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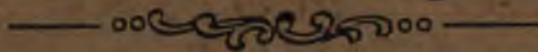
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Technical Drawing Series.

A TEXT-BOOK

OF

FREE-HAND LETTERING.

BY

FRANK T. DANIELS, A. M. B.,

INSTRUCTOR IN CIVIL ENGINEERING IN TUFTS COLLEGE.

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P R E F A C E .

THIS little book is published in the belief that in every school where technical drawing is taught there is need of a text-book setting forth the *elementary principles* of the formation of letters, of their combination to form words, and of the arrangement of words in titles. That such a system, for use in such schools, should begin with the most elementary work, every teacher of the subject knows.

The features to which attention is invited are:

1. The preliminary exercises which offer preparation in manual skill and in estimation of values.
2. The absence of rules and arbitrary expedients, and in their place *reasons* from which the student makes his own rules.
3. Variety, as much as is consistent with thorough practice in fundamental styles, though possibly at cost of logical arrangement.
4. The Plates, which are illustrations of principles set forth in the text, quite as much as definite exercises for practice.
5. The laying out of exercises in detail, thus making it possible for instructors who have charge of large classes to give their attention to matters of instruction. The student's progress, also, is measured by his adaptation to the work.

Most of the matter has been given to first year students in engineering at Tufts College, with such results as warrant the belief that the system leads to rapidity as well as to excellence of execution.

I express my indebtedness to Prof. Gardner C. Anthony of this College, for valuable suggestions.

Tufts College, Mass., August, 1895.

FRANK T. DANIELS.



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I.

INTRODUCTION.

SUCH lettering as a draftsman is called upon to do, must be done not only well, but rapidly. To secure either speed or well-balanced proportion, the student must be trained to do good lining *free hand*, and to estimate accurately both distance and direction. The following exercises are designed to secure such results.

Many combinations of lines and letters are very deceptive to the eye, hence the impossibility of giving rules, and the necessity of learning the reasons for such deceptive appearances and their probable amount for any given case. Good lettering requires careful attention to matters of smallest detail.

The remarks upon each exercise should be read carefully before practice is begun, and suggestions followed. It is the carefulness of practice rather than its amount that is of value. The elementary things are few, but they must be learned first and thoroughly.

PAPER. — This should be a good quality of drawing paper. The best German paper will do for pencil work. For inking, a hard, smooth surface is recommended. The exercises are intended to go upon sheets 7×10 inches, with one inch margin all around. The sheets should be tacked to a small drawing board with long edges horizontal.

PENCIL. — The best drawing pencils must be used, grade H being the best adapted to general work. The care of the point is of prime importance. With a sharp knife cut away

the wood, beginning the cut an inch back from the end, leaving at least $\frac{1}{4}$ inch of the "lead" bare. The point cannot be properly finished with the knife, but must be ground upon a piece of fine sandpaper fastened to a flat strip, or better still upon a file such as is sold for that purpose. Rub the pencil upon the file, holding the latter in the left hand. The point must be long, smooth, and conical, but not quite so sharp as can be made. Hold the pencil about $2\frac{1}{2}$ inches from the end, and be careful that the forefinger is but slightly bent. Exercise a constant care not to pinch the pencil, otherwise the muscles will soon tire and good lines can not be made. Roll the pencil slightly often enough to prevent the point being worn flat. *Sharpen frequently.*

LIMITING LINES. — These are ruled lines to limit the height of letters. A T square is most convenient for drawing them. They are necessary but undesirable adjuncts to the work; undesirable because their presence lends a slightly distorted appearance to some letters. They must be drawn light, fine, and accurately parallel. The "chisel" pointed pencil is best for drawing them, but the cone point will do if it be rolled in the fingers as the line progresses, thus producing it of uniform thickness.

When it is necessary to erase part of a limiting line, it must be drawn in again before work is done at that place.

A TRIANGLE will be useful for testing the direction of lines.

A SCALE should be used to lay off distances between limiting lines and for testing distances that have been estimated.

II.

PRELIMINARY EXERCISES.

PLATE 1.

Draw limiting lines according to figures given. Each line of each exercise will extend across the sheet, leaving a margin of one inch all around; thus each exercise will fill a sheet of practice paper.

EXERCISE 1

LINE 1.—ESTIMATION OF DISTANCE AND DIRECTION.—Make a dot upon the upper line where the exercise will begin, then another vertically below this upon the lower line. Draw from the upper to the lower point a fine, light line with one stroke of the pencil. Go over the line as many times as may be necessary to make it straight and firm. Now place another pair of points at an estimated distance of $\frac{1}{4}$ inch from the first pair and draw the second line. After having drawn three or four lines, test to see that they are vertical, and $\frac{1}{4}$ inch apart. If not, do not erase them, but seek to correct in following lines. In the latter half of the exercise try to dispense with the points upon limiting lines.

LINE 2.—Draw in pairs. A dash on the upper line forms a pair with the one below it. Draw upper line first, and finish one pair before beginning another.

Be careful that pairs are at the correct distance apart. Here the width of a space is compared with the length of a line.

LINE 3.— Make the angle between horizontal and vertical lines sharp and decided. Some difficulty will be experienced in estimating the distance from L to T, as we must here pass from the lower to the upper line. When the L is finished place a point vertically above its right hand limit, and from this estimate the distance to the beginning of the T.

Notice that when these letters are of the same width, the T *looks* much the narrower.

LINE 4.— This is a valuable exercise, in comparing a vertical with a horizontal distance. Point where lower end of first line will be. Point vertically above this, and to the right upon upper line point a distance equal to distance between limiting lines.

Join last point with first at a single stroke. In finishing up lines do not do it by a series of short strokes or “hitches,” but let them be as long and free as possible.

LINE 5.— A little more difficult than the last, because the direction of lines is contrary to common experience. Draw from the top downward, resting the hand upon the paper well above the line.

LINE 6.— This must be very carefully pointed, as follows: On the lower line estimate the extreme width of figure, $\frac{3}{8}$ inch, and bisect it. Point upon upper line vertically above bisecting point; or a square may first be very lightly outlined and its upper side bisected.

The latter half of the exercise may consist of V's.

Notice that when height and width are equal the height *appears* greater.

LINE 7.— This line is for additional practice upon such of the above work as shall have proved most difficult.

EXERCISE 2.

This exercise should be pointed in a manner similar to that used in Exercise 1. Detailed directions will not be needed. Be careful when it is possible to point the *whole* of a combination of lines before drawing any of them, for the presence of lines, especially diagonal or curved ones, greatly modifies our estimate of direction and distance.

LINE 1.—Omit pointing in latter half of exercise, but draw the vertical lines first, finishing each letter before beginning the next.

LINE 2.—Draw vertical lines first, bisect upon the lower line and add other members. Draw from top downward.

LINE 3.—In pointing this be careful that the corners of a *square* are marked out, that the letter may not appear to tip forward or backward. Try a few without pointing.

LINE 4.—Distances here must be carefully estimated before any lines are drawn. Compare apparent widths of **V**'s and **X**'s.

LINE 5.—Draw the vertical line; point for the top of upper inclined line, then for its lower end—two-fifths up the vertical line. Draw the inclined line and point for the last line, which joins the second at one-third its length from lower end.

LINE 6.—Very lightly outline the rectangle which will contain the **W**; bisect upper and lower sides, and bisect each of these divisions upon the lower line; join points. After a few have been made, dispense with vertical sides of rectangle, but place all points as long as necessary.

Note that alternate lines are parallel. Compare apparent widths of **M**'s and **W**'s.

LINE 7.—Additional practice.

EXERCISE 3.

Much patience will be needed with this exercise, but it is important and should be well done. When troubled to get a curve symmetrical, turn the paper so as to look at the work from different sides. This will help to determine where the fault lies.

LINE 1.—In pointing these quadrants remember that they may be circumscribed by a square. It will be well to sketch lightly the left hand side of the square. In drawing the curve remember that the right lower corner of the square is its centre and that the upper and left sides are tangent to it.

The temptation will be great to draw by hitches. This may be necessary at first, but the long, free stroke must be attempted. Draw either upward or downward. When this arc is drawn as part of a letter it will be drawn downward. Use compasses to test.

LINE 2.—Here the right side of the square should be sketched in.

LINE 3.—Be careful that a square includes the arcs; that they are tangent to upper and lower lines respectively, and that a vertical line drawn through the point where the two arcs join each other would be tangent to each.

LINES 4 AND 5.—The semicircle occupies a rectangle whose height is twice its width. Point in accordance with this, and point where middle of arc will come. Sharply define ends of arcs.

LINE 6.—Draw the vertical lines first, adding the semicircular lower part.

There is to be noticed here the difficulty of drawing straight parallel lines, knowing that they are to be joined by a curve. This knowledge is likely to lead to lines either curving slightly at their lower ends, or converging downward.

III.

FORMS OF GOTHIC LETTERS.

PLATE 2.

Before commencing the work of this plate it will be necessary to consider some of the general principles governing the forms of letters.

First of all they must have an appearance of stability. In some letters as **F**, **T**, and **P** it is not possible to avoid a top-heavy effect, but in general the correct form in this respect is secured:—

1. By making the upper part of the letter narrower than the lower as shown in Fig. 1, Plate 10.
2. By placing some horizontal members above the centre as in the **H**, Fig. 2, Plate 10.
3. By a combination of the above as in the **E**, **B**, and **S**, Fig. 3, Plate 10.

These considerations apply to figures as well as to letters.

Not only must the general *form* of each letter be attended to, but it will be found that the good appearance of a combination of letters will demand that some of them be *larger* than others.

In line 6, Exercise 1, Plate 1, it was noted that the width of the figure *seemed* less than its height. Also that in Exercise 2 the **W**, although really wider than the **M**, seemed hardly as wide. Refer now to Fig. 4, Plate 10. The **E** and **O** are of exactly the same height and

width, yet the **O** *looks* smaller than the **E**; not only narrower but shorter. It appears from this that letters composed of curves are affected as are those made up of inclined straight lines.

The reason for these deceptive appearances is a psychological one; under certain conditions the mental picture of what is seen through the eyes is distorted, and no amount of knowledge or experience enables us to set these erroneous impressions right.

The general principle may be studied to advantage from Fig. 5, Plate 10.

The width of the square taken anywhere is its average width, and there is no deception as to this dimension. The second figure, though really of the same width at base as the square, gives the impression that it is narrower. This is due to the effect of varying widths. The eye cannot separate the width at base from widths taken all along from base to top, but tries to accept their *average* for the extreme width—and partly succeeds.

The same thing has already been exhibited by the **O** in which, again, the width is variable. But the **O** is apparently contracted in height as well as in width, and for exactly the same reason. Hence we may say in general that *when the height or width of a letter is constantly changing the eye seeks to average the varying height or width*, and the letter must be made higher or wider, or both, to counterbalance the result. No general rule can be given for the amount of such increase, since it will vary under different conditions even in the same letter.

In the **M** and **W** it is always evident that they occupy more space horizontally than for instance the **E**, though they always occupy more than is apparent; but in the **O**, **C**, **A**, **V**, etc., the increase must be only enough to make the letters appear the *same* size as **E**, **H**, **N**, etc.

Some exceptions to the above rule must be made, as in the case of the **B**. If the letter be so wide as compared with its height that portions of the top and bottom lines are straight

and horizontal, as is generally the case, no increase in height is necessary. The width needs no increase, partly because of the straight line which limits it at the left, but principally because of the middle horizontal line, which breaks the outline into two loops, each wider than it is high. Notice that the **D**, having a single curve for its right hand side, stands in greater need of increase of width than does the **B**. With the general principles in mind, the student will do much better to cultivate and rely upon correct appearance than to seek arbitrary rules.

A complete alphabet will now be studied, taking the letters in groups and noting the peculiarities of each.

These Gothic letters, though of the simplest sort, exemplify most of the essential features of all styles.

Those letters whose widths appear what they really are, may be called normal width letters, or simply normal, and for present practice may be drawn "square," i. e. with width and height equal. The containing square may be lightly sketched in, but pointing will be sufficient in most cases.

Frequent measurement of estimated distances must be made. The normal width marked upon the edge of a card will be useful for this purpose.

Suggestions for pointing, and in some cases for order of strokes will be seen upon the plate. When dotted lines are given with pointing they should be sketched in before the letter is begun; where drawn upon a finished letter they simply call attention to some feature of the letter.

- E.** Upper horizontal line shorter than lower, and middle line a little above centre.
- F.** Short horizontal line a little above centre.

- H.** Horizontal line above centre.
- I.** As this letter occupies practically no space horizontally it will look crowded when written with others unless given considerable space.
- T.** A little wider than the normal because the only line determining its width is cut in two by the vertical, and the effect is something between the whole line and either of its parts.
- A.** Higher and wider than normal, and horizontal member below centre.
- K.** Top narrower than base.
- M.** Considerably wider than normal. Draw vertical lines first.
- N.** Draw vertical lines first.
- V.** As wide at top as **A** is at base. Draw slightly below the line.
- W.** Much wider than normal. Alternate lines parallel. Generally no increase in height if necessary.
- X.** Narrow at top.
- Y.** About the width of **A**.
- Z.** Slightly narrow at top.
- B.** Narrow at top and middle line above centre. The first example of one of the most troublesome curves. Observe that it is symmetrical about a horizontal line, which should be drawn if necessary. Also turn paper so as to look at it from one side.
- D.** Right side a semicircle.

- J.** About three-fourths normal width. Lower part a semicircle.
- P.** Curve joins vertical member a little below centre.
- R.** Upper curved portion narrow and joining vertical at centre or slightly above. The tail joins at point where curve ends, or a little way along straight part; never on curve itself.
- U.** Straight parts truly vertical and lower part semicircular.
- O.** Compare with other letters to give proper increase in size.
- C.** Slight contraction in width of upper part.
- G.** Horizontal line only a little below centre.
- S.** In this "square" **S** there is a little at the middle which is practically straight and horizontal and is above centre. The upper part also is narrowed. The upper and the lower part is each symmetrical about its own horizontal axis, which draw if needed, and end each curve tangent to a vertical line. The second stage shows how the curve differs from the corresponding part of the **O**.

FIGURES.—Careful practice here will make other and more difficult styles much easier.

- 2.** Middle portion slightly below centre. Curve at lower left-hand of small radius, so that curved part will end in a vertical line.
- 3.** A portion of the **S** with a slight addition.
- 4.** Above the line and of extra width.

5. Curved part of generous size and symmetrical about a horizontal axis.
6. The general outline symmetrical about a vertical axis, and the lower closed part about a horizontal one. With these conditions the **6** is not exactly upon the outline of the **O**.
7. Lower line may be straight.
8. The **S** with some additions.
9. The closed part is here contracted, otherwise like **6** inverted.

As the **O**, **S**, etc., are but slightly widened they will for convenience be classed as normal letters, and we may make this classification :

1. Normals.
2. Narrow, **I** and **J**.
3. Slightly widened, **A**, **T**, **V**, **Y**.
4. Much widened, **M**.
5. Very much widened, **W**.

Some letters will need additional practice, opportunity for which is offered at bottom of sheet.

IV.

SPACING OF LETTERS.

It has already been said that different combinations of lines and letters lead to different effects. Before beginning to put letters together we shall need to notice some cases in point.

In line 3, Exercise 1, it was shown that the **T**'s and **L**'s seem to be arranged in pairs; yet the distance between any two *measured horizontally* is the same as between any other two. In estimating the distance from **T** to **L** we look at once to the upper line and all seems as it really is; but in the combination **L T** we look from the lower line where **L** ends, to the upper where **T** begins. This gives an erroneous idea of the real distance—measured horizontally—between them. In such a combination, therefore, the space must be reduced. The beginning of the **T** might even be vertically above the end of the **L**. This contraction of space may occur when the letters in question have the space between them measured upon the same limiting line, as shown in Fig. 6, Plate 10. Here **L** and **A** should be separated but little, because their tops are so far apart,—another example of “the eye averaging values.” The **A** and **M** are separated a little further and the **M** and **E** still further.

Attention has already been called to the fact that the **I** must have more than the ordinary space. This is especially true when the nearest part of an adjoining letter is a straight line parallel to the **I**, as in **HIGH**, and is still more marked in **HILT**. Letters whose sides are curves may be rather near their neighbors.

The matters spoken of above must not be overdone. Exceptions to general rules are for the purpose of avoiding unbalanced appearances. After a word is sketched look at it AS A WHOLE. Sometimes bad spacing may best be perceived by looking at the word with eyes half closed and somewhat out of focus.

As examples for practices in addition to those given above, may be taken the words Highland, Late, Waver, Room.

V.

CONSTRUCTION OF TITLES.

PLATE 3.

The title of a map or plan shows what portion of a town, state, etc., the map or plan represents; the scale to which it is drawn; the date of finishing the drawing; and sometimes the name of the surveyor or engineer in charge; thus, *Map of Willowdale, Mass. Scale 400 feet to 1 inch. 1896. Plan of Horn Pond and Vicinity. Scale 80 feet to 1 in. July 15, 1897. F. A. Mason, Surveyor.*

If a plan is made by, or concerns, a corporation, city, or commission, the name of that body often stands first as a part of the title.

On maps the outline is generally irregular, and the title is placed wherever the largest open space occurs, sometimes even within the outline of the area shown. Plans and working drawings should have the title in the lower right-hand corner, for when such drawings are filed away a given one may be found more easily with the title thus placed.

The title for a drawing concerning a machine or structure shows the name of the machine or structure; declares whether it is a "general" drawing or one containing details, sections, or elevations; has the scale and date; and sometimes the name of the engineer, corporation, or commission.

As a study of the combination of words to form such a title take the following:

Details of Steam Crane No. 15. Scale 3 in. = 1 ft. 1896.

The thing of first importance is that the drawing relates to STEAM CRANE NO. 15; hence these words will be made conspicuous by being formed of comparatively large letters. That the drawing shows DETAILS OF the Crane is the fact of next importance. The whole will be arranged something like this:

**DETAILS OF
STEAM CRANE No. 15.
SCALE 3 IN. = 1 FT.
1896.**

The first thing in laying this out upon the drawing would be to fix upon the position and size of letters for the principal line. These would depend upon size of sheet, space available for title, and purpose of drawing.

Suppose $\frac{7}{16}$ inch to have been selected as height of letters in "Steam Crane No. 15." The height for "Details of" may be $\frac{5}{16}$ inch, for the scale $\frac{1}{4}$ inch and for the date $\frac{8}{16}$ inch.

The space between lines must also be fixed upon before the limiting lines can be laid down, as all of them should be before any lettering is done.

A good general rule is :—*Make the space between two adjacent lines of words equal to the height of the shortest letters in either.*

Thus in the above example the space between the first two lines will be $\frac{5}{16}$ inch, which is the height of the letters for "Details of," and other spaces will be in accordance with the rule. The whole is plainly indicated in Plate 3 which may now be made.

Having drawn all limiting lines, do the principal part of the title, beginning it at the place indicated. The letters are still "square" and spaces between words something less than the normal width of letters.

Having finished this line in a satisfactory manner, find the centre of its length and through it draw a faint vertical line, about which the remainder of the title must be symmetrical. At present the method will be to count the letters in each line and set off half of them as marking the middle of the line. In doing this, however, we must give due weight to the effect of spaces between words, and to letters much wider or narrower than the normal. Taking "Details of," we shall see that of the nine letters the I is the middle one; its narrowness, therefore, will not need to be considered. There are no letters of great width, the T and A being slightly wide. But the end of the T may be vertically above the beginning of the A, thus taking up the effect of their extra width. The space between words, then, is the only thing really needing consideration. As this comes in the latter half of the line, its effect will be to shift the beginning of the line to the left by an amount equal to one-half the width of the space. So that I, instead of being the centre of the line, will be forced a little to the left.

Draw in the latter half of the line first; measure its length from the vertical centre line, and lay off this distance at the left of the centre line; this will be the point at which to begin the word "Details." In the same way work in the scale and date. Several trials may be necessary in the scale as it is much broken, and consequently difficult to estimate.

In case of a long line the left-hand half would have to be made *backward* to insure good spacing. Much practice is necessary to successfully join the halves of a line, each half being drawn forward, unless, as in this case, the line is short. In working backward the letters must be carefully pointed, or their inclosing rectangles sketched, otherwise this part of the line will probably occupy more than its proper space.

Looking at the title as a whole it is seen to be a little more than four times as long as wide. This is not a good proportion; the remedy is either to reduce the width of letters in the principal line or to spread the lines farther apart. The former would be better here, though the latter would be justifiable, and should be resorted to rather than making the letters in long lines so narrow as to injure their appearance. The spreading apart of lines is avoided as giving a ragged, disassociated appearance to the title as a whole.

VI. LOWER-CASE LETTERS.

PLATE 4.

The general remarks concerning capitals apply in these small or lower-case letters. Skill in making the **o** will be of great service here, as its curves occur in so very many of the letters. In outlining curved members imagine that the complete **o** is to be made. In the **b**, **d**, **g**, **p**, and **q** the oval part should be made as a complete, closed curve independent of the straight parts. Note that the elements of all letters are very simple, being only the *o* and

the straight line ; however, the straight line must *be* straight and must join the curves smoothly. In addition note the following points, which are true for most styles of lower-case letters :

The **b, d, f, h, k** and **l** extend above the other letters ; their height is that of capitals with which they would be written.

The **g, j, p, q** and **y** extend below as far as **b, d**, etc., do above.

The **t** is between the short and stem letters in height.

The remaining letters are about three-fifths the height of capitals and stem letters.

The second and third lines of the sheet are to be repetitions of the first.

Figures when written with both capitals and lower-case letters should have the height of capitals when there are but few of them, or when they play an important part. When numerous, as in tables, they may have the height of **t**. *Clearness* is the all-important thing, and must not be sacrificed. In the exercise at the bottom of the Plate the spacing of lines is still in accordance with the general rule.

VII.

SLANT LETTERS.

PLATE 5.

As to the proper amount of inclination to give the slant letters, there is difference of opinion. That here recommended is shown on the Plate and is obtained as follows :

Draw a horizontal line, and at its right-hand end erect a vertical. From the vertex of the angle thus formed lay off three units upon the horizontal line and eight of the same units upon

the vertical. The line joining the two points thus placed will give the proper slant. This corresponds to an angle of about $69^{\circ}-25'$ with the horizontal. At this angle are to be drawn all lines which in the upright letters are vertical, the horizontal lines suffering no change in direction.

A triangle worked upon the T square blade will be found useful in testing slant.

Draw the first two lines of letters, pointing if necessary and testing the slant often. The width of normal letters is about seven-eighths their height. Before trying letters containing curves, a special study of the **O** is necessary. Draw accurately a symmetrical, upright **O** as shown, using instruments if necessary. Divide the vertical axis into several parts, working each way from its middle, and through each point of division draw indefinite lines to the right. Crossing these lines draw a slant line. Now upon the edge of a slip of paper measure off the distances **a**, **b**, etc., and mark them off from the slant line each side, as at **a'** and **b'**. Join the points thus produced and the proper form for the inclined **O** will result.

Notice carefully that the slant line is not an axis of symmetry, and the general effect with reference to this line is that of a closed curve whose upper right- and lower left-hand portions are full and well rounded, while the upper left- and lower right-hand portions are rather flat. Notice, too, that the highest and lowest points of the curve are on the slant line.

These characteristics should be studied thoroughly and the **O** practiced until it can be made well, for nearly all the curves used in the slant letters are portions of it. Much assistance in forming letters containing curves may be had by first lightly outlining the **O**, then taking such parts of it as are needed; even the **S** is but a slight modification of it.

Construct the exercises in their order, always estimating direction, and occasionally testing by comparison with slant line.

MODIFICATION OF THE FOREGOING STYLE.

PLATE 6.

By slight changes the Gothic letters may be made into another style, in effect at least. The changes in the capitals consist mainly in the addition of short, horizontal lines called "ceriphs" or "spurs," to finish off the ends of upright lines as in the **H** and **U**, and in extending some horizontal lines across the uprights as in **B**, **F**, and **L**. A few short lines ("kerns") upon the slant are added as at the ends of **S** and **Z**.

The lower-case letters are more difficult. Their successful execution depends upon,—

1. The curves being the inclined **O**, or the proper portion of it.
2. The spurs being straight and horizontal.
3. The uprights being straight till the curve in which some of them end is really reached.

Notice that in no case, excepting **q**, does the spur extend to the *right* of its upright.

4. The slant being *uniform*.

The curve with which **a**, **d**, **h**, and many others end may be studied to advantage in line 6, where in the word "drilled" it is shown that this curve is such as, if continued, will join smoothly the next letter.

The order in which parts of letters are made is from left to right. Make spurs before uprights, raising the pencil from the paper between the two strokes, if necessary, in order to avoid a rounded union of them.

The 8 and 9 are likely to prove troublesome. The order of strokes is indicated in the fifth line, the direction of each being downward. Each separate portion of letters and figures should be made at a single stroke and there should be uniform thickness of line.

Very careful practice of this style is recommended, not only because of its great usefulness to the draftsman, but also because it is the foundation of the difficult Roman type. It is not adapted to large lettering, but finds its greatest usefulness in notes, etc. When much matter is to be put into a small space the plainer form is better, as shown in the last line. In this and other sheets of slant letters, draw accurately a slant line in the upper left-hand corner.

VIII.

INKING.

PLATE 7.

Thus far we have studied upright and slanted Gothic letters, both capitals and lower case, and their modified forms. This Plate is a review of these, and will also introduce inking. Be careful to get each line of the titles symmetrical about the vertical centre line, which, in these cases, should be drawn first, and in the centre of the sheet.

It may here be said that the highest skill in spacing consists in ability to say where a line shall begin, so that when written through from beginning to end it shall be bisected by the centre line. The words are first written out on a slip of paper so that in some form the whole line may be before the eye at once. This should be attempted in the short lines of succeeding titles.

Ink the second title, carefully observing the following, which will apply to most of the subsequent work :

1. The knowledge that lines are to be finished in ink should lead to no slighting of the pencilling.

2. The ink should be good India ink; the pen rather coarse, with smooth point; the holder of large size, with ferrule of cork, rubber, or leather—anything but smooth metal. A pen is not at its best till it has been used for a short time, but it should be thrown away as soon as it becomes scratchy; any pen will give a ragged line if held so that one nib bears more heavily upon the paper than does the other, or if it is allowed to become sticky with dried ink. A smoother line will be obtained if the holder be carried at a large angle with the paper so that only the very point of the pen shall be used. Until otherwise directed do not spread the nibs of the pen, but use it as if it were a stick.

3. If a line is worked upon very long while the ink is wet, the fibres of the paper will become loosened, and a blot will result.

4. In order that the angle between two lines may be clean-cut, observe that—the pen should be filled often, but not as full as it will carry; a line should be drawn *to* another (especially if the letter be still wet) rather than *from* it; in inking lower case letters it is often necessary to draw parts of them in sections, as shown in the different stages of the *n*, Fig 8, Plate 10, the arrows showing the direction of the strokes.

5. The thickness of line for Gothic capitals should be not more than one-seventh the vertical height of letters. The thickening of the original pencil lines must be done so as not to increase the total width of letter, and so that lines will join each other as shown at (a), Fig. 7, Plate 10, and not as at (b).

6. Such letters as are shown in the last line are to be made with a single stroke of the pen, *with no shading*. Gillott's 404 is as fine a pen as should be used. The "ball pointed" pens are useful when it is desired to make this sort of letter large or prominent.

7. It will be found easier to make good lines when drawing downward, toward the body, and at first the paper may be turned so as to draw horizontal lines in that way, but ability to draw them with the paper in proper position should be cultivated. Never turn the paper when making lower case letters.

8. When the title is finished and the ink thoroughly dry, erase the limiting and other pencil lines, and look the work over carefully for places which may need touching up.

The dimensions for the second title are the same as those for the first, line for line.

For farther practice the following examples may be taken, the student to make the proper arrangement of parts :

*Assembly Drawing of Valve Gear for Pumping Engine
"Neptune." Scale $\frac{1}{2}$ inch to 1 foot. Jan. 3, 1896.*

*City of Boston. Mechanism of Draw Bridge No. 4.
Scale $1\frac{1}{2}$ inch to 1 foot. March, 1897.*

William A. Johnson, City Engineer.

It is considered bad taste to combine both upright and slant letters in the title proper, but appended notes may differ in this respect, as shown in the first title of Plate 7.

See remarks on underscoring, Page 31.

IX.

ROMAN LETTERS AND FIGURES.

PLATE 8.

This is the most exacting style and hardest to do really well. The following points — read before practice is begun — should be of great assistance :

1. **WIDTHS.**—In the Gothic letters, the **C**, **F** and **H** are of practically the same width. One point of difference between that style and the Roman is the addition in the latter of the spurs already mentioned in connection with Plate 6. These increase the total horizontal distance occupied by the letters. The Roman **C** has no such spur, and hence no increase in width; the **F** has spurs which increase the width at the left only, while the **H** has an increase at both left and right. Thus we have three different widths among what we called the normal width Gothic letters. The **W**, **M**, and others of extra width, are still given such extra width with the addition of the spurs beside. The spurs, therefore, modify *spacing* rather than *essential form*.

2. **LIGHT AND HEAVY LINES.**—All horizontal members are fine or “hair” lines except in the 2, 5 and 7.

All vertical lines are heavy except in the **N**, the first member of **M**, and the right side of **U**. All inclined lines extending upward to the right are hair lines except in **Z** and 7. All inclined lines extending upward to the left are heavy.

3. THE SPUR AND ITS JUNCTION WITH MEMBERS. The spur must be a strictly hair line, and accurately horizontal. To leave a definite angle where it joins members would give an unpleasing stiffness to the letters, hence a curve is introduced which is *tangent to vertical, but not to horizontal lines*. The correct form is shown at (a) Fig. 9, Plate 10, and the incorrect forms at (b). This curve must be small, and must never be drawn to the end of the spur. It is well in practice to draw first the members and spurs complete, then add the curve.

4. CURVED MEMBERS. Neglect of these is ofteneft responsible for spoiling Roman letters. The O is still the letter to be most carefully studied, all that was said of the Gothic O applying here. But now the sides of the letter are thickest at their middle and *rapidly* taper each way from that point. To secure the correct form, first draw the outline as for as the Gothic O, making it well rounded at the sides, then add the inside lines. Unless the letter is very wide as compared with its height these inside lines are perfectly *straight*, slightly eased at their ends by curves. Progressive stages are shown in Fig. 10, Plate 10. Make special practice of the letter before beginning Plate 8, that the characteristics of its curves may be carried into other curved letters. As some letters must be higher and wider than others, *so must the curved members of Roman letters be thicker at the thickest part than are the heavy straight members*.

5. No two heavy members, straight or curved, join or cross each other except in the Y. This must be carefully observed in such places as the right side of B, R, and 3.

6. The second member of M and N laps over the top of the first member, and the spur at this point is drawn at the left only.

7. THE W. To bring alternate members parallel requires a special study. Fig. 12, Plate 10, presents several stages which show the following order of procedure :

about the center.

From 2 draw the fourth member parallel to the second member parallel to the first.

Precautions are necessary in the M, in order that the middle intersect the free space between the first and fourth members. The line at the bottom of the sheet may be inked, first having care. Gillott's 303 pen is recommended. Leave the alphabet

ITALIC ROMAN.

PLATE 9.

Italic, or Italic Roman, is much used in titles and for marking and small portions of plans and titles it is written rather than about 60°. These forms are shown in the Plate.

Letters will prove the more difficult. The curve

in connection with the letters of Plate 6 that they are the foundation for the Roman style. The development of the *d* from the outline form there shown may be seen in Fig. 11, Plate 10, and all the letters may be built up in a similar way.

The ideal way of writing this type is to shade in the letters with single strokes of the pen. This requires much practice, and should not be attempted till skill is gained in form and slant by outlining each side of heavy lines and filling in as for capitals.

The last two lines may be inked.

For additional practice the following may be made into a title:

Chart of Shoals off Mento Bluffs. Scale 200 ft. to 1 in.
Nov. 28, 1895.

Note: Observations were taken at high tide.

OLD ENGLISH, GERMAN TEXT, AND ROUND WRITING.

PLATE 11.

The Old English and German Text are very seldom used except in diplomas, certificates, etc. The German Text, however, is the foundation of "Round Writing." The points to be noted in these styles are that:—

1. Lines extending upward to the right are hair lines.
2. Lines extending upward to the left are very heavy.
3. Vertical lines are medium heavy.

thick as the point is *wide*; when moved vertically there

German Text the tops of long, upright parts may be finished as shown in the H,—capital and lower case. Many of the letters have continuing curves, as shown in the S.

All the lines of the Text as here shown can be produced with a pen. This style of writing called "Round Writing" can be so formed. This can be written when sufficiently practiced. Special pens are on the market, made of steel, pencil or crayon. They are much like stub pens but have a reservoir furnished with an attachment which is a reservoir for ink, forming the fine lines possible. In order to write this as a "round writing" rules must be made on the up stroke. Unless the pen works well, good lines in this way, and it may be better to make all heavy lines with a pencil. This will necessitate the frequent lifting of the pen from the paper, which will prove troublesome as the hand is not in a favorable position.

XI.

MISCELLANEOUS STYLES.

PLATE 12.

This Plate shows some special styles which need but brief comment.

No. 1. Backhanded or Marking Letters. This style is easily done with a fine, flexible pen, springing the nibs so as to produce the heavy lines by single strokes.

No. 2. Suitable for architectural drawings. A coarse pen is best as all strokes should be made without shading, and no lines should be gone over more than once.

No. 3. This, as far as capitals are concerned, is the Italic Roman with short spurs and with kerns neither vertical nor upon the general slant of the letter. The slant is that shown in Plate 5. The lower-case letters differ considerably from any previously shown. In addition to general outlines note that letters reaching to the top line have the usual spur, while those reaching only to the middle line have curves instead; the curves are rather sharply turned, and the shading is carried just around them, the letters resembling the Round Writing in this respect. This style is not adapted to rapid execution and can hardly be recommended where much lettering is to be done.

At the bottom of the sheet are shown a few groups of words, the last two being under-scored. It is quite common to draw heavy black or red lines beneath words in notes and remarks upon working drawings. They should always be drawn at least $\frac{1}{32}$ inch below the line and should be broken when necessary to avoid crossing letters which extend below the

XII.

ORNAMENTATION.

PLATE 13.

amentation is not now very common. It has its appr

—

Fanciful forms of letters.

Striking arrangement of parts of title. When lines are
h the horizontal the upright members of letters are better
re many degrees of arc are covered they must be written
ness.

Geometric figures, scroll-work, flowers, etc. These may

Ornamental features are usually symmetrical about some axis; in designing, draw this axis first and sketch in the half of the ornament lying to one side of it; lay a piece of tracing paper over and trace the work upon it, using a medium soft pencil. Now turn the tracing bottom side up on the other side of the axis, bringing the traced position of the axis into its former position, and with a hard point go over the lines, thus transferring them to the paper. The whole may now be strengthened in pencil and, if found satisfactory, inked. Never ink one-half of an ornament before the other half is firmly pencilled.

Much elaboration should be avoided. Combinations of straight lines of different widths are usually sufficient for borders. Very large maps require that some area be occupied by the border; then curved lines may be introduced, otherwise too many straight lines, or too great spaces between lines would be necessary.

CONCLUSION.

While simple styles and arrangements of letters are most common and in general in best taste, the student is advised to make a collection of more elaborate forms. The pages of magazines and periodicals will furnish much in this line; and while not all that is printed is worthy of imitation, such a collection is likely at some time to prove very valuable.

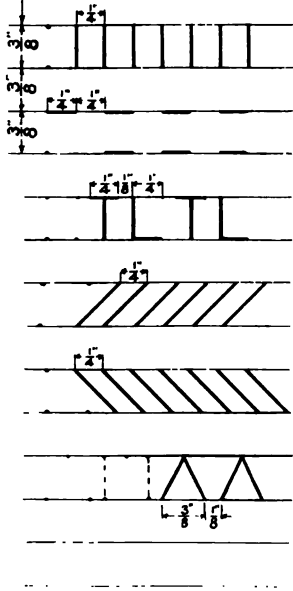
It is common to get an erroneous idea of what is meant by rapidity in lettering. No such speed as is reached in ordinary writing should be aimed at in any style. Rather keep in mind that first of all the correct form of letters must be secured, doing them always free-hand and

with as much deliberation as is necessary. One should aim at the accurate placing of lines, thus keeping free from necessity of erasures, rather than at rapidity of motion. After a careful practice of the styles shown in the Plates the student should begin to practice simple styles with the pen alone, using the pencil only to draw the limiting lines; these should never be omitted, even though but one word is to be formed. In doing lower-case letters expert letterers sometimes omit the top line, but the other two should always be used.

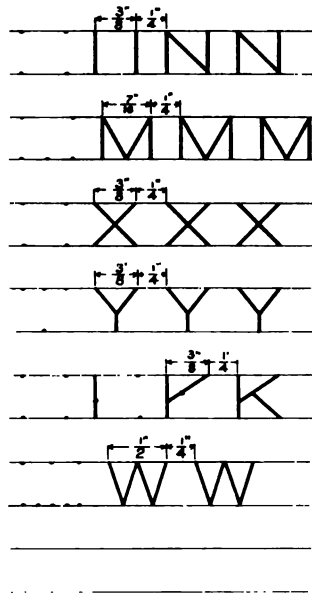


PLATE I

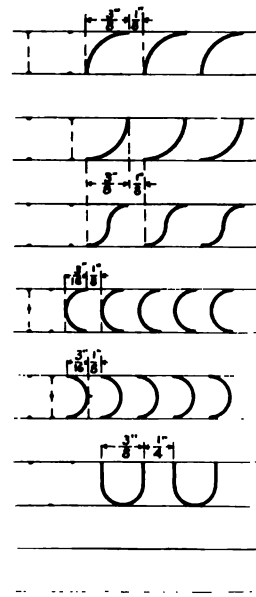
EXERCISE 1.



EXERCISE 2.



EXERCISE 3





LL LL

AA KK MM II

WW XX YY

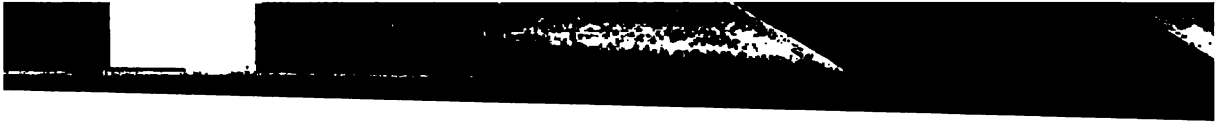
BB DD JJ FF

OO CCC GGG QQQ

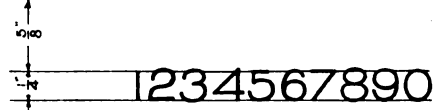
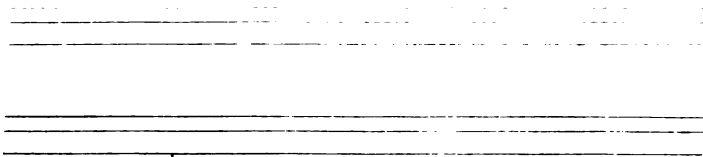
2 3 4 5 6 7



2

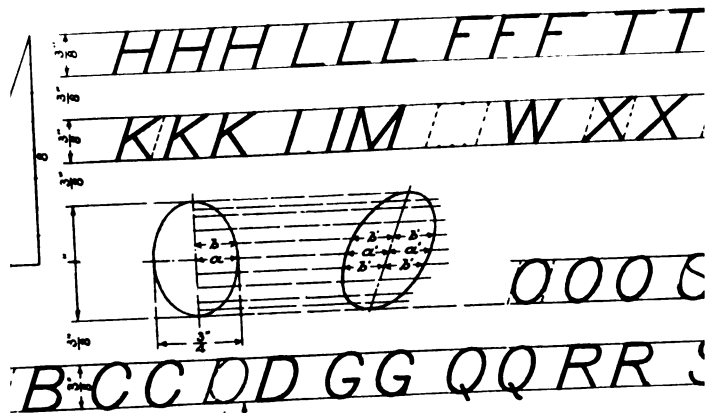


U U



CITY WATER WORKS.
Pipes for 12" Mains.
1 1/2" Plugs.





PLAN OF
HOUSE LOTS.
Each 80x126 Ft.



1/ 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

cd z 12

B C D E F G H I J K L M M N N O

T U V W X Y Z

1 2 3 4 4 5 6 7 8 8 9 1 2 3 4 4 4 5 6 7

*Note: Holes to be drilled and reamed
drilled*

Note: Holes to be drilled and reamed.



PLAN AND PROFILE
OF
COLUMBUS AVENUE.
Finished grades in red.
Scale 40 ft. to 1 in.

See Section Plan N.

FRONT ELEVATION
OF
TRAIN SHED NO 26.
C. H. & D. R. R.
Scale $\frac{1}{2}$ in. = 1 ft.

For elevations see Sheet 53



B C D E F G H I J K L

O P Q R S T U V W X

1 2 3 4 5 6 7 8 9 &

2
18

SURVEY

OF

BALD MOUNTAIN

1896.





PLATE 9

o c 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 1 2 3 4 5 6 7 8 9

LAKE HURON

ROCKY HILLS

Figures in red give finished Grades.

See Plan N^o 256.



Fig. 2



Fig. 5

Fig. 3

LAME

Fig. 6

Fig

NN

(a) Fig. 7 (b)



Fig. 9 (b)

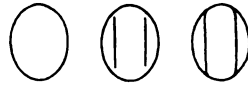


Fig. 10

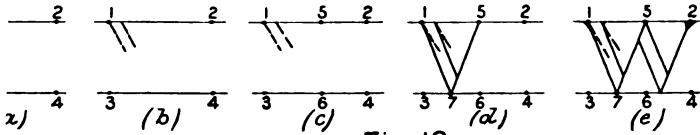




PLATE 10



Fig. 1

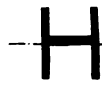


Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



(a) Fig. 7 (b)



Fig. 8



(a) Fig. 9 (b)

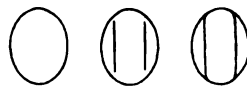


Fig. 10



Fig. 11

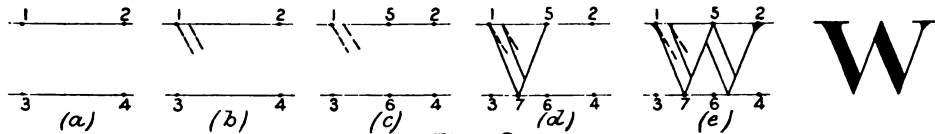


Fig. 12



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

Q R S T U V W X Y Z

q r s t u v w x y z

German Text

3 C D E F G H h I J K L
h c d e f g h h i j k l

O P Q R S S T U V W X
o p q r s s t u v w x y

Round Writing

r o o e f e h i j k l m n o p q r



BCDEFGHIJKLMNOPQRS
TUVWXYZ abcdefghijklmnopqrstu
vwxyz 123456789.

BCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

BCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz 123456789

Round Writing figures 123456789

Address Diagram No. 569 Dining Room



