrace their steps and go by themselves, while the others are advancing freely and rapidly in a new class. For these purposes, the pupil should be led to expect a *rigid personal examination* at the close of each stage of progress, and a division of the class as the result. Several lesson hours should be devoted to this examination. It might be conducted in a separate room, while the rest of the class are practising. In adult classes, most of the questions might be announced to the class, and the answer given in writing at the time, and they would only require *separate examination* in connection with the exercises. The examiner would then decide by the result of the two examinations. A register of each examination should be kept by the teacher, and a memorial of it given to the pupil. To aid both the self-teacher and the class-teacher, the following questions and tests of progress are given:—Let no one consider himself worthy to pursue the course further until he has thoroughly fulfilled these requirements. Things to be done are marked by an asterisk. These especially must not be omitted.

QUESTIONS AND TESTS OF PROGRESS ON THE "FIRST STAGE."

[The questions are to be answered from book over and over again until they can be also answered from memory.]

LESSON 1 (page 27).

1. What were the reasons that encouraged "our friend" to think that he had a voice? What kind of road to music do we offer? What are the conditions of admission to it?

2. What is the difference between *high* and *low* in music?

3. What must be chosen and fixed before the notes which may be introduced into a tune are distinctly ascertained? What is this arrangement of notes called, and by what primary laws is it regulated? On what grounds do we call it the scale of all nations and of all times?

4. What is a musical interval? Is it a distance in time? in space? in what?

* 5. Draw from memory a diagram of the scale, with the sol-fa syllable to represent the notes, marking carefully the two shorter distances.

6. What is the general character of the 1st, 3rd, and 5th of the scale? How is the voice *tuned*?

* 7. Sol-fa and point on the diagram, from memory, Exercises 1, 2, 3, 4.

LESSON 2 (page 90).

1. Give an account of the first experiments on the sounds of a single string. What note does half a string give?—two-thirds?—three-fourths?—four-fifths?—etc.

2. Describe the "siren." What is the relation of a note's length of string to its vibrations?

3. What is the smallest perfect measurement of the scale in plain figures, and according to that how many degrees belong to the great tone?—small tone?—tonule?

4. What is an "octave" note or "replicate"?

* 5. Sol-fa and point on the diagram of the scale, from memory, Exercises 5, 6, 7, 8.

LESSON 3 (page 145).

* 1. Explain the two sets of tetrachords. Arrange them by memory, taking coins to represent your notes.

2. By what intervals are the tonules of the scale always separated from one another? Show this by drawing a circular diagram.

* 3. Draw a modulator from memory. (Notice that the right-hand column takes its DOH from the level of SOH, the left from FAH.)

4. Explain fully the three great advantages of the modulator, its picture of interval; its mnemonic (or memory-helping) power; and its aid to the pattern.

5. What is the effect of a "mental modulator" on the horizontal line of notes?

6. Give three reasons for learning an "interpreting notation" of music in connection with the other.

7. What is accent? How many sorts of accent are there?

8. What is a measure?—an aliquot?

9. What is the structure of the BINARY MEASURE, and what is its character? TRINARY? QUATERNARY? SENARY?

10. Give Dr. Bryce's views of the origin of our sense of Rhythm, and its connection with the heart and lungs?

LESSON 4 (page 211).

* 1. Sol-fa and point on the modulator, from memory, Exercises 9, 10, 11, 12, 13, 14.

LESSON 5 (page 273).

1. What are the three different senses in which the word *time* is used in ordinary musical language? Give examples of each.

2. What is the peculiarity in the swings of the pendulum? What regulates the speed of a pendulum?

3. Describe the "metronome." With what is it proposed that each swing of the metronome should correspond in the binary, trinary, and quaternary measure?—in quick senary measure?

4. How would you use the string pendulum?

5. In learning to "keep time," what is the double object to be gained? Will *beating* time help you?

6. Describe the views of Rousseau, Dr. Burney, and Dr. Bryce on "beating" time.

7. What is the standard by which the length of notes is measured in the sol-fa notation? What proportion of time

belongs to a note placed alone immediately after an accent mark? What is the meaning of the horizontal stroke?—the dot after a note?—the comma?—the dot and comma?—the inverted comma? What means an empty aliquot?

8. How do you indicate a slur?

9. Explain the meaning of the following signs:—D.C., D.S., S., F., f., p., ff., pp., <, >, and ' over a note.

10. How would you indicate "expression" in writing or printing words?—loud?—soft?—abrupt?

11. Take a book of hymns or songs, and mark ten pieces for expression. [This is a really important and useful exercise of judgment and taste.]

12. What are the vibrations of the TENOR C—the standard note of pitch? Draw a diagram of the standard scale. What is meant by G sharp? B flat?

* 13. Pitch the key-note A—G—F—E—D, and take the chord in each case.

LESSON 6 (page 339).

* 1. Point on the modulator by memory, and afterwards sing to words the tune GRIFFIN.

2. What is the difference between the sound of the voice in speaking and in singing? What is a sound of the singing voice called?—of the speaking voice?

3. What is the best posture for the singer in reference to his head?—shoulders?—chest?—mouth?—tongue?—lips?

4. What is the first daily practice for opening and strengthening the lungs? How should the chord and scale be sung, and with what two peculiar observances, in this daily practice?

5. What three faults should be especially avoided by the singer?

6. What habit, in reference to loudness and softness of voice, should be carefully formed?

7. In what respects would you alter your phraseology and mode of illustration if you had to set the facts and principles of this first "stage" of our course before the minds of the young, or persons dull of comprehension? [It will be a good exercise of mind for you to answer this question. It will be better still for you to do so practically. Teach what you know. There is no better way of perfecting your knowledge.]

8. What are the advantages and disadvantages of class teaching? Show the importance of personal effort and examination.

* 9. Sing a high note with the low larynx,—a low note with the high larynx.

* 10. Sing (taking a very low note for DOH) DOH, ME, SOH, DON, ME', and if you can without straining the voice, SOH, holding each note with a long and steady breath. [You should be more anxious about the chord than the scale in the present stage of your course; for you may not yet have got all the notes of the scale quite perfectly in tune.]

* 11. Repeat slowly and very distinctly (with good use of tongue, lips, and teeth), and in one breath, "How doth the little busy bee improve each shining hour." Take two more lines in another breath, and so on.

* 12. Point and sing the tune LEBURN from memory on the modulator.

LESSONS IN FRENCH.—XXVI.

SECTION XLV.—THE PASSIVE VERB [§ 54].

1. THE passive verb is conjugated by adding to the verb *être* in all its tenses, the past participle of an active verb. See model, § 54.

2. This participle must agree in gender and number with the subject [§ 134 (2), Sect. XLI. 6].

Ces vieillards sont respectés, Those old men are respected.
Ces enfants sont aimés de tout le monde, Those children are loved by everybody.

3. The genius of the French language seems to prefer the active to the passive voice. Many expressions which are in the passive in English, are accordingly rendered into French by the active or reflective [§ 128 (5), § 113 (1)].

Cette maison est à louer ou à vendre, That house is to be let or sold.

Ma sœur est à plaindre, My sister is to be pitied.
Cet homme est à craindre, That man is to be feared.

Cet homme s'appelle H. [Sect. That man is called H.

Cet homme se trompe [Sect. *That man is mistaken.*
XXXVII. 2],
On dit que cela est ainsi [Sect. *It is said that it is so.*
XXXIV. 2].
On nous a dit cela [Sect. XXXIV. 2]. *We have been told that.*

4. In an answer to a question [see Sect. XXIII. 12], the pronoun *le* corresponds in signification with the English word *so* or *it*, expressed or understood. *Le* refers then to a noun not determined (not preceded by an article or a possessive adjective), to an adjective, to a verb, or even to a whole sentence.

Ces enfants sont-ils aimés? *Are those children loved?*
Il ne le sont pas, *They are not (so).*
Ces demoiselles sont-elles sœurs? *Are those young ladies sisters?*
Elles ne le sont pas, *They are not.*

5. When *le* refers to a determined noun, it often corresponds in signification to the pronoun *he, she, or they*, which may or may not be expressed in the English sentence. *Le* must then assume the gender and number of the noun to which it refers.

Êtes-vous la sœur de mon ami? *Are you the sister of my friend?*
Je la suis, *I am (she).*

RÉSUMÉ OF EXAMPLES.

Leur conduite est-elle approuvée? *Is their conduct approved?*
Elle n'est approuvée de personne. *It is approved by nobody.*
Cette dame est-elle estimée et respectée? *Is that lady esteemed and respected?*
Elle n'est ni estimée ni respectée. *She is neither esteemed nor respected.*
Ces marchandises sont à vendre. *Those goods are to be sold (for sale).*
Ces enfants sont bien à plaindre. *Those children are to be pitied.*
A-t-on dit quelque chose à mon frère? *Has anything been said to my brother?*
On ne lui a rien dit. *Nothing has been said to him.*
Savez-vous comment cela s'appelle? *Do you know how that is called?*
Madame, êtes-vous maîtresse ici? *Madame, are you mistress here?*
Je ne le suis pas, Monsieur. *I am not (so), Sir.*
Êtes-vous la maîtresse de la maison? *Are you the mistress of the house?*
Je la suis. *I am (she).*

VOCABULARY.

S'appeler, 1, <i>pec.</i> , to be called [§ 49 (4)].	Diligent, -e, <i>diligent.</i>	Paresseux, -se, <i>idle.</i>
Auteur, m., <i>author.</i>	Écolier, m., <i>scholar.</i>	Punir, 2, to punish.
Blâmer, 1, to blame.	Gros, -se, <i>large, stout.</i>	Rarement, <i>seldom.</i>
Car, <i>for.</i>	Jardin, m., <i>garden.</i>	Relieur, m., <i>bookbinder.</i>
Conduite, f., <i>conduct.</i>	Louer, 1, to let, to praise.	Souvent, <i>often.</i>
Croi-re, 4, ir., to behave.	Mère, f., <i>mother.</i>	Us-er, 1, to wear out.
		Ven-dre, 4, to sell.

EXERCISE 85.

1. Votre mère est-elle aimée de sa sœur? 2. Elle est aimée de son frère et de sa sœur. 3. Les Italiens sont-ils aimés des Français? 4. Vos écoliers ne sont-ils pas blâmés? 5. Ils sont blâmés quelquefois. 6. Sont-ils souvent punis? 7. Ils sont rarement punis. 8. Par qui êtes-vous puni quand vous êtes paresseux? 9. Je ne suis jamais puni. 10. Sa conduite a-t-elle été approuvée? 11. Elle a été approuvée de tout le monde. 12. Elle a été approuvée par ses amis. 13. Cet auteur est-il estimé? 14. Il est estimé de tout le monde. 15. Le jardin du relieur est-il à vendre ou à louer? 16. On dit qu'il est à louer. 17. Le menuisier a-t-il fait faire un habit? 18. Il en a fait faire deux. 19. Les habits que vous avez achetés sont-ils usés? 20. Ils sont usés, j'en ai fait faire d'autres. 21. Dit-on que nos amis sont aimés de tout le monde? 22. On ne le dit pas, car on ne le croit pas. 23. Les dames que nous avons vues à l'église hier au soir, sont-elles sœurs? 24. Elles ne le sont pas, on dit qu'elles sont cousines. 25. On dit que l'officier qui vient d'arriver s'appelle S.

EXERCISE 86.

1. Are you blamed or praised? 2. I am neither blamed nor praised. 3. Is not your cousin esteemed by everybody? 4. She is esteemed by nobody. 5. What has been said of my brother? 6. Nothing has been said of him. 7. Do you know if your brother's house is to be let? 8. I have been told (on m'a dit) that it is to be sold. 9. Is not an idle person to be pitied? 10. The idle man is to be pitied. 11. Is your son sometimes punished at school? 12. He is always punished when he is idle. 13. Are your scholars praised when they are diligent? 14. They are praised when they are diligent, and they are blamed when they are idle. 15. Is that lady esteemed and respected? 16.

She is loved, esteemed, and respected by everybody. 17. What has been told you? 18. We have been told that your brother is respected by everybody. 19. Madam, are you Mr. S.'s sister? 20. No, Sir, I am not. 21. Madam, are you pleased with your son's conduct? 22. No, Sir, I am not, for he is blamed by everybody. 23. What is that stout man called? 24. They say he is called H. 25. What is your brother's name? 26. He is called James. 27. Have you been told that my brother has arrived? 28. We have been told so. 29. Are the goods which your brother has bought for sale? 30. They are not for sale? 31. Has the bookbinder had a coat made? 32. He has had a coat made. 33. Is his other coat worn out? 34. The coat which he bought last year is worn out.

SECTION XLVI.—IDIOMATIC EXPRESSIONS.

1. In the compound tenses of the verb *s'en aller*, to go away [Sect. XXXIX. 1, 2], the pronoun *en* will of course keep its general place, after the other pronouns and before the auxiliary. It must never come between the auxiliary and the participle.

Je m'en suis allé, <i>I went away.</i>	Nous nous en sommes allés, <i>We went away.</i>
Tu t'en es allé, <i>Thou wentest away.</i>	Vous vous en êtes allés, <i>You went away.</i>
Il s'en est allé, <i>He went away.</i>	Ils s'en sont allés, <i>They went away.</i>

Les dames s'en sont allées, *The ladies are gone away.*
Les messieurs s'en sont allés, *The gentlemen are gone away.*

2. The verb *aller*, when referring to articles of dress, answers to the English to fit, to set.

Mon habit va bien, *My coat fits or sets well.*

3. Soir [4, ir.; see table, § 62] answers to the English to suit, to become.

Ce chapeau ne vous sied point, *That hat does not become you.*

4. Essayer [§ 49] corresponds in signification to the English to try on.

J'ai essayé mon gilet, il me va bien, *I have tried on my waistcoat, it fits me well.*

5. Être is often used in French for appartenir, to belong [§ 106 (3)].

À qui est cette maison? *{ To whom does that house belong?*
Elle est à mon cousin, *{ Whose house is that?*
It is my cousin's.

RÉSUMÉ OF EXAMPLES.

À quelle heure vous en êtes-vous allé? *At what hour did you go away?*
Je m'en suis allé à neuf heures. *I went away at nine o'clock.*
Vous en êtes-vous allées trop tôt, Mesdames? *Did you go away too soon, ladies?*
Nous nous en sommes allées trop tard. *We went away too late.*
Cette robe vous va-t-elle bien? *Does that dress fit you well?*
Elle ne me va pas bien. *It does not fit me well.*
Cet habit vous sied-il fort bien? *Does that coat become you very well?*
Je l'ai essayé, mais il ne va pas bien. *I have tried it on, but it does not fit me.*
Il lui va bien (indirect regimen). *It fits him well.*
Il me gêne, il me serre trop. *It hurts me, it presses me too much.*
Cette robe ne lui va pas bien. *That dress does not fit her well.*
Ces livres sont-ils à vous ou à moi? *Are those books yours or mine?*
Ils ne sont ni à moi ni à vous. *They belong neither to me nor to you.*
À qui sont-ils donc? *Whose are they, then?*
Les livres de qui avez-vous apportés? *Whose books have you brought?*
J'ai apporté ceux de mon frère. *I have brought my brother's.*

VOCABULARY.

Beau-frère, brother-in-law.	Foncé, -e, <i>dark.</i>	Mieux, <i>better.</i>
Botte, f., <i>boot.</i>	Gên-er, 1, to hurt, to press.	Neuf, -ve, <i>new.</i>
Clair, -e, <i>light.</i>	Gilet, m., <i>waistcoat.</i>	Où, <i>where.</i>
Court, -e, <i>short.</i>	Grand, -e, <i>large.</i>	Serr-er, 1, to press.
Étroit, -e, <i>narrow, tight.</i>	Large, <i>wide.</i>	Ten-ir, 2, ir., to hold.
		Vers, towards, about.

EXERCISE 87.

1. Vos bottes ne vont-elles pas bien? 2. Elles ne me vont pas bien, elles me serrent trop. 3. Sont-elles trop étroites? 4. Elles sont trop étroites et trop courtes, elles me gênent. 5. Le cordonnier s'en est-il allé? 6. Il ne s'en est pas encore allé. 7. À quelle heure les compagnes de votre sœur s'en sont-elles

* The prepositions *de* and *par* are used indifferently after many passive verbs.

allées? 8. Elles s'en sont allées vers six heures de l'après-midi. 9. L'habit que vous tenez, est-il à vous ou à votre frère? 10. Il n'est ni à lui ni à moi, il est à mon beau-frère. 11. Lui va-t-il bien? 12. Il lui va fort bien, et il lui sied bien. 13. Où l'a-t-il fait faire? 14. Il l'a fait faire en France ou en Allemagne. 15. À qui sont les livres que lit Mademoiselle votre sœur? 16. Ils sont à moi. 17. Votre gilet va-t-il mieux que celui de votre beau-frère? 18. Il me va beaucoup mieux. 19. Votre habit ne vous gêne-t-il pas? 20. Il ne saurait (*cannot*) me gêner, il est de beaucoup trop large. 21. Avez-vous essayé votre habit neuf? 22. Je l'ai essayé, mais la couleur ne me sied pas. 23. Est-elle trop claire? 24. Elle est trop foncée. 25. Les couleurs foncées ne me siéent jamais.

EXERCISE 88.

1. Are your friends gone away? 2. They are not yet gone away, they are still here. 3. At what hour did your mother go away? 4. She went away early this morning. 5. Did your little sister go away late? 6. She went away too soon. 7. Does your sister's new dress become her? 8. It does not become her. 9. Why does it not become her? 10. Dark colours never become her. 11. Do light colours become your brother's wife? 12. They become her very well. 13. Are your new boots too narrow or too wide? 14. They are neither too narrow nor too wide, they fit very well. 15. Does your brother's waistcoat fit him? 16. It fits him, but it does not become him. 17. Light colours never become him. 18. Does your coat press you? 19. It does not press me, it is by far too wide. 20. Whose house is that? 21. It is my father's and brother's. 22. Whose books have you brought this morning? 23. I have brought my brother's and my sister's. 24. Whose dresses are those? 25. They are my mother's, my sister's, and my cousin's. 26. Are not those German books yours? 27. They are not mine, they are my friend's. 28. Are those pens yours or mine? 29. They are neither yours nor mine, they are my brother's. 30. Does this hat fit you? 31. Yes, Sir, it fits me, but it does not become me. 32. Is your hat too small? 33. It is too large. 34. Are your gloves too large? 35. They are too small, I cannot put them on.

SECTION XLVII.—UNIPERSONAL VERBS AND THEIR USES.

1. The verb *falloir* [3, ir.], *to be necessary*, is always conjugated unipersonally. See table, § 62.

Il faut, it a fallu, *It is necessary, it was or has been necessary.*

Il faut étudier tous les jours, *It is necessary to study every day.*

2. As *falloir* has always a unipersonal pronoun for its nominative or subject, a pronoun in the indirect regimen (*dative*—me, te, lui, nous, vous, leur), placed before the verb, will be equivalent to the pronoun used as nominative to the English verbs *must, to be obliged, etc.*

Il me faut écrire un thème, *I must write an exercise.*
Où nous faut-il aller? *Where must we go?*

3. *Falloir* is used in the signification of *to want, to need, to be under the necessity of having.*

Il me faut un livre, *I need a book.*
Il lui faut de l'argent, *He is in want of money.*

4. When *must* is used in the last acceptation, and has a noun as its nominative, the noun in the corresponding French sentence should be in the indirect regimen preceded by *à*.

Il faut un livre à ma sœur, *My sister must have a book (needs a book).*

RÉSUMÉ OF EXAMPLES.

Four apprendre une langue il faut étudier, *To learn a language it is necessary to study.*

Il faut aller à l'église et à l'école. *It is necessary to go to church and to school.*

Il faut rester à la maison. *It is necessary to remain at home.*

Il me faut lire un bon livre.* *I must read a good book.*

Il lui faut aller voir sa mère. *She must go and see her mother.*

Que nous faut-il faire? *What must we do?*

Que leur faut-il lire? *What must they read?*

Que leur faut-il? *What do they want or need?*

Il leur faut de l'argent ou du crédit. *They need or must have money or credit.*

* Another construction of these sentences will be found in Sect. XXI, 1, 2.

Vous faut-il cinquante francs?

Do you want or must you have fifty francs?

Il me faut cinquante-cinq francs. *I must have or I need fifty-five francs.*
Combien d'argent faut-il à votre père? *How much money does your father want?*

Il lui en faut beaucoup.

He wants much (of it).

Nous avons ce qu'il [R.3] nous faut.

We have what we want.

VOCABULARY.

Aller trouver, <i>to go to a person.</i>	Désirer, 1, <i>to wish, to desire.</i>	Main de papier, f., <i>a quire of paper.</i>
Centime, m., <i>100th part of a franc.</i>	Dette, f., <i>debt.</i>	Modiste, milliner.
Chirurgien, m., <i>surgeon.</i>	Envoy-er, 1, ir. [§ 49 (2)], <i>to send.</i>	Ouvrage, m., <i>work.</i>
Combien, <i>how much, how many.</i>	Fin-ir, 2, <i>to finish.</i>	Payer, 1, pec. [§ 49 (2)], <i>to pay.</i>
Davantage, <i>more.</i>	Fort, <i>very, very much.</i>	Peine, f., <i>trouble.</i>
		Quand, <i>when.</i>

EXERCISE 89.

1. Que faut-il faire aujourd'hui? 2. Aujourd'hui il faut travailler. 3. A-t-il fallu travailler fort pour finir l'ouvrage à temps? 4. Il a fallu travailler toute la journée. 5. Quand faut-il écrire à notre ami? 6. Il faut lui écrire aujourd'hui. 7. Me faut-il aller trouver mon père? 8. Il vous faut aller le trouver, il désire vous parler. 9. A-t-il besoin de quelque chose? 10. Il lui faut des livres, des plumes, et de l'encre. 11. Ne lui faut-il pas aussi de l'argent? 12. Il lui en faut beaucoup pour payer ses dettes. 13. Vous faut-il encore quelque chose? 14. Il ne me faut plus rien, j'ai tout ce qu'il me faut. 15. Ne faut-il pas du papier à votre sœur? 16. Il ne lui en faut pas davantage.* 17. Que faut-il envoyer au chirurgien? 18. Il faut lui envoyer de l'argent, il en a grand besoin. 19. La modiste a-t-elle tout ce qu'il lui faut? 20. Elle n'a pas tout ce qu'il lui faut. 21. Combien vous faut-il? 22. Il me faut cinq francs. 23. Ne vous faut-il pas davantage? 24. Il ne me faut pas davantage. 25. Que lui faut-il pour sa peine? 26. Il demande un franc vingt-cinq centimes.

EXERCISE 90.

1. What must we do? 2. You must bring your book and learn your lesson. 3. Is it necessary to write to your brother to-day? 4. It is not necessary to write to him. 5. Has it been necessary to speak to your father? 6. It has been necessary to speak to him. 7. Is it necessary to go to D. to-day? 8. It is necessary to go there (y). 9. Must I go to your sister? 10. You must go to her, she wishes to speak to you. 11. How much money must your brother have? 12. He must have ten francs fifty centimes. 13. How many books does your sister want? 14. She must have many books, she reads (*lit*) much. 15. What will you send to the surgeon? 16. We must send him our horse; his own (*le sien*) is sick. 17. Must he not have paper? 18. He must have some; he has letters to write. 19. Must he have much? 20. He must have a quire. 21. Do you want anything more? [See No. 13, in the French exercise above.] 22. I need something more. 23. I need nothing more. 24. Must you have one hundred francs? 25. I must have ten dollars. 26. What does the surgeon want? 27. He must have money to (*pour*) pay his debts. 28. Has the tailor all that he wants? 29. He has not all that he wants. 30. The milliner has received all that she wants. 31. What must you have for your trouble? 32. How much do you want? 33. How much do we want? 34. What must I do? 35. You must write a letter. 36. What must she write? 37. She must write four pages. 38. She must go to church.

READING AND ELOCUTION.—XIII.

ANALYSIS OF THE VOICE (*continued*),VIII.—CORRECT INFLECTION (*continued*).

Both inflections, the Rising and the Falling, in connection.

Rule 1.—When negation is opposed to affirmation, the former has the rising, the latter the falling inflection, in whatever order they occur, and whether in the same or in different sentences, as:—

He did not call *mé*, but you.

He was esteemed not for wealth, but for wisdom.

Study not for amusement, but for improvement.

* This adverb can never be placed before a substantive.

He called you, not me.

He was esteemed for wisdom, not for wealth.

Study for improvement, not for amusement.

This proposal is not a mere idle compliment. It proceeds from the sincerest and deepest feelings of our hearts.

Howard visited all Europe, not to survey the sumptuousness of palaces, or the stateliness of temples; not to make accurate measurements of the remains of ancient grandeur; not to form a scale of the curiosities of modern art; not to collect medals or collate manuscripts; but to dive into the depths of dungeons; to plunge into the infection of hospitals; to survey the mansions of sorrow and pain; to take the gauge and dimensions of misery, depression, and contempt; to remember the forgotten, to attend to the neglected, to visit the forsaken, and to compare and collate the distresses of all men in all countries.

Note.—A similar principle applies to the reading of concessions and of unequal antitheses or contrasts. In the latter, the less important member has the rising, and the preponderant one the falling inflection, in whatever part of a sentence they occur, and even in separate sentences, as:—

Science may raise you to éminence. But virtue alone can guide you to happiness.

I rather choose

To wrong the dead, to wrong myself and you,
Than I will wrong such honourable men.

Exception.—When negation is emphatic or preponderant, it takes the falling inflection, as:—

He may yield to persuasion, but he will never submit to force.

We are troubled on every side, yet not distressed; perplexed, but not in despair; persecuted, but not forsaken; cast down, but not destroyed.

Rule 2.—In question and answer, the falling inflection ends as far below the average level of the sentence, as the rising ends above it. In this way, a certain exact correspondence of sound to sound, in the inflections, is produced, which gives to the full downward slide of the answer a decisive and satisfactory intonation, as a reply to the rising slide of the question, as:—

Are they Hébrews?—So am I. Are they 'Israelites?—So am I.

What would content you, in a political leader?—Talent? No!—Enterprise? No!—Courage? No!—Reputation? No!—*Virtue? No!—The man whom you would select, should possess not one, but all of these.

Rule 3.—When a question consists of two contrasted parts, connected in syntax by the conjunction *or*, used in a disjunctive sense, the former has the rising, and the latter the falling inflection, as:—

Does he mean you, or me?

Is this book yours, or mine?

Did you see him, or his brother?

Are the people virtuous, or vicious; intelligent, or ignorant; affluent, or indigent?

Note.—When *or* is used conjunctively, the second inflection does not fall, but rises higher than the first, as:—

Would the influence of the Bible—even if it were not the record of a divine revelation—be to render princes more tyrannical, or subjects more ungovernable; the rich more insolent, or the poor more disorderly; would it make worse parents or children—husbands or wives—masters or servants—friends or neighbours? Or would it not make men more virtuous, and consequently more happy, in every situation?

Rule on the Circumflex, or Wave.

The circumflex, or wave, applies to all expressions used in a peculiar sense, or with a double meaning, and to the tones of mockery, sarcasm, and irony, as:—

You may avoid a quarrel with an if. . . . Your if is the only peacemaker: much virtue in an if.

From the very first night—and to say it I am bold—

I've been so very hot, that I'm sure I've caught cold!

Go hang a calfskin on these recreant liubs!

What a beautiful piece of work you have made by your carelessness!

The weights had never been accused of light conduct.

* In successive questions, the rising inflection becomes higher at every stage, unless the last has, as in the above example, the falling inflection of consummating emphasis.

† The last *or* is used disjunctively, and forms an example to the Rule, and not to the Note.

Rule on the Monotone.

The tones of grand and sublime description, profound reverence or awe, of amazement and horror, are marked by the monotone, or perfect level of voice.

Note.—A monotone is always on a lower pitch than the preceding part of a sentence; and to give the greater effect to its deep solemn note—which resembles the tolling of a heavy bell—it sometimes destroys all comma pauses, and keeps up one continuous stream of overflowing sound, as:—

His form had not yet lost

All her original brightness, nor appeared

Less than archangel ruined, and the excess

Of glory obscured. As when the sun, now-risen,

Looks through the horizontal misty air,

Shorn of his beams, or from behind the moon,

In dim eclipse, disastrous twilight sheds

On half the nations, and with fear of change

Perplexes monarchs.

And I saw a great white throne and Him that sat on it, from whose face the heavens and the earth fled away; and there was found no place for them.

Upon my secure hour thy uncle stole,

With juice of cursed hébenon in a vial,

And in the porches of mine ears did pour

The feverous distilment; whose effect

Holds such an énimity with blood of man,

That swift as quicksilver it courses through

The natural gates and alleys of the body,

And, with a sudden vigour, it doth posset

And curd, like éager droppings into milk;

The thin and wholesome blood; so did it mine;

And a most instant tetter barked about,

Most lazar-like, with vile and loèthsome crust,

All my smooth body.

Rule on "Harmonic" Inflections.

"Harmonic" inflections—or those which, in emphatic phrases, are intended to prevent the frequent occurrence of emphasis in the same phrase from becoming monotonous to the ear—are applied in clauses of which every word is emphatic, and are marked by a distinct and separate inflection, as:—

He has been guilty of one of the most shameful acts that ever degraded the NATURE or the NAME of MAN.

Note.—In such cases the inflections usually alternate, in order to give the more vivid and pungent force to vehement emphasis.

Rule on Repeated Words, Phrases, and Sentences.

Words, phrases, and sentences which are repeated for effect, rise higher, or fall lower in inflection, besides increasing in force, at every repetition.

From these walls a spirit shall go forth, that shall survive when this edifice shall be, "like an unsubstantial pageant, faded." It shall go forth, exulting in, but not abusing, its strength. It shall go forth, remembering, in the days of its prosperity, the pledges it gave in the time of its depression. IT SHALL GO FORTH, uniting a disposition to correct abuses, to redress grievances. IT SHALL GO FORTH, uniting the disposition to improve, with the resolution to maintain and defend, by that spirit of unbought affection, which is the chief defence of nations.

What was it, fellow-citizens, which gave to Lafayette his spotless fame?—The love of Liberty. What has consecrated his memory in the hearts of good men?—THE LOVE OF LIBERTY. What nerved his youthful arm with strength, and inspired him in the morning of his day with sagacity and counsel?—THE LIVING LOVE OF LIBERTY. To what did he sacrifice power, and rank, and country, and freedom itself?—TO THE LOVE OF LIBERTY PROTECTED BY LAW.

LESSONS IN PENMANSHIP.—XXVI.

WITH this lesson, which is accompanied by copy-slips headed by the remaining capital letters of the writing alphabet, from S to Z, we complete our elementary series of Lessons in Penmanship, having enabled the self-teacher, by an easy and carefully graduated succession of steps, to advance from the formation of the first elementary stroke that enters into the composition of the small letters, to writing sentences in which are to be found capital letters and figures, as well as small letters. We have now done as much for him as it is possible to do by verbal instruction, and it remains for the learner to acquire an easy, flowing style of writing, and facility and rapidity in the use of

Smeaton built the Eddystone Lighthouse.

COPY-SLIP NO. 99.—SMEATON BUILT THE EDDYSTONE LIGHTHOUSE.

The art of printing, invented by Koster, 1438.

COPY-SLIP NO. 100.—THE ART OF PRINTING INVENTED BY KOSTER, 1438.

Ulm in Germany.

COPY-SLIP NO. 101.—ULM IN GERMANY.

Victoria Regina, 1837.

COPY-SLIP NO. 102.—VICTORIA REGINA, 1837.

Wellington, born 1769, died 1852.

COPY-SLIP NO. 103.—WELLINGTON, BORN 1769, DIED 1852.

Xeres, chief seat of the wine trade in Spain.

COPY-SLIP NO. 104.—XERES, CHIEF SEAT OF THE WINE TRADE IN SPAIN.

Yarmouth, in Norfolk, famous for its herrings.

COPY-SLIP NO. 105.—YARMOUTH, IN NORFOLK, FAMOUS FOR ITS HERRINGS.

Zollverein, the German Customs Union, 1818.

COPY-SLIP NO. 106.—ZOLLVEREIN, THE GERMAN CUSTOMS UNION, 1818.

his pen by building, by zealous practice, on the foundation that we have assisted him to lay, by means of the copy-slips and the instructions that have been brought under his notice in the present series of lessons. In some future Lessons in Writing we will give specimens of the various styles of writing which are required for commercial purposes and for candidates for the Civil Service Examinations, etc.

HISTORIC SKETCHES.—XIII.

HOW A LONDON JURY A TRUE VERDICT GAVE, ACCORDING TO THE EVIDENCE.

JUST as there are many great men in the world who never get an opportunity of asserting themselves in it, so there are many memorable events in history which are seldom if ever mentioned. Some of these are important enough, not merely in a political but also in a social sense, and it is well not to suffer them to languish in the cold shade of oblivion. Such an event is the subject of the present sketch. It has been selected not only because of its intrinsic importance, but also as showing how great privileges may be won and valuable rights established by very humble means.

In the report books of proceedings in the law courts in 1670 is an account of a scene in which the principal actors were the Recorder of London, King Charles's Attorney-General, and a citizen, Bushell, member of a jury. The case is called "Bushell's Case," and it is one of the most important possible, for upon it was established once and for ever the grand right of a jurymen "a true verdict to give according to the evidence," without reference to whether that verdict was or was not acceptable to the court to whom it was returned. Now-a-days, when juries are chosen with the utmost regard to the ends of justice, and with a single eye to perfect impartiality, and, when chosen, are treated with the fullest respect, neither being worried into verdicts nor molested after they have given them, we who have never seen a different state of things, are apt to suppose that there never was one, and to take it for granted that the thing which is, is the same that hath been. Let us look for a few minutes at "Bushell's case."

The circumstances under which Bushell, the jurymen, came upon the scene were these:—Two Quakers, Penn and Mead, had thought fit to preach to the people from the steps of a house in Gracechurch Street. In the course of their address they had used language which was interpreted as conveying, and perhaps was meant to convey, animadversions upon the government. For this they were arrested, and, having been committed by a city magistrate on the charge of stirring up a riot, were put upon their trial. Like many of the charges preferred at that time by the over-zealous agents of the government, the accusation was an extravagant one, and considerable sympathy was shown by the Londoners in favour of the prisoners. If what the two men had said amounted to sedition, then, it was felt, no man could safely talk politics even in the mildest way; and it was further felt that the prosecution was a tyrannical act on the part of the government, and people were getting rather tired of the thing. Notwithstanding such was the case—popular sympathy at that time was but a whet to the prosecuting spirit of the crown lawyers—the trial was urged, and it came on before the Recorder of London at the Old Bailey.

The following scene, illustrative of the manner in which prisoners were treated under Charles II., presented itself on the entrance of Penn and Mead into the court:—After the manner of their brethren, the two Friends kept their hats on in the presence of the judge, as they would have done in the presence of the king himself. The gaoler rudely knocked their hats off, whereupon the Recorder, not with a view to rebuking the man's roughness, but to having a preliminary fling at the prisoners, ordered him to replace them. Being put in the dock, the prisoners were thus addressed by their judge:—

RECORDER: Do you know where you are?

PENN: Yes.

RECORDER: Do you not know it is the king's court?

PENN: I know it to be a court, and I suppose it to be the king's court.

RECORDER: Do you not know there is respect due to the court?

PENN: Yes.

RECORDER: Why do you not pay it then?

PENN: I do.

RECORDER: Why do you not pull off your hat then?

PENN: Because I do not believe that to be any respect.

RECORDER: Well, the court sets forty marks a-piece upon your heads, as a fine for the contempt of the court.

PENN: I desire it might be observed that we came into the court with our hats off (that is, taken off), and if they have been put on since it was by order from the bench; and therefore not we, but the bench, should be fined.

After this the prisoners, undoubtedly with much pertinacity and some show of disrespect to the court, refused to plead to the indictment, which charged them with having caused a tumultuous assembly, until the questions they raised as to the legality of it in point of form should have been answered. The Recorder and the Lord Mayor tried in vain to silence them, resorting to threats, and abuse of a very coarse description, and not succeeding, the Recorder did in effect enter a plea of "not guilty" for them, and had them put upon their trial.

Among the jury was one man, Bushell, whose character for conduct displeasing to the court was already well known, and to whom several unworthy remarks had been made at the time he was sworn. Under his guidance the jury retired, and in a short time returned into court with a verdict acquitting Mead, and saying that Penn was "guilty of speaking in Gracechurch Street." This verdict angered the court exceedingly. "Is that all?" they asked the foreman. "That is all I have in commission," was the reply. "You had as good say nothing." Being further pressed, and also told, "the law of England will not allow you to part till you have given your verdict," the jury replied, "We have given in our verdict, and we can give in no other."

The Recorder refused to take such a verdict, and sent the jury back again to reconsider it. In half an hour's time they came back into court, and handed in a written verdict to the same effect as before, and signed by all of them. Upon this being received, the Lord Mayor rated the jury in these words:—

MAYOR: What, will you be led by such a silly fellow as Bushell? An impudent, canting fellow. I warrant you, you shall come no more upon juries in haste. You are a foreman, indeed (addressing Bushell). I thought you had understood your place better.

RECORDER: Gentlemen, you shall not be dismissed till we have a verdict that the court will accept; and you shall be locked up, without meat, drink, fire, and tobacco. You shall not think thus to abuse the court. We will have a verdict by the help of God; or you shall starve for it.

The jury declined to alter their verdict, and Penn, one of the prisoners, claimed to have it recorded. "The agreement of twelve men is the verdict in law; and such a one being given by the jury, I require the clerk of the peace to record it, as he will answer at his peril. And if the jury bring in another verdict contradictory to this, I affirm they are perjured men in law;" and looking upon the jury, he said: "You are Englishmen! Mind your privilege! Give not away your right!"

The court was adjourned till next morning at seven o'clock, the prisoners were sent back to Newgate, and the jury were ordered into the custody of those who swore to keep them without fire, food, drink, or any other accommodation till the adjourned sitting of the court.

While the jury are thus away in their retiring room, making up their minds what verdict they shall give—chafing, some of them, at the manner in which they have been treated by the court, and, under the guidance of their foreman, resolving that they will not submit to dictation, but act upon the exordium delivered to them by the prisoner as they quitted their box—let us consider for a moment what right it was for which they were contending, and the way in which that right was acquired.

Trial by jury was an old-established institution in England, as old, some think, as the Anglo-Saxon laws. Something like it is certainly to be found in the history which has come down to us of those times, but the jury system, as we understand it now, was the creation of a period subsequent to the Norman Conquest, 1066. Before that date the jury which tried causes consisted of a certain number of "compurgators" as they were called, that is to say, persons who did not give their opinion upon evidence adduced before them on oath, but who merely swore that they

believed what the defendant said under sanction of his oath. The form of procedure was simply this. A man accused of default, on civil or criminal process, was put on his oath if he chose to be so, and then swore he was innocent of the offence charged, or that his version of the case between him and the plaintiff was a true one. The compurgators, of whom the number varied from twelve to thirty-six, being also sworn, deposed to their belief in what the defendant had said, and, as they were commonly chosen from among the neighbours and acquaintance of the man, they were supposed to know something of the facts connected with his case, as well as to be able to form an estimate of the truth or falsehood of his statements. It can easily be imagined that such a tribunal was not one from which to expect strict justice, and the shortcomings of the system amounted in many instances to gross miscarriage of right. Nevertheless, it continued to be used with other systems till Henry II. (1154-1189) introduced the Norman form of trial by jury for civil causes, and Henry III., or rather those who represented him, introduced it about 1235 on criminal process.

The Norman-English jury was not like ours of to-day. Instead of deciding upon the case according to evidence for and against, and after hearing the summing-up of the judge, the jury included all those who under our system would be witnesses, and would be rigidly excluded from the jury for the very reason that they knew most of the facts. Then it was the duty of the sheriff to summon specially on the jury all those who were, or might be supposed to be, acquainted with the material points in the case, and these persons compared notes with their fellows, but without being subjected to any cross-examination, and gave their verdict according to what then appeared to them to be right. Common rumour, repetitions of what somebody else had said, unsifted testimony of various kinds, were received by these juries, and sometimes constituted all the evidence they had to guide them. All such would be utterly rejected now, and any person who had evidence to give would be summoned as a witness—would certainly be precluded from sitting on the jury. It was not till the twenty-third year of the reign of Edward III. (1327-1377) that witnesses, though still added to the jury, were not allowed to vote as to the verdict; and it was not till the eleventh year of Henry IV. (1399-1413) that they were made to give their evidence in open court, under the scrutiny of the judge, and without being associated in any way with the jury.

Under the Plantagenet princes (from Henry II., 1154, to Richard II., 1399), though the grand provision in Magna Charta—that no free man should be tried by any but his peers—was constantly disregarded, it does not appear that juries as such suffered any violence; but with the Tudor princes came in this, as in other respects, quite another order of things, and that which the Tudors did the Stuarts did likewise. Juries were called to account in the most direct and personal manner for verdicts given according to their conscience (some authorities, however, say they were frequently bribed), and were frequently reprimanded by the judge or the king's council, and sometimes cited before the Court of Star Chamber, where, if they did not repent, they were heavily fined and also imprisoned. Some of the fines imposed on individual jurymen were as much as £2,000, a ruinous amount in Queen Mary's reign (1553-1558), when such a fine was actually inflicted. Whether there was or was not any ground for the interference of the Star Chamber on the score of bribery of the jurors by the parties to suits, it is evident that the offence might have been punished by more regular means, and that the means actually adopted were liable to be grossly abused. As a matter of fact they were grossly abused, and the tyrannical conduct of the Star Chamber in dealing with juries was one of the chief causes which contributed to its downfall. When the Star Chamber was abolished by Act of Parliament in 1641, with an indignant protest against its ever having existed, and a solemn declaration that nothing of the kind should be permitted in the time to come, this evil practice of threatening and punishing juries, so as to compel them to give such verdicts as the Crown wished, was abolished also. During the civil war (1642-1648), and during the protectorate of Oliver Cromwell, (1648-1658) it was not heard of; jurymen were allowed to be responsible alone to God and their conscience, and gave their verdicts freely, no man making them afraid.

With the restoration of Charles II., in 1660, some of the old governmental vices were restored also. The Star Chamber men

would not have back at any price, nor to please any one, but the judges took upon themselves to revive the wicked old custom of polluting the very source of justice by intimidating those who had charge of it. Two Chief Justices of England, Hyde and Keeling, were especially guilty of this crime, and made themselves so notorious that the House of Commons came to a resolution to impeach the latter for his misconduct. He was suffered to speak for himself at the bar of the House, and to go free on promise of amendment.

In the face of this, and in spite of the expressed opinions of most of the legal luminaries of the day, including Lord Chief Justice Hale, the Recorder of London, in 1670, ventured, under the circumstances stated above, to fine the jury which acquitted Penn and Mead, and to commit Mr. Bushell to prison when he refused to pay. Here was what followed when the jury remained obstinate in their simple verdict of "not guilty," after having been browbeaten, threatened, and ridiculed, both by chief magistrate and Recorder, and after having been sent back three times to consider their verdict, which indeed they did alter to a simple verdict of "not guilty" as to both prisoners.

CLERK: Are you agreed upon your verdict?

JURY: Yes.

CLERK: Who shall speak for you?

JURY: Our foreman.

CLERK: What say you? Look upon the prisoners at the bar. Is William Penn guilty of the matter whereof he stands indicted in manner and form as aforesaid, or not guilty?

FOREMAN: William Penn is guilty of speaking in Gracechurch Street.

MAYOR: To an unlawful assembly?

BUSHELL (the foreman): No, my lord, we give no other verdict than what we gave last night. We have no other verdict to give.

MAYOR: You are a factious fellow. I'll take a course with you.

SIE T. BLOODWITH (alderman): I knew Mr. Bushell would not yield.

BUSHELL: Sir Thomas, I have done according to my conscience.

MAYOR: That conscience of yours would cut my throat.

BUSHELL: No, my lord, it never shall.

MAYOR: But I will cut yours so soon as I can.

RECORDER: He has inspired the jury. He has the spirit of divination. Methinks I feel him. I will have a positive verdict, or you shall starve for it.

PENN: I desire to ask the Recorder one question. Do you allow of the verdict given of William Mead?

RECORDER: It cannot be a verdict, because you were indicted for a conspiracy, and one being found not guilty, and not the other, it could not be a verdict.

PENN: If not guilty be not a verdict, then you make of the jury and Magna Charta but a mere nose of wax.

MEAD: How! Is not guilty no verdict?

RECORDER: No, it is no verdict.

After this fine judicial dictum there were other passages between the jury and the court, and the jury being once more asked as to William Penn's guilt, said, as before, that he was guilty of speaking in Gracechurch Street.

RECORDER: What is this to the purpose? I say I will have a verdict. (And speaking to Edward Bushell, said): You are a factious fellow. I will set a mark upon you; and whilst I have anything to do in the city I will have an eye upon you.

MAYOR: Have you no more wit than to be led by such a pitiful fellow? I will cut his nose.

PENN: It is intolerable that any jury should be thus menaced. Is this according to the fundamental laws? Are not they my proper judges by the Great Charter of England? What hope is there of ever having justice done when juries are threatened, and their verdicts rejected? I am concerned to speak, and grieved to see such arbitrary proceedings. Did not the Lieutenant of the Tower render one of them worse than a felon? And do you not plainly seem to condemn such for factious fellows who answer not your ends? Unhappy are those juries who are threatened to be fined, and starved, and ruined if they give not in verdicts contrary to their consciences.

RECORDER: My lord, you must take a course with that same fellow.

MAYOR: Stop his mouth. Gaoler, bring fetters, and stake him to the ground.

PENN: Do your pleasure. I matter not your fetters.

RECORDER: Gentlemen, we shall not be at this trade always with you. You will find the next session of parliament there will be a law made that those that will not conform shall not have the protection of the law. Mr. Lee, draw up another verdict, that they may bring it in special.

LEE: I cannot tell how to do it.

JURY: We ought not to be retained, having all agreed, and set our hands to the verdict.

RECORDER: Your verdict is nothing. You play upon the court. I say you shall go together and bring in another verdict, or you shall starve, and I will have you carted about the city as in Edward the Third's time.

FOREMAN: We have given in our verdict, and all agreed to it; and if we give in another, it will be a force upon us to save our lives.

Finally the jury gave their verdict "not guilty" against both prisoners, and each one of them affirmed the same separately; whereupon the Recorder fined them forty marks each, and ordered them to be imprisoned till the fine should be paid.

Imprisoned they were accordingly in the common gaol of Newgate, a noisome, filthy den, which was a disgrace to any country calling itself civilised. From Newgate, however, the spirit which had made itself felt in opposition to the oppressive conduct of the Recorder's Court made itself heard at the Court of King's Bench. A writ of Habeas Corpus* was sued out and made returnable immediately, and when the governor of Newgate brought up his prisoners it turned out that they were detained for non-payment of fines imposed upon them on account of their verdict.

Chief Justice Vaughan, in one of the most learned and masterly judgments ever delivered, went into the whole matter. What he said may be found in the sixth volume of the State Trials, and in the collected judgments of the eminent Chief Justice. The studious who have opportunity will do well to seek the judgment there; but we have all an interest in the gist of what he said, and that can be reproduced without such careful search. He laid it down as law that the fines were illegal, and that the imprisonment consequent on them was necessarily illegal also. But he went on still further, and declared in effect that the Recorder had improperly refused to receive the verdict of the jury, and that the jury had an unquestionable right to give what verdict they pleased, the remedy for a stupid verdict being in the discretion of a judge to order a new trial on the ground of the verdict being contrary to the evidence; and for a corrupt verdict, in the power of any one to prosecute a jurymen for perjury if committed wilfully in the course of his duty as a jurymen.

As the law was thus settled it has remained ever since, few occasions having arisen in which the rights of juries have been imperilled. To Edward Bushell and his fellow-citizens we are directly indebted for the establishment of the law upon this most satisfactory footing; and the occasion seemed to us so full of interest, and the principle gained so full of importance, that we have thought fit to make them the subject of this number of our Historic Sketches.

SYNOPSIS OF EVENTS IN THE LIFE AND REIGN OF CHARLES II.

Charles II., the second son of Charles I. and Henrietta Maria of France, was the twenty-sixth king of England after the Norman Conquest, and the third of the Stuart Dynasty. He married a Portuguese princess, Catherine of Braganza, who

* A writ of Habeas Corpus is an order which a judge is obliged, under a penalty of £500, to send on petition of a prisoner, to the gaoler who detains him, requiring him to bring up the body of his prisoner, and to show cause why he detains him, so that the judge may be satisfied as to the propriety or otherwise of the detention, and may remit the prisoner to custody or discharge him as he may see fit. This is a British subject's great safeguard against illegal or tyrannical imprisonment. When the Habeas Corpus Act is suspended, the writs of course do not run.

brought him as her dower Tangier, in Morocco; Bombay, in Hindostan or India; and £300,000 in money. The first-named town was abandoned, in 1683, as a place not worth the expense of holding by an armed force; while the second, now the capital of one of the five presidencies of British India, was handed over to the East India Company for a small annual quit-rent.

Born at St. James's Palace, May 29, 1639	Declaration of Indulgence in favour of the Papists . . . 1672
Crowned at Scone . . . 1651	Test Act passed . . . March, 1673
Obliged to retire to Holland after the Battle of Worcester . . . 1651	Marriage of Mary, daughter of the Duke of York (afterwards James II.) to William of Orange . . . 1677
Returns to England May 29, 1665	Treaty of Breda . . . 1672
Trial of the Regicides, etc. . . 1669	Supposed Conspiracy of the Papists to assassinate the King and restore the Roman Catholic religion . . . Aug. 12, 1678
Revision of the Common Prayer Book . . . 1661	Murder of Sir Edmond Aubrey Godfrey . . . Oct. 15, 1678
Act of Uniformity passed . . . 1662	Murder of Archbishop Sharpe . . . May 3, 1679
Bombay and Tangier added to the British dominions . . . 1662	The present Habeas Corpus Act passed . . . May 27, 1679
Dunkirk sold to Louis XIV. of France for £500,000 . . . Oct. 17, 1662	Battle of Bothwell Bridge . . . June 22, 1679
War with the United Provinces of the Netherlands . . . 1661	Meal Tub Plot . . . Oct. 24, 1679
The Great Plague . . . 1665	Persecution of the Covenanters in Scotland . . . 1680
The Great Fire of London . . . 1666	Charter of the City of London declared to be forfeited . . . 1682
Ships in the Medway burnt by the Dutch . . . 1667	Rye House Plot . . . June 12, 1683
Peace of Breda . . . 1667	Execution of Algernon Sydney and Lord William Russell . . . 1683
"Triple Alliance" of England, Holland, and Sweden against France . . . Jan. 28, 1668	Death of Charles II. . . Feb. 6, 1685
Peace of Aix-la-Chapelle . . . 1684	
War with Holland . . . 1672	
Dutch defeated in the Battle of Solebay or Southwold Bay . . . May 28, 1672	

SOVEREIGNS CONTEMPORARY WITH CHARLES II.

Denmark, Kings of.	Portugal, Kings of.	Sweden, King of.
Frederick III. . . 1648	Alphonso VI. . . 1656	Charles XI. . . 1659
Christian V. . . 1670	Peter II. . . 1683	Turkey, Sultan of.
France, King of.	Rome, Popes of.	Mahomet IV. . . 1619
Louis XIV. . . 1643	Alexander VII. . . 1655	United Provinces of the Netherlands, Stadtholders of.
Germany, Emperor of.	Clement IX. . . 1667	No Stadtholder from 1659 to 1672
Leopold I. . . 1658	Clement X. . . 1670	William Henry (afterwards William III of England) . . . 1672
Poland, King of.	Innocent XI. . . 1676	
John II. (sometimes styled Casimir V.) . . 1649	Russia, Cæsar of.	
Interregnum . . . 1668	Alexis . . . 1645	
Michael . . . 1689	Feodor II. . . 1676	
John III. . . 1674	Ivan IV. and Peter I. conjointly 1682	

LESSONS IN GEOMETRY.—XIII.

In the last lesson (page 383) was given the method of drawing a triangle equal in superficial area to any regular four-sided figures, such as a square, rectangle, or parallelogram; and, before entering on the geometry of the circle, it only remains to show the learner how he may draw a triangle equal in superficial area to any given irregular four-sided figure, whether it be a trapezium or trapezoid (Defs. 31, 32, page 53), or to any multilateral figure or polygon, whether regular or irregular; that is to say, having its sides and angles equal on the one hand, or having its sides and angles unequal on the other (Def. 33, page 53). It will be seen that either process is effected by the aid of the knowledge of certain geometrical facts in connection with the triangle which have been already explained.

PROBLEM XXXIII.—To draw a triangle that shall be equal in superficial area to any given irregular quadrilateral figure.

Let A B C D (Fig. 46) be the given irregular quadrilateral figure: it is required to draw a triangle equal to it in superficial area. Draw B D, one of the diagonals of the irregular quadrilateral figure or trapezium A B C D, and produce the side C D, on which the figure stands, indefinitely towards E. Then through A draw A F parallel to the diagonal B D, and meeting C E in the point F. Join B F; the triangle B F C is equal to the trapezium A B C D. That this is true may be soon seen. After taking away the

common piece $B C D K$ from the trapezium $A B C D$ and the triangle $B F C$, we have the triangle $A K B$, the remainder of the trapezium $A B C D$, and the triangle $K F D$, the remainder of the triangle $B F C$.

But these triangles are also parts of the triangles $A D B$, $B F D$, which are equal in area, since they are on the same base, $B D$, and between the same parallels $A F$, $B D$, and as the triangle $K D B$ is common to both, the triangle $A K B$ is equal to the triangle $K F D$. In the same manner, by drawing the diagonal

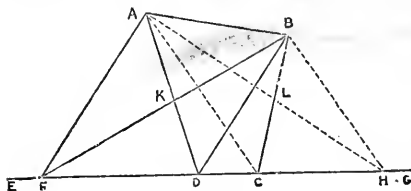


Fig. 46.

$A C$ of the trapezium $A B C D$, producing $D C$ in the direction of G ; drawing $B H$ parallel to $A C$, and meeting $D G$ in H ; and lastly, joining $A H$, it may be shown that the triangle $A D H$ is also equal

in superficial area to the irregular quadrilateral figure $A B C D$. It will be useful for the student to repeat this construction as an exercise, taking the sides $C B$, $B A$, and $A D$ in succession as the base of the trapezium $A B C D$, or the side on which it stands.

PROBLEM XXXIV.—To draw a triangle that shall be equal in superficial area to any given multilateral figure or polygon.

First let us take a five-sided figure, as being next in order to a four-sided figure, as far as the number of its sides are concerned, and let $A B C D E$ (Fig. 47) represent the five-sided figure or pentagon, to which it is required to draw a triangle equal in superficial area. From C , the apex of the pentagon, draw the straight lines $C A$, $C E$, to the points A , E , the extremities of the base on which it stands. By doing this we divide the pentagon $A B C D E$ into three triangles $A B C$, $C A E$, and $C E D$. Produce the base $A E$ indefinitely both ways in the direction of F and G , and through B and D draw the straight lines $B H$, $D K$, parallel to $C A$, $C E$ respectively, and meeting the base $A E$ produced, in the points H and K . Join $C H$, $C K$; the triangle $C H K$ is equal in superficial area to the pentagon $A B C D E$. That this is true may be seen as follows:—Of the three triangles $A B C$, $C A E$, and $C E D$, into which the pentagon was divided, the triangle $C A E$ is common to both the pentagon and the triangle $C H K$. Of the remaining portions of the pentagon and triangle, the triangle $A B C$ of the former is equal to the triangle $C H A$ of the latter, because they are on the same base, $A C$, and between the same parallels; and for the same reason the triangle $C E D$ of the pentagon is equal to the triangle $C E K$ of the triangle.

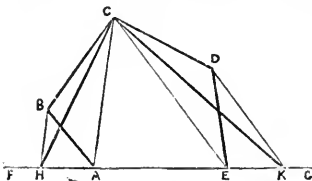


Fig. 47.

The learner will find it useful to repeat this construction as an exercise, taking the sides $A B$, $B C$, $C D$ and $D E$ in succession, as the base on which the pentagon is supposed to stand.

That the learner may thoroughly understand the process of drawing a triangle equal in superficial area to a polygon having a great number of sides, and see that it is as easy as it is to draw a triangle equal in area to a pentagon, which has only five sides, we will take the irregular seven-sided figure, or heptagon

$A B C D E F G$ (Fig. 48), and proceed to construct a triangle equal to it in area. As the figure is complicated, the lines which contain the heptagon and the triangle equivalent to it in area have been drawn thicker than the lines which are necessary in working out the process (as in Fig. 47), that the reader may the more readily distinguish the relative areas of the figures in question.

The first step is to draw straight lines from A , the apex of the polygon, taking $D E$ to represent its base, to the points C , D , E , F , or to each salient point of the polygon except the two immediately on the right and left of the apex. The straight lines $A C$, $A D$, $A E$, $A F$ divide the polygon $A B C D E F G$ into five unequal triangles, $A B C$, $A C D$, $A D E$, $A E F$, and $A F G$. The reader will note that however many may be the sides of the polygon, it is divided by this process into a number of triangles always less by two than the number of its sides. Thus in the figure below the number of triangles into which it is divided by drawing straight lines from its apex to its salient points is five, the number of its sides being seven; a dodecagon, or twelve-sided figure, would be divided into ten triangles, and so on. Now—beginning with the triangle $A B C$, the highest triangle on the left side of the apex—by producing $D C$ in the direction of P , indefinitely; drawing $B H$ parallel to $A C$ to meet $C D$ produced in H ; and joining $A H$; we get a triangle, $A H C$, equal to the triangle $A B C$, and by adding the polygon $A C D E F G$ to each of these triangles, we find that we have a hexagon or six-sided figure, $A H D E F G$, equal in area to the original seven-sided polygon $A B C D E F G$. By making the triangle $A K D$ equal to the triangle

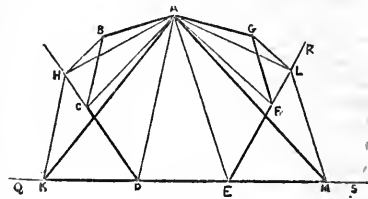


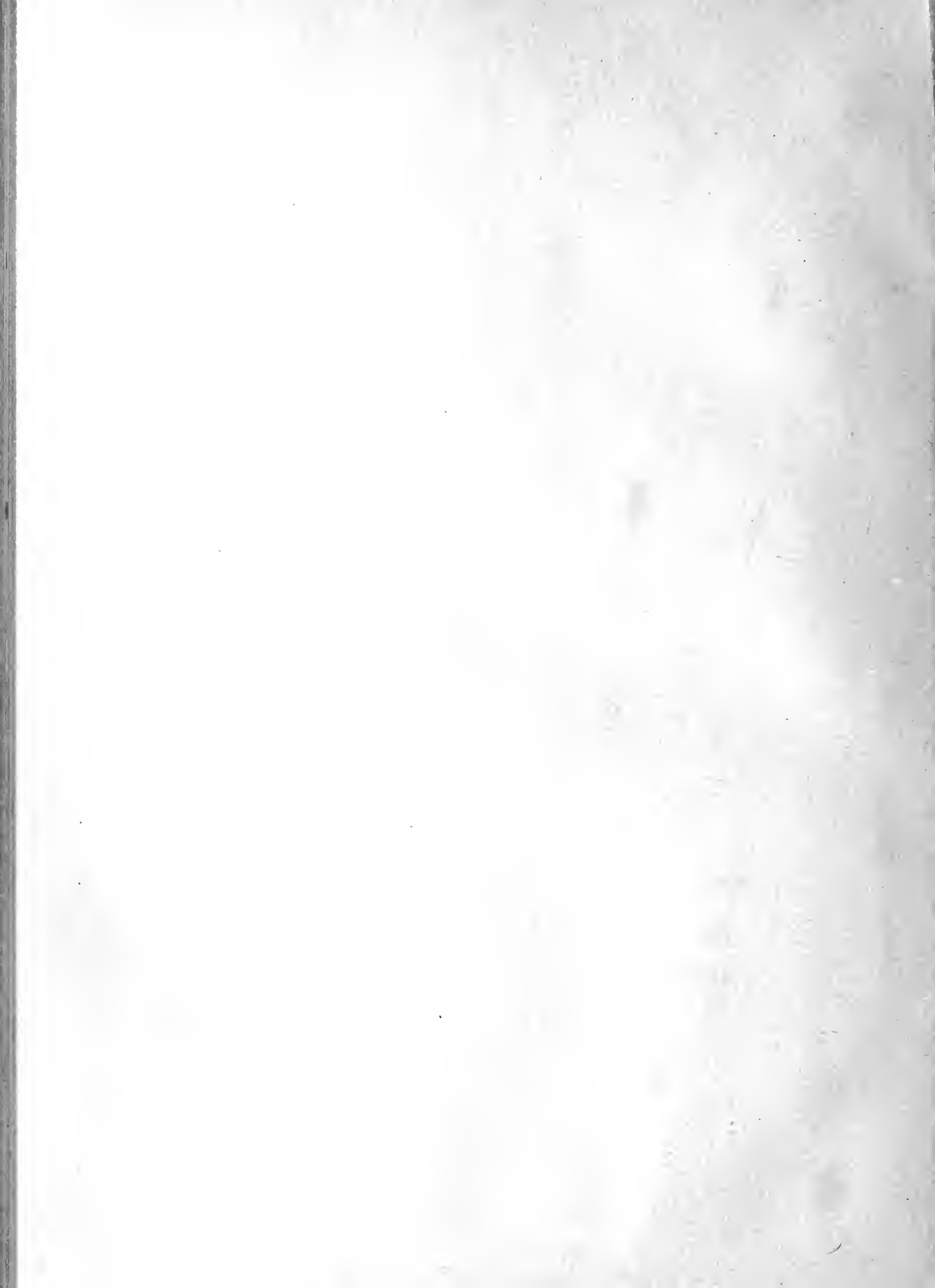
Fig. 48.

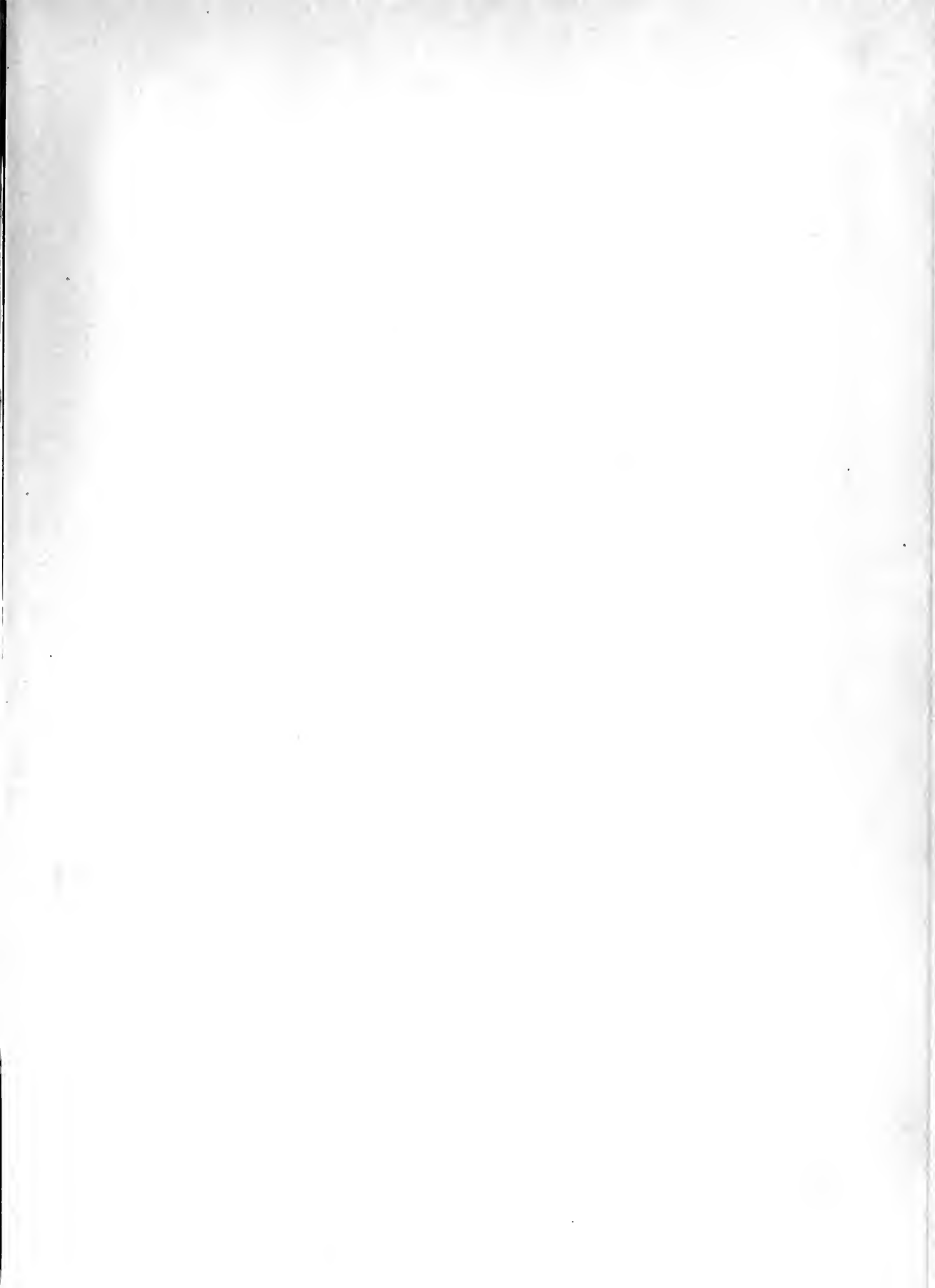
$A H D$ by the same construction, which we need not repeat, we get a pentagon, or five-sided figure, $A K E F G$, equal in area to the hexagon $A H D E F G$, and consequently to the original heptagon $A B C D E F G$. Continuing the process with making the triangle $A F L$ equal to the triangle $A F G$, the highest triangle on the right side of the apex, we get an irregular quadrilateral figure, $A K E L$, equal to the pentagon $A K E F G$, the hexagon $A H D E F G$, and the heptagon $A B C D E F G$. Once more, by making in a similar construction the triangle $A E M$ equal to the triangle $A E L$, we get at last a triangle, $A K M$, equal in area to the quadrilateral figure $A K E L$, and the above-named pentagon and hexagon and the original heptagon $A B C D E F G$.

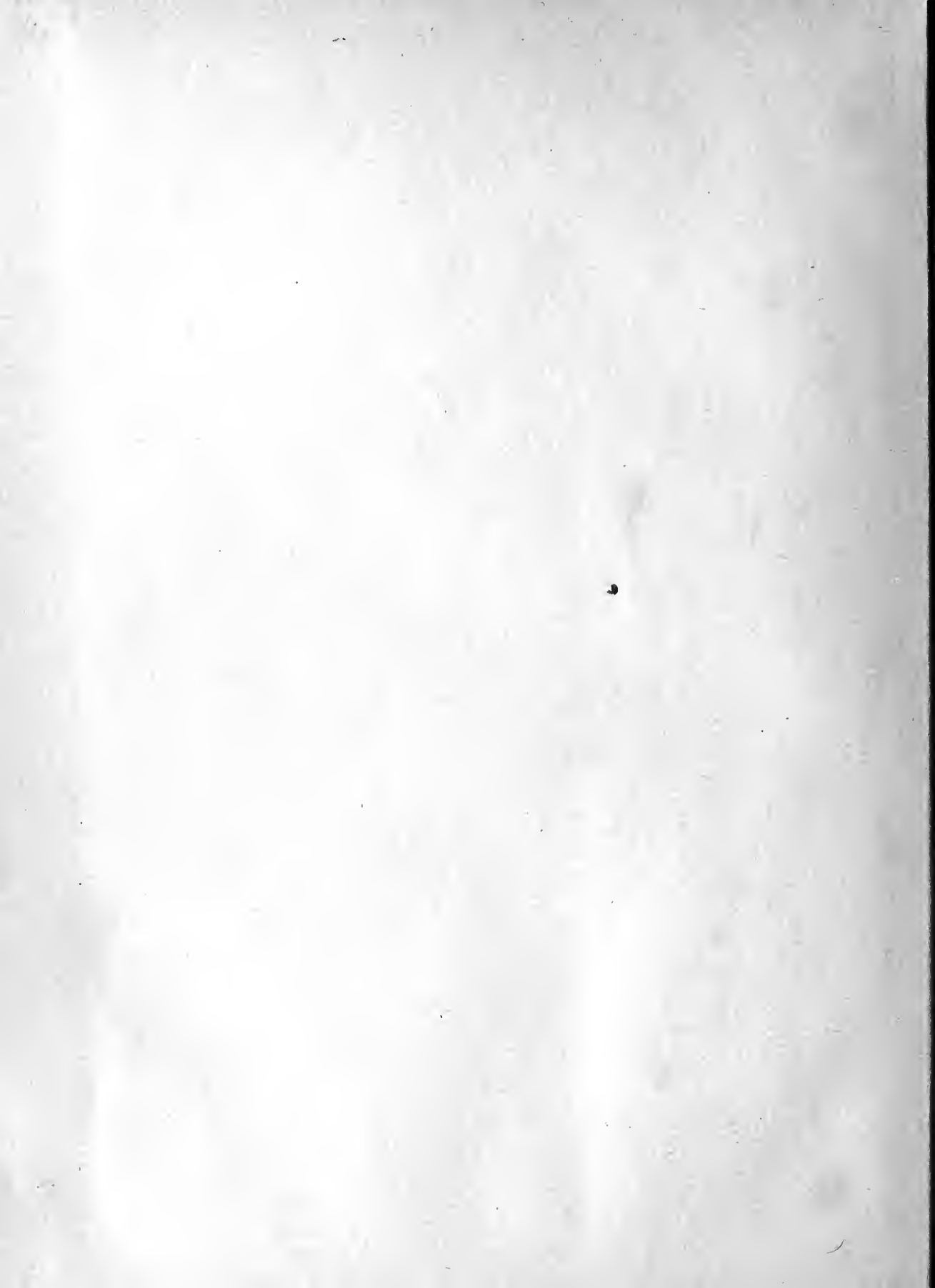
The learner will find the value of this geometrical process in determining the areas of irregular polygons in mensuration. To calculate the area of the heptagon $A B C D E F G$, it would be divided as in the above figure into five triangles, and by an arithmetical process to be explained hereafter the superficial content of each triangle would be found, and the five results added together to obtain the area of the polygon. By reducing the area of the polygon to a triangle, its area can be found by one calculation instead of five, and a sum in compound addition; or, to ensure accuracy, both processes may be gone through, each proving a test whereby the correctness of the other may be ascertained.

As in the preceding propositions, let the learner repeat the above construction as an exercise, taking the sides $E F$, $F G$, $G A$, $A B$, $B C$, and $C D$ in succession, as the base on which the polygon is supposed to stand, and the salient point which happens to be immediately opposite the base in each case as the apex.









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