BRITISH WEIGHTS & MEASURES

WATSON

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AS DESCRIBED IN THE LAWS OF ENGLAND FROM ANGLO-SAXON TIMES

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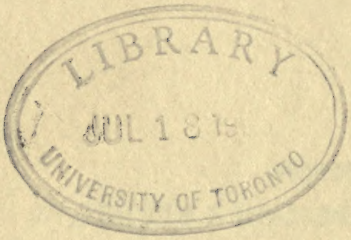

PREFACE

THESE notes have been written to give a popular idea of the history of British Weights and Measures, as described in the Laws of England, since the time of the Anglo-Saxon kings, and to explain briefly the changes that have been made in them by successive generations, with a view to their simplification and improvement.

C. M. WATSON.

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BRITISH WEIGHTS AND MEASURES

CHAPTER I

INTRODUCTION

British Weights and Measures as described in the Laws of England. Languages in which the Laws were Written. The Troy Pound used as a Standard of Comparison. The Wheat Grain and the Barley Grain as Weights. Both still used in Egypt.

THOSE persons who are so anxious to do away with the British system of weights and measures, and to compel the inhabitants of the United Kingdom to adopt the French or Metric system, are in the habit, in their speeches and writings, of describing the British system as complicated and inconvenient, and as if it had grown up in a haphazard and ill-considered manner. But they show by their statements that they do not know what the British system is, as laid down by Act

of Parliament, and that they are ignorant of its history; for, so far from being based on an uncertain foundation, British weights and measures have altered but little during the past thousand years, they have proved admirably adapted to the requirements of the people, and such changes as have been made have all been in the direction of simplification and of improvement.

Although the history of the subject has been treated in various scientific works, and in official publications, such as the reports of parliamentary committees, and the annual reports of the Standards Department of the Board of Trade; yet, as these books are not accessible to every one, it may be useful to give a resumé of this history, for the information of those who would wish to know how our system of weights and measures has been built up, and why it is not desirable that it should be abandoned in favour of the brand-new and somewhat hastily devised system adopted in France in 1792, at the time of the great Revolution.

Perhaps the most convenient method of dealing with the question is to follow the

laws of England, dealing with weights and measures, which have been enacted since the time of the Anglo-Saxon kings. This appears to be sufficiently far to go back, although our weights and measures have a much longer history, as they are the modern representatives of the ancient measures of the East, and of the Roman Empire. It is also unnecessary to consider the interesting but difficult question as to when the prototypes of the British units were first introduced into this country, whether by the Phœnicians, the Romans, or the Scandinavians.

It is sufficient to say that it is probable that the Saxons, when they arrived in England in the fifth century, adopted the weights and measures already in use, just as the Normans did, six centuries later. It must be remembered that the greater portion of the inhabitants of Britain remained the same as before the arrival of the Saxons, although the latter formed the ruling class.

Fortunately the laws of England have been preserved since the reign of Ethelred, King of Kent (A.D. 560-616), and of them several editions have been published. Of these, prob-

ably the most complete is that compiled by the Commissioners of Public Records, and it is this one which has been used in preparing this short history.

It is necessary to state briefly the languages in which the laws were originally written, because, in the originals, the same word is in different places used to express different measures, while the same measure is sometimes represented by different words. This is occasionally overlooked by translators, and an incorrect idea of the meaning is thus given.

The laws of the kings who reigned from A.D. 560 to A.D. 1042 are written in Anglo-Saxon, and, as this language is not very generally known, the extracts which I have given are taken from the English translation made by the Public Record Commissioners. The latter also published a Latin version, believed to have been made in the twelfth century, which throws considerable light on the Anglo-Saxon original.

The laws of the kings who reigned from A.D. 1042 to A.D. 1272, King Edward the Confessor to King Henry III., are in Latin.

Some laws of William the Conqueror are also in Norman French, but probably the Latin was the official version. Acts of Parliament commence in the reign of Henry III.

The laws of Kings Edward I. and Edward II. are sometimes in Latin and sometimes in French, but more usually in the former language.

The laws of the kings from A.D. 1327 to A.D. 1461, King Edward III. to King Henry VI., are mostly in French. The English language was first used for parliamentary proceedings in 1392, but not for Acts of Parliament until later.

The laws of the kings from A.D. 1461 to A.D. 1488, the fourth year of Henry VII., are in French. After 1488, the laws of King Henry VII., and of all succeeding sovereigns, are in English.

There is another preliminary matter which must be referred to. As will be seen later, there were a number of different kinds of pounds used in England, and it is necessary to have a fixed standard by which to compare them with one another. For this I have taken the pound, afterwards called the troy pound,

composed of 12 troy ounces, or of 5760 troy grains. This pound is no longer a British legal weight, having been abolished by the Weights and Measures Act of 1878, and it existed long before the name "Troy" was given to it, as it is derived from the Roman pound. But as it has been called troy pound for centuries, it is allowable to use the term as a mode of speech.

The expression troy grain is also not quite accurate, as this weight ought to be called "barley grain." The use of grains of corn as a means of expressing small weights is very ancient, and is still in use in some countries. There were two corn grains used, the wheat grain and the barley grain, which bore to one another the proportion of three to four. For example, in Egypt, the rotl (pound) is divided as follows :—

1 rotl	=	12 oukiyeh (ounces).
1 oukiyeh	=	12 dirhem (drams).
1 dirhem	=	16 kirat (carats).
1 kirat	=	3 hebbeh (barley grains).
1 kirat	=	4 kambeh (wheat grains).

The Egyptian dirhem is a very ancient weight, and is believed not to have altered in

the course of many centuries; it is equal to 48 barley grains, and the half dirhem, a coin used by the Sultans of Egypt, weighed 24 barley grains. As the British pennyweight was also 24 barley grains, it is not unreasonable to suppose that there is some connection between the weights of England and of Egypt.

But in former times the English pound was not divided into barley grains, but into wheat grains, of which 7680 went to the troy pound. The wheat grain has long ceased to be used as a weight in this country, except by dealers in precious stones, who buy and sell diamonds by the carat of four grains. This is not a legal weight, and there is no authorised standard for it, but, as used in the trade, the carat is equal to 3·17 imperial grains.

CHAPTER II

THE ANGLO-SAXON KINGS

Law of King Edgar respecting Weights and Measures. Anglo-Saxon Weights. The Money Pound. The Merchants' Pound. Anglo-Saxon Money. Measures of Capacity. King Athelstane's Law of the King's Peace. Anglo-Saxon Measures of Length. The Law of the Ordeal. The Elne or Cubit. The Palm. The Acre. The Yard of Land. Laws of King Ethelred and King Canute. Summary of Anglo-Saxon Weights and Measures.

THE first important ordinance insisting on uniformity of weights and measures in England was enacted in the reign of King Edgar, A.D. 958-975. It ran as follows :—

"And let one money pass through the King's dominions, and that let no man refuse; and let one measure and one weight pass, such as is observed at London and Winchester; and let the Wey of wool go for cxx pence, and let no man sell it cheaper; and if any one sell it cheaper, either publicly or privately, let each pay xl shillings to the King."

It is necessary to consider what were the weights and measures referred to in this Law, and the matter is not without difficulty. The word "money" undoubtedly means the pound of silver, which was divided into 240 pennies, just as the pound of account is at the present day. And as Anglo-Saxon pennies, which have been found, weigh 22½ troy grains, it would seem probable that the money pound of silver weighed 5400 troy grains, as it certainly did later in the time of the Norman kings. But it does not necessarily follow from this that the pound used by the merchants for buying and selling was also 5400 grains, and it may have been the original pound of 5760 grains, or even a larger one. In after years the merchants' pound was always larger than the money pound, and the same may have been the case in Anglo-Saxon times.

Various explanations have been given as to why the two pounds should have been different, and the following appears to be a possible solution. When a merchant took a pound of silver to the king's mint to be coined into pennies, if his pound weighed 5760 grains,

he should have received back 240 silver pennies, each weighing 24 grains, provided no charge was made for coining; but, if he was given 240 pennies, each weighing $22\frac{1}{2}$ grains only, it would mean that the mint authorities had kept back three-quarters of an ounce of silver to pay for the coining. As we shall see later, the weight of the coined silver penny tended to diminish, while the weight of the merchants' pound tended to increase; and, in the time of Edward I., while the money pound was $11\frac{1}{4}$ troy ounces, the merchants' pound had become 15 ounces.

In the Anglo-Saxon money system the silver penny appears to have been the only actual coin; but in money of account, there was, between the pound and the penny, an intermediate unit of account equal to four pence in some parts of England, and to five pence in other parts, which was called a "scilling." The scilling remained as a unit of money of account until the Norman Conquest, when its place was taken by the shilling, equal to twelve pence. The shilling appears to have been introduced by the Emperor Charlemagne, who in the ninth century adopted a pound, which,

like the British, was based on the Roman pound. This pound was divided as follows for money, and was called "livre."

1 livre	=	20 sous (shillings).
1 sou	=	12 deniers (pennies).
1 denier	=	24 graines (grains).

For buying and selling, Charlemagne's pound was divided into 12 ounces, and exactly the same tendency to increase on the part of the merchants' pound showed itself in France as in England, as, in process of time, the French pound weighed 16 ounces in Paris and 15 ounces in other parts of the country.

Another division of the Anglo-Saxon money pound is mentioned in a law of King Ethelred II., in which it is stated that the pound was counted as equal to 15 ore in the Danish parts of England. The word "ore" is still used as the name of a small coin in Denmark, Norway, and Sweden.

There is nothing in the Anglo-Saxon laws to explain what is meant by the "Wey of wool," but, in an ordinance of Edward I., it is given as being equal to 175 pounds, each of 15 ounces.

The only Anglo-Saxon measure of capacity

referred to in the laws is the "Amber," which is given as a measure for butter and Welsh ale in a law of Ina, King of Wessex, and for meal in a law of King Athelstane. The content of the amber is described, in a document of the reign of King Edward I., as being equal to half a London quarter, and as containing four London bushels; it is therefore not unreasonable to assume that the quarter and bushel were used as measures of capacity by the Anglo-Saxons.

A number of the Anglo-Saxon measures of length are given in a law of King Athelstane (A.D. 925-940), which defines the extent of the king's grith, meaning the king's peace, or distance from his dwelling, within which peace was always to be maintained:

"Thus far shall be the King's grith from his burh gate where he is dwelling, on its four sides; that is iii miles, and iii furlongs, and iii acres' breadths, and ix feet, and ix palms, and ix barley corns."

The same regulation is repeated in the laws of Henry I., except that the number of acres' breadths is given as 9 instead of 3.

Of these measures of length there can be no

doubt that the mile, and the furlong, or acre's length, are the same as are in use in the United Kingdom at the present day, as there is no point in a continuous history where any alteration is mentioned. The acre's breadth is the same measure that is now called the chain, and from later laws it would appear that it always consisted of four perches.

It is doubtful what was the length of the foot in Anglo-Saxon times, and it is probable that feet differing in length were in use, varying from the Roman foot of 11·65 inches, up to a foot of 13 inches. The present British foot of 12 inches does not appear to have been definitely fixed until the reign of Edward I., when it was ordained that, in future, the foot was to be exactly one-third of the yard.

It will be observed that neither the yard nor the cubit are included in King Athelstane's list of measures, but there can be little doubt that the latter was used by the Anglo-Saxons, and it appears to be referred to in the laws of King Athelstane, which deal with the trial by ordeal, by which criminals were allowed to prove their innocence if they could.

The ordeal was of three kinds, the trial by

hot iron, the trial by hot water, and the trial by cold water. In the ordeal by hot iron, a piece of iron weighing 1 lb. was made red hot, which the person under examination had to carry for a certain distance in his naked hand. His hand was then bound up for a fixed time, and if when the bandage was removed he had suffered no ill effect, he was pronounced innocent.

In the ordeal by hot water, the criminal had to plunge his hand up to the elbow in a vessel full of boiling water, and take out a stone; his hand was then bound up and examined as in the previous ordeal.

In the ordeal by cold water, the man was lowered into water by a rope, until the water was an "elne and a half" over him, apparently over his head. If he was drowned he was judged guilty, and innocent if he survived. In the Latin version of this law the words used are *una ulna et dimidia.*

The word "ulna," of which "elne" is the Saxon equivalent, denotes the length of the forearm of a man from the elbow to the end of the middle finger; it is about 18 inches in length, a little more or a little less. The

average cubit, used by Eastern nations, was about 17·7 inches, and that used in England was 18 inches; it was not, however, until the end of the thirteenth century that the length of the inch was definitely fixed as the $\frac{1}{18}$ of the cubit.

The palm, mentioned in Athelstane's law, and sometimes called the "hand-breadth," is the sixth part of a cubit; in England it was divided into 3 thumb-breadths or inches. It is necessary to distinguish the "palm" from the "hand," the latter, which is used for measuring horses, being 4 inches in length. In the East the palm was counted as 4 finger-breadths.

The "barley-corn" appears to have been the smallest measure of length used by the Anglo-Saxons, and was probably the same as that described in the laws of Edward I., of which three, placed end to end, were equal to one inch. In the East, on the contrary, it was the breadth of the barley-corn that was used as a measure; 6 barley-corns placed side by side made 1 finger-breadth.

The "acre," the Anglo-Saxon unit of land measurement, was the area of a rectangular

piece of land 1 furlong or acre's length in length, and $\frac{1}{10}$ of a furlong, or an acre's breadth, in width. The area of the acre has apparently not altered since the time of the Anglo-Saxons.

Although the word "yard" was not used as a measure of length by the Anglo-Saxons, the term was employed as a land measure. In a law of Ina, King of Wessex (A.D. 688-728) the following clause occurs :—

"If a man agree for a yard of land (ȝyrde ȝeard) or more, at a fixed rent, and plough it; if the lord desire to raise the land to him to service and to rent, he will not take it upon him, if the lord do not give him a dwelling; and let him lose the crop."

From statements in Domesday Book it would appear the area of a yard of land was equal to 30 acres, or one-fourth of an average hide.

The law of King Edgar with regard to uniformity of weights and measures was re-enacted by succeeding kings. For example, in the laws of King Ethelred II., who reigned A.D. 979-1014, the following clauses occur :—

"And let fraudulent deeds and hateful

illegalities be earnestly shunned; that is, false weights and wrongful measures, and lying witnesses, and shameful fightings.

"And let weights and measures be carefully rectified, and every illegality be thenceforth avoided."

The latter law was repeated by King Canute, after his accession to the throne of England, in almost the same words :—

"And let weights and measures be carefully rectified, and every species of injustice be henceforth abstained from."

Before leaving the Anglo-Saxons, it will be advisable to summarise the system of British weights and measures as it existed before the Norman Conquest.

The pound, the standard of weight, was probably the original pound of 12 ounces, derived from the Roman pound, and afterwards called the troy pound. But the money pound was smaller, and seems to have consisted, as in Norman times, of $11\frac{1}{4}$ troy ounces, or 5400 troy grains. This pound was divided into 240 silver pennies, each weighing $22\frac{1}{2}$ troy grains. On the other hand, the mer-

chants' pound, used for buying and selling heavy goods, was possibly larger.

The standards of capacity, *i.e.* the bushel and the gallon, were probably the same as were in use afterwards, but there is little information on the subject in the Anglo-Saxon laws.

The measures of length—the mile, the furlong, and the acre's breadth, afterwards called the chain—were the same as at present.

The acre, the unit of land measure, was also the same in Anglo-Saxon times as at the present day.

CHAPTER III

KING WILLIAM I. TO KING EDWARD I.

Law of William the Conqueror as to Weights and Measures. No Change made in the British System. Domesday Book. Magna Carta. Laws of King Henry III. respecting Weights and Measures. The Ulna. Measures of Capacity based on Measures of Weight. The Width of Cloths in the Thirteenth Century. Important Laws of Uncertain Date. The Assize of Weights and Measures. The Lesser Pound. The Greater Pound. The Money Pound. The Gallon and the Bushel. The Wine Gallon of King Edward I. Wool Weights. The Meaning of Troy Weight and of Avoirdupois Weight. The Auncel. The Assize of Bread and Ale. The Statute for Measuring Land. The Acre. The Iron Standard Yard of King Edward I. Length of the Foot Fixed. The Statute concerning Bakers, etc. Laws for the Inspection and Verification of Weights and Measures. The Statute of Wales.

In A.D. 1066 William the Norman successfully invaded England, but before proclaiming himself as king he took the precaution of going through the form of election by the people, and he always desired to be regarded,

not as a usurper, but as the lawful successor of King Edward the Confessor.

Just as the Saxons made no change in the British system of weights and measures on their arrival in England, so the Norman kings did not attempt to alter them, and one of the early laws of William the Conqueror ran as follows :—

"*De mensuris et ponderibus.*"

"Et quod habeant per universum regnum mensuras fidelissimas, et signatas, et pondera fidelissima et signata, sicut boni predecessores statuerint."

"And that they shall have throughout the whole kingdom most accurately adjusted and properly certified measures, and most accurately adjusted and properly certified weights, as our good predecessors have ordained."

In fact, the only alteration that seems to have been made was the substitution of the Norman or French shilling for the Saxon scilling (see p. 10), and even this change was effected slowly, as the scilling is frequently referred to in the laws of the Norman kings in a manner that shows it was still regarded as a legal monetary unit.

It is remarkable how little alteration was made in the laws of England by the Normans; the laws of Henry I., for example, which are very lengthy, are practically a simple repetition of the law of the Anglo-Saxon kings. Of course, after the suppression of the unsuccessful insurrection against William the Conqueror, a large number of the Saxon landowners were deprived of their property and replaced by his Norman followers, but the bulk of the people were but little interfered with.

The commissioners, who were charged with the duty of collecting the information for Domesday Book, which was a valuation of land for purposes of taxation, were specially directed to record the values, not only at the time of their inquiry, but also what they were in the reign of King Edward the Confessor. This shows that it was simply a revision of valuation, and there is not the smallest indication in Domesday Book that there was any intention to interfere with existing measures. There was no break in the history of British weights and measures at the time of the Norman Conquest.

There is no information on the subject of

weights and measures in the laws of the kings from Stephen to Richard I., but in the Magna Carta, signed by King John in A.D. 1215, there is an important clause, confirming the uniformity of weights and measures, which introduces some new and interesting points :—

"Ut mensura vini, bladi, et latitudines pannorum, et rerum aliarum emendetur, et ita de ponderibus."

"That the measure of wine and of corn, and the widths of cloths, and the measures of all other things, be made correct, and so also of weights."

The same clause was repeated and extended in the Great Charter of King Henry III., signed on his accession in A.D. 1216 :—

"Una mensura vini fiat per totum regnum nostrum, et una mensura cervisie, et una mensura bladi, scilicet quarterium Londinium ; et una latitudo pannorum tinctorum, russetorum, et haubergettorum, scilicet due ulne infra listas. De ponderibus sit ut de mensuris."

"Let one measure of wine be used throughout the whole of our Kingdom, and one measure of ale, and one measure of corn, that is to say, the London quarter ; and one width of coloured and russet cloths, and of cloths for hauberks,

that is to say, two 'ulne' between the lists. And let the law be for weights as for measures."

It is clear from this that the London quarter, which, as I have already shown, was probably used in Anglo-Saxon times, was to be the standard measure of capacity for corn; but it is not quite clear whether the quarter was also to be used for wine and ale, or whether, as in after times, there were different measures of capacity for the two latter.

There can be little doubt that the original idea of measure of capacity was based on weight, and that a pint measure was a vessel which held a pound weight of any article, and a gallon held 8 pounds. But, as the specific gravity of articles differ, so also the measures of capacity for them would also differ; for example, a gallon which held 8 pounds of wine would contain less than 8 pounds of wheat. As will be seen later, an attempt was made to get over this difficulty in the time of Edward I., but not successfully; and the principle of having the same gallon for corn, wine, and ale was not definitely accepted until the passing of the Weights and Measures Act of A.D. 1824.

There is also some doubt as to the meaning of the word used for the measure of cloth in the above-quoted Charter. If the term "ulna" means "yard," then the cloth made at that time must have been 72 inches between the lists, and this seems rather an improbable width. In succeeding laws regarding cloths, while three-quarters of a yard, or 54 inches, was a usual width for broadcloths, other cloths are described as being one yard, or three-quarters of a yard wide. It would therefore seem more likely that the word "ulna" in this Charter meant the single cubit of 18 inches, rather than the double cubit or yard of 36 inches; but, to settle the point definitely, it would be necessary to ascertain what was the width of a cloth loom in the time of Henry III.

We have now to consider some very important ordinances respecting weights and measures, the exact date of which is not known. They are attributed by some writers to the reign of Henry III., and by others to that of his successor, Edward I. The Public Record Commissioners decline to give a definite opinion, and describe them as of uncertain

date, but before the reign of King Edward III. But, however, as one of them, "The Assize of Bread and Ale," is referred to in *The Statute of Wales*, enacted by Edward I. in A.D. 1284, and another, "The Assize of Weights and Measures," is mentioned in the *Year Book* of the twentieth year of the same king, it is reasonable to believe that they were composed not later than his reign. I shall therefore speak of them as being of the time of King Edward I., leaving it an open question whether they ought not to be attributed to his predecessor.

These ordinances appear to be royal regulations, or what would now be called "Orders in Council," rather than Acts of Parliament. As the relative dates of issue are not known, I will describe them in the order most convenient for considering them. They are written in Latin, and are of some length, so only the important parts will be quoted in full. These ordinances are named as follows :—

1. "The Assize of Weights and Measures."
2. "The Assize of Bread and Ale."

3. "The Statute for Measuring Land, etc."
4. "The Statute concerning Bakers, etc."

1. *The Assize of Weights and Measures.*

This ordinance commences as follows :—

"Per ordinacionem totius Anglici regni, fuit mensura domini Regis composita, videlicet; quod denarius Anglicanus, qui vocatur sterlyngus, rotundus et sine tonsura, ponderabit xxxii grana frumenti in medio spice. Et uncia debet ponderatur viginti denarios. Et duodecim uncie faciunt libram Londiniam, videlicet, xx solidos sterlyngas."

"By the Law of the whole Kingdom of England the measure of our Lord the King was composed in the following way; that is to say that the English penny, which is called a sterlyng, round and uncut, ought to weigh 32 grains of wheat taken from the middle of the ear. And the ounce ought to weigh 20 pennies. And 12 ounces make the London pound, that is to say, 20 shillings sterlyng."

There has been much discussion as to what is the pound here described. At that time the silver penny, as actually coined at the mint, weighed 30 wheat grains ($22\frac{1}{2}$ troy grains),

and 240 of these made a pound of 5400 troy grains. Some persons consider that it is this money pound which is described in the ordinance, but the wording will hardly bear that meaning. To me it appears to be an authoritative declaration of what the true British pound was, irrespective of the weight which the royal mint might give to the silver pennies coined there. It is the measure, *i.e.* the standard of weight, of the king that is being described, and it is laid down that a penny ought to weigh 32 wheat grains, no matter what any particular coin did weigh; just as at the present day, the twentieth part of a troy ounce is called a penny-weight, though no one thinks of it as the weight of a bronze penny.

A later clause in the ordinance gives the same meaning, and, although out of its proper place, I will quote it now, as it bears directly on the subject of the pound :—

"Et sciendum quod que libra de denarios et specibus, et confeccionibus, utpote in electuario, constat ex xx solidos; libra vero omnium aliarum rerum ex xxv solidos. Uncia vero constat ex xxd, et libra continet xii uncias. In aliis veris rebus libra continet xv uncias.

Uncia vero hinc inde est in pondere xx denarios."

"And it is to be known that the pound of pennies, and of spices, and of apothecaries' goods, consists of 20 shillings; but the pound of all other things consists of 25 shillings. And the ounce consists of 20 pennies, and the pound contains 12 ounces. In the case of all other things the pound contains 15 ounces; in this case also the ounce is 20 pennies in weight."

In this paragraph there can, I think, be no doubt that it is weights, not coins, which are being discussed. At that time there was no coin of the value of a pound nor of a shilling; but there were pound weights, ounce weights, shilling weights, and penny weights, while there was only one coin, the silver penny.

There would appear, therefore, to have been three recognised pounds at the date of the ordinance; first, the old British pound of 12 ounces, used for buying and selling gold and silver bullion, spices and drugs; second, the pound of 15 ounces, used for buying and selling all other things; third, the pound of $11\frac{1}{4}$ ounces, for coined silver. The divisions of these three pounds were:—

(1) *The lesser pound for Gold, Silver, Spices, and Drugs.*

1 pound = 20 shillings.
1 shilling = 12 pennyweights.
1 pennyweight = 32 wheat grains.

or

1 pound = 12 ounces.
1 ounce = 20 pennyweights.
1 pennyweight = 32 wheat grains.

(2) *The greater pound for all other things.*

1 pound = 25 shillings.
1 shilling = 12 pennyweights.
1 pennyweight = 32 wheat grains.

or

1 pound = 15 ounces.
1 ounce = 20 pennyweights.
1 pennyweight = 32 wheat grains.

(3) *The pound for coined silver.*

1 pound = 240 silver pennies (coins).
1 penny = 30 wheat grains.

I will now return to an earlier part of the ordinance, in which the measures of capacity are described in the following words :—

"Et viii libre faciunt galonem vini, et octo galones vini faciunt busellum Londinium;

et octo buselli faciunt quarterium Londinium; et duodecim libre et dimidium faciunt petram Londiniam."

"And eight pounds make a gallon of wine, and eight gallons make a London bushel; and eight bushels make a London quarter; and 12½ pounds make a London stone."

This is not very easy to understand. Wine is usually sold by the gallon, and corn by the bushel, but there is only one kind of gallon and bushel mentioned in the ordinance. But if a gallon contained 8 pounds of wine, the same measure would not contain 8 pounds of wheat, assuming that the same pound was used in both cases. If, however, wine was treated as one of "the other things," and was weighed by the greater pound of 15 ounces, while wheat, as had always been the custom, was weighed by the lesser pound of 12 ounces, then a gallon which held 8 pounds of wine would contain about 8 pounds of wheat, if the latter was sold by "heaped measure."

It rather looks, therefore, as if an attempt was made by this ordinance to have only one standard gallon for wine, corn, etc. If this was so, the attempt did not succeed, and it

appears to have led to a good deal of difficulty later, until the matter was put right in the reign of King Henry VII.

Assuming that the above solution of the question is correct, it is easy to calculate approximately the content of the wine gallon of Edward I. An imperial gallon has a capacity of 277·463 cubic inches, and contains 10 imperial pounds of water. As wine has an average specific gravity of 0·99, 8 pounds of wine, each of 15 troy ounces, would be contained in a vessel of about 230½ cubic inches capacity. The suggestion is confirmed by the fact that, when the wine gallon was standardised in the reign of Queen Anne, it was fixed as 231 cubic inches, as that was the customary wine gallon then in use, though its origin seems to have been forgotten (see p. 81).

After describing the gallon and the bushel, the ordinance goes on to deal with the weight of wool, and states that the sack of wool ought to weigh 28 stone, each stone of 12½ pounds, but that in some parts of the country it is 30 stone. It also gives the weight of a load of lead as 2100 pounds, each pound being 25

shillings; lead, being one of "the other things," was of course weighed by the greater pound, which is given indifferently as 25 shillings, or 15 ounces.

Another system of weighing lead is described in the following paragraph:—

"Secundum vero quosdam alios la charre consistit ex xii Wayes, et hoc est secundum troni ponderacionem."

"But, according to some others, the load consists of 12 Wayes, and this is according to troy weight."

The expression "troni ponderacionem" is translated "troy weight" by the Public Record Commissioners, and, as it is the first time that the words occur in the laws, it is advisable to explain their meaning, and also that of the kindred expression "avoirdupois weight."

A study of the matter shows that the word "troy" did not originally mean a particular kind of pound, nor did it refer to the nature of the article weighed, but to the manner of weighing. "Troy" is probably derived from the old English word "troi," signifying a balance (see Wright's *English Dialect Dic-*

tionary). Another form of the word was "tron," used in parts of England and in Scotland. "Tron" was also used to express the market, or place of weighing, and still exists in Scotland in words such as the "Trongate"; the latter form of the word is that used in the ordinance under consideration. From time immemorial articles of value were weighed by the balance, and, in process of time, weighing by the balance came to be called "troy weight." The nature of articles weighed by troy were those of which the value was considerable relatively to the weight.

The word "avoirdupois," on the other hand, was not the name of a particular kind of pound, but was a generic word, used with respect to articles of which the weight was considerable relatively to the value, such as wool, iron, lead, etc. In ancient times in England, articles of avoirdupois were sometimes weighed by a kind of steelyard, called the auncel. This consisted of a beam with a fixed weight at one end, while the article to be weighed was suspended from the other; the fulcrum, or point of support, was moved

along the beam, and its position indicated the weight of the article. It was an unsatisfactory mode of weighing, and one that afforded opportunities for cheating; so, as we shall see later, several laws were enacted, forbidding the use of the auncel, and ordering that all kinds of goods should be weighed by the balance. Having regard to the meaning of the words "troy" and "avoirdupois," it is easy to understand that, when the balance was generally used, the lesser pound, used for valuable articles, was called a troy pound, while the greater pounds, used for bulky articles, were called avoirdupois pounds. Of these latter there were three, of which the first was the pound of 15 troy ounces, described in the Assize of Weights and Measures.

2. *The Assize of Bread and Ale.*

This ordinance fixes the price at which bread and ale were to be sold according as the price of corn varied. It commences by stating that when a quarter of wheat sold for 12 pence, the farthing loaf of wastel bread was to weigh 6 pounds 16 shillings. It then gives the rate at which the size of the loaf

was to be reduced as the price of wheat rose, and finally says that, when wheat sold for 12 shillings the quarter, the farthing loaf was to weigh 11 shillings and 4 pence.

It is evident that the pounds, shillings, and pence used with reference to bread were weights, *not* coins. As I have already pointed out, there were no coins of the value of a pound or shilling in the time of Edward I., and, if the weighing had been done by coins, it would have taken 1632 silver pennies to weigh the loaf weighing 6 pounds 16 shillings.

The price of ale and beer was fixed in the following way. When the quarter of wheat sold for 4 shillings, or 4 shillings and 3 pence, the quarter of barley for 20 pence or 2 shillings, and the quarter of oats for 16 pence, then 2 gallons of ale or beer were to be sold for a penny in the cities, and three or four gallons for a penny out of the cities. These prices give a good idea of the high value of money in those days, and show that it is quite out of the question that silver pennies could have been used as weights.

3. *The Statute for Measuring Land, etc.*

Although this ordinance deals principally with the measurement of land, it gives information of the greatest importance with reference to the standards of measures of length. A large part of it is devoted to a table, giving the lengths and breadths of a rectangular acre of different shapes, varying from one of 16 perches in length and 10 perches in breadth, up to one of 80 perches in length and 2 perches in breadth. The area of the acre is, of course, always the same, *i.e.* 160 square perches.

Beside this table of land measure, the ordinance contains the following paragraphs, which may be regarded as the Royal Charter of British measures of length.

"Ordinatum est quod tria grana ordei, sicca et rotunda, faciunt pollicem; duodecim pollices faciunt pedem; tres pedes faciunt ulnam; quinque ulne et dimidia faciunt perticam; et quadraginta pertice in longitudine et quatuor in latitudine faciunt unam acram.

"Et memorandum quod ulna domini Regis ferrea continet iii pedes et non plus; et pes debet continet xii pollices per recta mensura hujus

modi ulne metita, videlicet, tricesima sexta parta dicte ulne facit i pollice, nec plus nec minus; et quinz ulne et dimidium faciunt i perticam, sexdeci pedes et dimidium, per predicatam ulnam domini Regis ferream."

"It is ordained that three grains of barley, dry and round, make an inch; 12 inches make a foot; 3 feet make an 'ulna'; $5\frac{1}{2}$ ulne make a perch; and 40 perches in length and 4 perches in breadth make an acre.

"And it is to be remembered that the Iron Ulna of our Lord the King contains 3 feet and no more; and the foot must contain 12 inches, measured by the correct measure of this kind of ulna; that is to say, one thirty-sixth part of the said ulna makes one inch, neither more nor less. And $5\frac{1}{2}$ ulne, or $16\frac{1}{2}$ feet, make one perch, in accordance with the above-described Iron Ulna of our Lord the King."

It would seem without doubt, that the object of this ordinance was to secure uniformity in British measures of length. Up to that time, while the length of the cubit was fixed, as it was dependent on the area of the acre, which never appears to have altered, the foot was a measure of uncertain length, varied in different parts of the country, and had not been made commensurable with the cubit. Now a new

ulna or cubit was created, called the royal ulna, exactly double the length of the old cubit, and the length of the foot was definitely fixed as one-third of this royal ulna, which was afterwards called the "yard."

It is sometimes stated that the iron standard yard of the king was made the length of the king's arm, but this is a childish suggestion. The word "ulna" does not mean "arm," and its length depended upon the area of the British acre, which no king or parliament could have altered.

There was only one flaw in the new system, namely, that it made the length of the perch $5\frac{1}{2}$ yards, or $16\frac{1}{2}$ feet, inconvenient numbers; but this could not be avoided, as the acre's breadth of 22 yards, and the acre's length of 220 yards, could not be changed. But this was of small importance, as compared with the great advantage of having only one standard measure of length for the whole kingdom, the iron yard of the king.

Just as the ordinance definitely fixed the length of the foot, so also it fixed the length of the inch. The former was to be $\frac{1}{3}$ of the royal ulna, and not more; and the latter was to be

$\frac{1}{36}$ part of the royal ulna, neither more nor less. These words show clearly that there had previously been an uncertainty as to the lengths of the foot and inch.

The division of the inch into barley-corns was probably not an innovation, but a statement of an old custom; as a fact, 36 average barley-corns fixed end to end, make a foot almost exactly.

It is much to be regretted that the iron standard yard of King Edward is no longer in existence, but the brass standard yard of King Henry VII., which is probably a pretty accurate copy of the former, is still kept in the Standards Office, and is practically the same as the British standard yard of the present day.

4. *The Statute concerning Bakers, etc.*

This ordinance enumerates the punishments to be awarded if the Assize of Bread and Ale was not strictly observed by bakers and others, and it also gives the regulations as regards keeping the standard measures, in different parts of the country, in the following words :—

"Standardum buselli, galones, et ulne, sigillo domini Regis ferreo signantur, diligenter et

salvo custodiantur, sub pena centum libras. Et nulla mensura fiat in villa, nisi mensura domini Regis concordat et signa comunitatis villa sit signata. Si quis emat vel vendat per mensuras non signatas, et per majorem et ballivos non examinatas, graviter amercietur. Et omnes mensure et ulne, majores vel minores, bis in anno videantur et diligenter examinantur. Standardum buselli, galones, et ulne, et signa, quibus signanda sunt, sint sub custodia majoris et ballivorum, et sex legaliter de villa juratorum, coram quibus mensure signentur."

"The standards of the bushel, of the gallon, and of the 'ulne' (plural), which have been sealed with the iron seal of our Lord the King, are to be kept diligently and safely, under a penalty of £100. And let no measure be made in a town, unless it agrees with the measure of our Lord the King, and is sealed with the seal of the corporation of the town. If any person buys or sells with measures that have not been sealed, or that have not been inspected by the mayor and the bailiffs, he will be severely punished. And all measures and 'ulne,' greater or less, are to be inspected and carefully examined twice every year. The standards of the bushel, of the gallon, and of the 'ulne,' and the seals with which they are sealed, are to be kept in the custody of the mayor and the bailiffs, and of six legally sworn citizens of the town, in whose presence all measures must be sealed."

It is evident from the wording of this ordinance, that, after the original standard measures had been made in London, certified copies of these were sent to the different towns of England, in order that all the measures in actual use might be compared with them.

The fact that only one kind of bushel and one kind of gallon are mentioned in this law tends to confirm the idea that the same measures were used for corn and wine; but this is a point on which it is not possible to speak with certainty. The standard "ulne" were probably marked with feet and inches, so as to comply with the regulations in the Assize of Weights and Measures, and to ensure that the correct foot should be used as well as the correct yard.

Although the immediate duty of keeping the local standards, and examining the local measures, was placed on the mayor and bailiffs of each town, it was necessary to have a higher authority to see that these gentlemen did their duty in an efficient manner. The oldest law dealing with this superior inspection, which I have been able to find, is the Statute of Wales, enacted in the twelfth year of Edward I., A.D.

1284. The fourth section of this statute enumerates a number of matters which it was the duty of the sheriff of each county to inquire into, including the following:—

"De Assiza Panis et Cervisie non observata, et eam infringentibus. De busellis, galonibus, et aliis mensuris injustis. De ulnis et ponderibus injustis, et per ea vendentibus."

"Respecting the non-observance of The Assize of Bread and Ale, and discovery of those that break the Law. Respecting illegal bushels, gallons, and other measures. Respecting illegal ulne and weights, and those who sell by them."

It will be seen, therefore, that, at the end of the thirteenth century, British weights and measures had been carefully standardised, and great precautions had been taken to ensure uniformity in the use of them.

CHAPTER IV

KING EDWARD II. TO KING RICHARD III.

The word "Avoirdupois" first used in the Statute of Stamford. Rules for the measuring of Cloths. The word "Aune" used for Yard. The Ell. The French Ell. The Use of the Auncel strictly Forbidden. The Stone of 14 Pounds. Three different Pounds used for Avoirdupois Goods. Deceits practised by the Merchants. The word "Verge" used for Yard. Wool Weight. Corn Measure. Price fixed for Silver-Gilt Articles. The Troy Pound first referred to by Name in A.D. 1414. The Tower Pound. Depreciation of the Weight of the Silver Penny. Regulations for Measuring Cloth. The different words used for "Yard" in the Laws.

A CONSIDERABLE number of Acts of Parliament dealing with weights and measures were passed during the period from A.D. 1307 to A.D. 1485; but, as there is a good deal of repetition in these, it will be necessary to refer only to the more important ones, and to those which made alterations in the system which had been so carefully established in the thirteenth century.

In the Statute of Stamford, enacted in the third year of King Edward II., which deals with the custom duties to be charged on goods brought into England, the following paragraph occurs :—

"Et, quant a les custumes que le Roi prent par ses Ministres, cest asavoir de chacun tonel de vin, ii s. ; de chacun drap que merchaundz aliens font venir en sa terre, ii s. ; et de chacun livre de aver de poys, iiii d."

"And, as regards the custom duties which the King takes by his servants, it is hereby made known that two shillings is to be taken for each tun of wine; two shillings for each piece of cloth which foreign merchants import into his Kingdom; and four pence for each pound of avoirdupois."

This is the first time that the word "avoirdupois" occurs in the laws of England, and there would appear to be little doubt that the pound here referred to is the pound of 15 troy ounces described in The Assize of Weights and Measures (see page 28), and not the pound afterwards commonly called the avoirdupois pound. The latter weight cannot be definitely traced before the time of Queen

Elizabeth, and was not an authorised weight in A.D. 1309.

In the second year of King Edward III., A.D. 1328, an Act was passed entitled the Statute of Northampton, the fourteenth section of which deals with the rules for the measurement of cloth in these words :—

"Ensement est accorde et establi par notre Seigneur le Roi et son conseil, que de la Seint Michel proschein avenir en avant, touz les draps es lieux ou ils seront mis a terre soient aunez par le auneour le Roi, en presence des meires et baillifs, ou meire y est, ou des baillifs, ou meire nyest, de meisme les lieux; cest assavoir la longure de chacun drap de Reye, par une corde de sept aunes quatre foitz mesure par le list, et la laoure de chacun drap de Reye, six quarters de lee, mesure par laune; et de draps de colour la longure soit mesure par le dos, par une corde de sis aunes et demi quatre foitz mesure, et la laoure sis quarts et demi, mesure par laune sans defoler les draps."

"It is also agreed and ordained by our Lord the King and his council that, commencing next Michaelmas Day, and thenceforward in future, all cloths shall be measured by the King's measurer at the places where they are brought, in the presence of the mayor and bailiffs, if there is a mayor, or of the bailiffs

of the same places, if there is no mayor; and it is made known that the length of each cloth of Reye is to be measured by a cord of seven yards, four times measured by the list, and the breadth of each cloth of Reye six quarters of a yard measure; and the length of each coloured cloth is to be measured by the fold by a cord of six yards and a half, four times measured, and the breadth six quarters of a yard and a half quarter, measured by the yard without unfolding the cloth."

In this law the word "aune" evidently means the British yard of 36 inches, as standardised by Edward I. "Aune," or, as it is sometimes written "aulne" or "alne," is derived from the Latin word "ulna," which, as has already been explained, signified a "cubit," and was used to express the royal yard in the statutes of Edward I. Some writers translate the word "aune" by "ell," but this is evidently incorrect. There was, it is true, an English measure called an ell; but this was equal to 5 quarters of a yard, or 45 inches, and could not be the measure used in the Statute of Northampton, in which the width of cloth is given as 6 quarters of an aune.

Six quarters of a yard makes 54 inches, a

width which is still used for cloth at the present day; but 6 quarters of an ell would be $67\frac{1}{2}$ inches, and 6 quarters and $\frac{1}{2}$ quarter of an ell would be $73\frac{1}{8}$ inches, measures which seem unlikely for the width of cloth.

In France, on the contrary, "aune" *always* meant "ell." The French aune is supposed originally to have been the length of 4 Roman feet, or $46\frac{1}{2}$ British inches, but it varied in different parts of the country. The aune of Paris, however, was equal to 46·54 British inches. As there was much communication between England and France in the fourteenth century, there may have been some confusion between the British yard and the French ell; and it may have been for this reason that the word "verge" is used for "yard" instead of "aune," in a later statute of Edward III.

In a statute enacted in the fourteenth year of King Edward III., A.D. 1340, the law with regard to uniformity of weights and measures was laid down in the following words:—

"Item come il soit contenuz en la grande chartre que une mesure et un poys soit parmy toute Engleterre, et auxist contenuz soit en un estatu fait en temps le Roi Edward aiel le Roi

qorest, que nul ne vende par bussel sil ne soit marche du seal le Roi, et qil soit accordant a le standard du Roi. . . .

"Si est assentiz et accorde que desore en avant un mesure et un poys soit parmy toute Engleterre, et que le Tresorier face faire certaines estandardz de bussel, de galon, de poys d'airesne, et les face mander en chascune countee, par la ou tielx estandardz ne sont pas avant ces hures mandez."

"As it was contained in Magna Carta that there should be one measure and one weight throughout all England, and also, as it was contained in a statute made in the time of King Edward, the grandfather of the present King, that no one should sell by a bushel measure, unless it was marked with the Royal seal, and was in accordance with the standard measure of the King. . . .

"It is now agreed and ordained that henceforth there shall be one measure and one weight throughout the whole of England, and that the Treasurer shall cause to be made accurate copies of the standards of the bushel and gallon, and brass weights, and shall cause them to be sent to every county, to which these standards have not hitherto been sent."

More than fifty years had passed since the ordinances of King Edward I. respecting weights and measures had been promulgated,

and it was no doubt very necessary to see that they were strictly adhered to, and that every county and town in the kingdom was provided with certified copies of the standards.

In the twenty-fifth year of Edward III. an important law was passed, by which the use of the auncel (see p. 33) was forbidden, and ordering that, henceforth, all weighing must be done in England by the balance only. This was essential in order to ensure uniformity of weights, as there was no satisfactory means of checking the marks on the beam of the auncel, whereas weights, which had to be placed in the pan of a balance, could be inspected and marked.

In the same statute it was laid down that the sack of wool was to weigh 26 stone, and that each stone was to be 14 lbs. This was an alteration in the provisions of The Assize of Weights and Measures, in which it was stated that the stone was 12½ lbs. The 14 lbs. stone, first mentioned in this law of Edward III., has been retained in this country to the present day.

The difficulty experienced in the fourteenth century in maintaining uniformity of weights and measures is well illustrated by a statute,

which was enacted in the twenty-seventh year of Edward III. The tenth chapter of this statute contained the following words :—

"Item par ce que nous avons entendu que aucuns marchand achetent avoir de pois, laines, et autres marchandises, par un pois, et vendent par un autre, et fount aussint deceivables retretes sur le poiser ; et aussint usent falses mesurres et verges, en grant deceite de nous et de tote la comunaute, et des loialz marchantz ; si volons et etablissons que un pois, un mesure, et une verge soit par tote la terre, sibien hors de lestaple come dedeniez ; et que laine et tote maniere de avoir de pois soient poisez par balance."

"As we have been given to understand that certain merchants buy goods of avoirdupois, wools, and other merchandise by one weight and sell by another ; and also that they act deceitfully in the matter of weighing ; and also that they use false measures and yards, so as grievously to deceive us and all the people and the honest merchants ; we will and ordain that one weight, one measure, and one yard be used throughout all the land, as well without the Staple[1] as within it, and that wool and all goods of avoirdupois shall be weighed by the balance."

[1] The Staple is defined by Mr Chisholm as a "district in which commodities are authorised by authority to be bought and sold."

In this statute there are several points which require consideration. In the first place it is quite clear that the word "avoirdupois" meant, as I have explained at page 33, goods of a certain kind, *i.e.*, bulky or heavy goods, and not a particular pound weight. As a fact, there were three different pounds used at different times in England for weighing avoirdupois goods, and called avoirdupois pounds. These were:—

1. The pound of 15 troy ounces, or 7200 troy grains.
2. The pound of 16 troy ounces, or 7680 troy grains.
3. The pound of 16 avoirdupois ounces.

The avoirdupois ounce was not divided into grains, the smallest division being the $\frac{1}{16}$ part of an ounce. For the avoirdupois pound the division into 16 ounces was essential, so that it could be halved continually downwards. It is not known exactly when this latter pound was first used in England, but it is possible that it was brought from France about the time of King Edward III., and was derived from one of the French pounds. In the time of Queen Elizabeth this pound weighed

approximately 7000 troy grains. The fact that there were several kinds of pounds used for avoirdupois goods gave opportunities for fraud to the dishonest merchants, as recorded in the statute under consideration.

The deceits in the process of weighing were, no doubt, due to the persistent use of the auncel, and the only way that they could be prevented was by insisting on the use of the balance.

The word "verge" is, in this statute, used for the first time to represent "yard"; possibly, as I have suggested, this was to avoid confusion with the French "ell."

The weighing of wool seemed a special source of fraud, and, in A.D. 1357, a law was enacted to the effect that standard balances were to be sent to every county, doubtless to replace the auncels, with standard weights, representing the sack of wool, the half sack, the quarter sack, the pound, half pound, and quarter pound. All local balances and weights were to be brought to the sheriff to be tested by the standards.

In A.D. 1360 an Act was passed, ordering that auncel weight must be wholly put out, and

that all weighing must be done by the balance. Another clause in the same Act repeats the law that all measures must be in accordance with the king's standards, including the bushel, half bushel, peck, gallon, pottle, and quart, and that the quarter must contain 8 bushels and no more.

From this it would appear that there was still only one standard bushel and one standard gallon, which were to be used both for corn and for wine. But, as I have already pointed out, the standard bushel of Edward I. would not contain 64 pounds of wheat if sold by struck measure, and the London merchants were in the habit of counting 9 bushels to the quarter. Repeated laws were passed to stop this custom, and, among others, a statute of the first year of Henry V., by which it was ordained that a quarter of wheat must always consist of 8 standard bushels and no more, and that anyone who bought or sold by a different measure was to be imprisoned for a year, and to be fined 100 shillings. This fine of £5, for using or possessing for trade illegal measures, has been maintained ever since, and is that which is imposed for the first offence by the Weights and Measures Act of 1878.

The London merchants, however, seem to have got their way in the end, and the difficulty was adjusted in the reign of Henry VII., by making the corn gallon contain a little more than 8 troy pounds of wheat. This is a good instance to show that the wishes of the people must be attended to with regard to weights and measures. These can be regularised by the Government, and uniformity can be insisted upon, but they cannot be materially altered.

In the second year of King Henry V., A.D. 1414, an Act was passed dealing with the price which was to be paid for articles of silver gilt. In this it is stated that the goldsmiths were in the habit of charging for silver-gilt ware double the price of pure silver, "which was an outrageous price," and apparently, even then, the silver was not always of good quality. It was therefore enacted that in future no silver of less value than sterling (*i.e.* the silver used for coins) should be gilt, and that a troy pound of silver-gilt ware should be sold for £2, 6s. 8d. at the most.

This is the first time that the pound used for weighing silver, *i.e.* the pound of 12 ounces, is

definitely called a troy pound in the laws of England, and the view is thus confirmed that the lesser pound of Edward I. was the troy pound, and not the money pound of $11\frac{1}{4}$ troy ounces (see p. 27).

The latter, the money pound, is first called the "tower pound" in an Act passed a few years later, in A.D. 1421. This Act, which gives the regulations with regard to coining gold and silver, brought to the mint at the Tower to be converted into money, fixes the charge for coining at 5 shillings per tower pound (*Livre de Tour*) for gold, and 15 pence for silver.

At this period the tower pound had ceased to represent a pound's worth of silver pennies, just as the original, or troy pound, had ceased to represent it in Anglo-Saxon times. As I have explained (see p. 27), the silver penny, the $\frac{1}{240}$ part of the silver pound, ought to have weighed 32 wheat grains or 24 troy grains. But, under the Anglo-Saxon kings, and under the Norman kings up to Edward II., it weighed $22\frac{1}{2}$ troy grains. Edward III. reduced it first to 20 grains and then to 18 grains, and Henry IV. still further

reduced it to 15 grains, so that a tower pound was then coined, not into 240, but into 360 silver pennies. This was no doubt due in part to the rise in the value of silver, but it was much to the advantage of the king's treasury. But the people generally were not allowed to gain anything, as, by an Act passed in A.D. 1423, it was forbidden to purchase silver at a higher price than 30 shillings for the troy pound (*Livre du Troie*), being of as good alloy as the sterling, although, as is stated in the Act, the pound troy of coined silver was worth 32 shillings, and should therefore have been made into 384 silver pennies.

This Act definitely gives the relative weights of the troy and tower pounds as being 32 to 30, and thus affords one more proof of the fact that the troy pound used for buying silver was 5760 grains, and that the tower pound used only in connection with the coining of silver was 5400 grains.

The next Act which will be referred to deals with the methods adopted by the London merchants for cheating in the purchase of cloth. It is curious how persistent these merchants appear to have been in trying to

get the better of their customers by using measures other than the legal standards. This Act was passed in the eleventh year of Henry VI., A.D. 1433, and the sixteenth chapter concerns the "The Evil of Measuring Cloth by London Measure."

It is stated that whereas formerly the London merchant, when purchasing cloth, measured by the yard and an inch (*la alne et pous*), now he tries to measure by the yard and the full hand (*par lalne et la pleyne mayn*), which gives the buyer the advantage of 2 yards in the piece of 24 yards, "by which many are grievously oppressed." It is then ordained that every official measurer of cloth (*gardeyn del alnage de drap*) shall have a measure of silk or of linen, 12 yards and 12 inches in length, marked at each yard an inch, at each half yard half an inch, and at each quarter yard a quarter of an inch, and that all cloths are to be measured with this to the end of the cloth.

In a statute of King Richard III., A.D. 1483, "Touchinge the order of dyeinge and of wollen cloths," the measures of cloths given in previous laws are repeated; but the word

used for "yard" in the French original is "verge," not "aune" or "aulne." In the old English version this is translated "yerde," and it appears to be the first time that this word is used in the laws to express a yard. It may be desirable therefore to recapitulate here the various terms used for "yard" in the British statutes :—

Ulna, aune, aulne, alne, verge, yerde, yard.

CHAPTER V

KING HENRY VII. TO QUEEN ELIZABETH

New Standard Weights and Measures issued in 1492. The Royal Commission of 1496. Definition of the Troy Pound. The Avoirdupois Pound of 16 Troy Ounces. The New Standard Corn or Winchester Gallon. The Winchester Bushel. The Standard Yard of King Henry VII. The Old Standard Measures "damned and broken." The Tower Pound abolished by King Henry VIII. Butcher's Meat to be sold by Avoirdupois Weight. Committee appointed in 1574 to inquire into Weights and Measures. List of New Standard Weights prepared by them. Second Committee appointed in 1582. New Standards prepared of the Troy Pound, the Avoirdupois Pound, the Corn Gallon and Bushel, the Ale Gallon, and the Yard. These were the British Standards until 1824.

THE reign of the next King of England, Henry VII., A.D. 1485-1509, was an important epoch in the history of British weights and measures, as he seems to have devoted special attention to the subject. In the seventh year of his reign, A.D. 1491-1492, an Act of Parliament

was passed, re-enacting the former laws with regard to uniformity of weights and measures, and ordering that standards of brass were to be sent to every city in the kingdom. This Act was confirmed by another passed four years later, in which the names of forty-three county towns are given, to which the copies of the standards were to be sent, there to be kept by the mayors, bailiffs, and other chief officers.

But the king and his councillors were not satisfied, and in A.D. 1496, a Royal Commission was appointed, which sat in the Star Chamber at Westminster, to inquire into the whole system of British weights and measures. Their report is given in the *Seventh Annual Report of the Standards Department of the Board of Trade*, 1872-1873, accompanied by a very interesting commentary by Mr H. W. Chisholm, late Warden of the Standards. This is well worth careful perusal, but is too long to quote *in extenso;* it is necessary, however, to quote a part of the paper drawn up by the Royal Commissioners, which seems to have been a draft for the Act of Parliament passed in the following year :—

"For the syse of our realme. Twenty pens the unce of Troie, which is for silver, golde, and bread, and all other maner of wares for one unce and one penie.

"The same time ordeined twelve uncs of troie to be for xx*s* sterling after xx*d* the unce. And xii uncs for the pound weight, which is xl*s* currant at this daye, the which is foure Rialls, of olde time called foure nobles, the which weight standeth at this time for ye syse of the baker and other syses.

"By the discretion and ordinance of our sovereigne Lord the King, and of his Lords Spiritual and Temporall, with the Commons of the same his realme of England, of all maner of weights and measure yt was made by the graine of wheate, that is to understand, that xxxii graines of wheate taken out of the middest of eere weigheth a sterling, otherwise called a peny, and xx*d* sterling maketh an ounce, and twelve uncs maketh a pounde of Troye weight for silver, golde, breade; and measure with half an unce with weight a pinte of wheate. And two pyntes maketh a quarte, and two quartes maketh a pottle, and two pottles maketh a gallon, and viii gallons maketh a bushell of wheate, and nother heape nor cantell, to be stricken with a raysing stricke, and viii bushells maketh a quarter, stricken with a raysing stricke, and nother heape nor cantell.

"The same tyme ordeined that xvi uncs

of Troie maketh the Haberty poie pounde for to buy spice by, to be devided from the more pte to the leaste, that is to saye, the unce and the pound for garbelling, a i lb., ii lb., iii lb., iiii lb., viii lb., and no further, of old tyme called the stone of London."

In this paper the troy pound is described in exactly the same manner as the lesser pound in the ordinance of King Edward I. (see p. 26), and there can, I think, be no doubt that these two pounds are identical, and that the troy pound of Henry VII. was the ancient British pound.

It will be observed that the value of money is given in terms of the troy pound, *not* of the tower pound. In the time of King Edward IV. the weight of the silver penny had been reduced to 12 troy grains, so that 480 silver pennies were contained in a troy pound (5760 grains) of silver. This is given in the Royal Commissioners' paper as 40 shillings, which, of course, meant money of account, as at that time there were no coins of the value of a shilling.

The "riall" or, as it is usually written, ryal, was a gold coin introduced by King Edward IV., which weighed 120 troy grains of gold,

and was of the value of 120 silver pennies, or ¼ troy pound of silver.

It is stated in the paper that the troy pound, like the lesser pound of Edward I., was to be used for gold, silver, and bread, but an important change was introduced with regard to the measure of wheat. Instead of the pint measure containing exactly 1 troy pound of wheat, it was to contain a troy pound with half an ounce added, or 6000 troy grains. The gallon, therefore, contained 8⅓ pounds of wheat. The corn gallon, so constructed, still exists, and has a capacity of 272¼ cubic inches. The bushel, which contained 8 of these gallons, is called the Winchester bushel.

It is interesting to note that the avoirdupois pound mentioned by the Royal Commission is the pound of 16 troy ounces, and not the pound of 15 ounces. The 8 pound weight is described as the old stone of London; this stone, though not a legal weight, is still used in selling butcher's meat.

Besides the new measures of weight and capacity, a new standard yard was constructed in the reign of Henry VII. and is still preserved in the Standards Office; this is an octagon bar

of brass, on one side of which there are cross lines, showing $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{16}$ of a yard; while on another side a foot is marked, divided into inches. This is the oldest standard yard that exists, and it only differs from the present standard by 0·037 inch.

The new standard measures were legalised by an Act of Parliament passed in the twelfth year of Henry VII., which further ordered that the old local standards were to be "damned and broken," and were to be replaced by copies of the new standards in all parts of the kingdom.

The next important Royal Order, dealing with weights and measures, was one passed in the eighteenth year of King Henry VIII., A.D. 1527, by which the tower or money pound was abolished. As the weight of the silver penny had been diminished to 12 troy grains, the tower pound was coined into 450 pennies, an inconvenient number, as it was equal in value to £1, 17s. 6d. The Order, which dealt with matters concerning coinage, contained the following clause:—

"And whereas heretofore the merchaunts paid for coynage of every pounde Towre of fine

gold, weighing xi oz. and quarter Troye, iis vid. Now it is determined by the King's Highness, and his said councille, that the foresaid pounde Towre shall be no more used and occupied, but all maner of golde and silver shall be wayed by the pounde Troy, which maketh xii oz. Troye, which exceedeth the pounde Towre in weight iii quarters of the oz."

This was a useful improvement, as, in consequence of the diminution in the weight of the silver penny, the tower pound had ceased to have any meaning.

In A.D. 1532 an Act was passed, fixing the price of butcher's meat, which ordained that beef, pork, mutton, and veal were to be sold by the weight called *haver du pois;* not more than one halfpenny was to be charged for a pound of beef or pork, nor than three farthings for a pound of veal or mutton. The avoirdupois pound here referred to was probably the same as the pound of 16 troy ounces mentioned in the *Report of the Royal Commission of* 1496.

The question of British weights and measures was again taken up with great vigour in the reign of Queen Elizabeth. In A.D. 1574, a committee of merchants and

goldsmiths of London were appointed to investigate the question, and were given instructions, which may be summarised as follows:—

1*st.* To inquire what sorts of weights may lawfully be used.

2*nd.* How were they composed, and what were their names.

3*rd.* Wherein did they differ from one another, and for what things were they severally to be used.

4*th.* How many ounces were in each kind of pound, and of what were these ounces composed.

5*th.* Whether the weights submitted to the committee for examination were correct.

6*th.* To construct new standard weights.

7*th.* To have these new weights properly marked with their respective values.

The committee went very carefully into the question, and examined a number of different weights, including the standards of the Exchequer of London, Winchester, and other cities, and the weights used at the Tower mint, and by the Goldsmiths' Company. In their report they replied to the questions

which had been referred to them in the following manner :—

"To the first of the same articles theye saie that ther are onlie twoo sortes of weights lawfull in use at this daie in this realme of England, and none other so fare as to them doth in any wise apeare.

"To the second article they saye, that the one sorte of weight nowe in use is commonlie called the troie weight, and that other sorte thereof is also comonlie called the avoirdepoiz weight, and further they say that both the saide consiste compounded frome thauncient Englishe penye named a sterling, rounde and unclipped, which penny is limeted to waie twoo and thirtie grains of wheate in the midest of the eare, and twentie of those pence make an oz., and twelf of those ounc make one pounde troie.

"To the thirde and fourthe articles theye saie that the said twoo sortes of weights doe differ in weight the one from the other three ounces troie at the pounde weight, for the pounde weight troie doth consiste onlie of xii oz. troie, and the lb. weight of avoir de poiz weight dothe consiste of fiftene ounc troie, and they saie that, according to the auncient usage and longe custome of time, wherof no memorie is to the contrary, the troie weight is to be used in the weainge of breade, gold, silver, pretious stonnes, pearles, corall, amber, and kindes of confections namelie, electuaries.

And that in all other things the avoir de poiz weight is to be used.

"To the fifte article they saie that the weights to them delivered by order of this corte, and all other by them examined, are uncertaine and not of the right standard of England, whose defectes and varietes emongest themselves under the titelles of their several names be hereafter particularly expressed in these presentes in maner and form following."

The committee then enumerate the different troy and avoirdupois weights, which were submitted to them for examination, and describe the variations that existed between them.[1] In the case of the troy weights the differences were comparatively small; but, on the other hand, the variations of the different avoirdupois weights were very considerable. Not only did weights, which were apparently intended to be the same, differ from one another, but there were evidently two different kinds of avoirdupois pounds, one being the pound of 15 troy ounces, and the other the avoirdupois pound of 16 avoirdupois ounces, and approximately equal to 7000 troy grains. There was a 56 pound

[1] For the comparison of weights made by the committee, see the *Seventh Report of the Standards Department*, 1872-1873, already quoted.

Exchequer weight, based on the latter pound, which was supposed to date from the time of Edward III., while the smaller weights of the Exchequer, recently constructed, were evidently based on the former pound. As, however, all the weights were submitted to the committee as avoirdupois pounds, they were naturally puzzled, and in their report went on as follows :—

"To the sixte article they saie yt by resone of the saide defectes, and varietes of the saide weights as before is expressed, they could not vouche any sorte of the same, for the juste standerd of England, and therefore according to the chardge to them in yt behalfe geven, they have done to be sized one certen severall standerd as well of ye troie weight, as of the avoir de poiz aunswearable to the lawes and ordinances of this realme, and agreable to the very true olde standerd thereof, so neare as by their understanding, with all manner of diligence, and enquire they could finde out of suche severall poiz, as paterns thereof have bene delivired to them, for the purpose whereof particular mention is hereafter made in these presentes, under the titelles and names of the severall sortes as ensueth."

The committee then describe the new weights,

which they had prepared, and which included the following :—

1. A set of troy weights from 256 ounces down to $\frac{1}{16}$ ounce.
2. A set of troy weights from 1 ounce to $\frac{1}{16}$ grain (the grain being $\frac{1}{32}$ penny-weight).
3. A set of troy weights from 1 ounce to $\frac{1}{16}$ grain (the grain being $\frac{1}{24}$ penny-weight).
4. A set of avoirdupois weights from 56 pounds down to 1 pound.
5. A set of avoirdupois weights from 8 pounds to $\frac{1}{16}$ ounce.

This is the first time that the division of the troy pennyweight into 24 barley grains, instead of 32 wheat grains, appears to have been recognised in an official document, although probably the former division had been used by the goldsmiths in England long previously. Mr Chisholm has pointed out that in the Issue Rolls of the Exchequer for 1356, there is a record of the purchase of certain instruments for the mint in the Tower, amongst which was included :—

"One pair of small scales for the subtle assay, one little case with the small weights, viz., one pennyweight of 24 grains, one half pennyweight of 12 grains, etc."

But, whenever the pennyweight of 24 grains was introduced into England, there can be no doubt that it definitely took the place of the ancient British pennyweight of 32 wheat grains in the time of Queen Elizabeth.

With regard to the seventh article of their instructions, the committee reported that they had had the different weights properly marked with their respective values.

Notwithstanding the care that the committee of 1574 had taken, the queen and her councillors were not satisfied as to the accuracy of the standard weights which they had produced, and in 1582 another committee was appointed to go into the whole question again. A new set of standard weights was then constructed with the greatest care possible. The weights of the Goldsmiths' Company, which were considered to be most nearly in accord with the ancient standard of England, were taken as the basis of the troy weights, while the 56 pound weight of King Edward III., which

has already been mentioned, was adopted as the standard for avoirdupois weight. This decision did away with the two other avoirdupois pounds of 15 and 16 troy ounces. The avoirdupois pound of Queen Elizabeth was divided into 16 avoirdupois ounces, but *not* into grains; it was equal in weight to 7002 troy grains. The Elizabethan troy and avoirdupois pounds remained the standard weights of England until 1824.

As soon as the new standards had been completed, they were legalised by a royal proclamation, dated 16th December 1587, and fifty-seven copies were made and sent to the counties and important towns as a guide in the examination of the local weights.

Besides the new weights, standards of the gallon and bushel were also made, based on the standards of King Henry VII., and a standard gallon for ale was legalised.

A new standard yard of brass was made at the same time, and a standard ell of 45 inches in length was provided. These standard measures are still preserved in the Standards Office of the Board of Trade; the yard agrees with the present standard yard within $\frac{1}{100}$th of an inch.

CHAPTER VI

KING JAMES I. TO QUEEN VICTORIA

Hopton's *Concordancy of Dates.* His Tables of Weights and Measures in 1610. Description of the Troy and Avoirdupois Pounds. Hopton's Table of Measures of Length. The Cubit. Measurement of Brickwork. Gunter's Chain. Its Use for Land Measurement. The Standard Wine Gallon of 1707. The Standard Coal Bushel of 1713. New Standard Yard and Pound constructed by Parliamentary Committee of 1758. Comparison of the Troy and Avoirdupois Pounds. The Weights and Measures Act of 1824. The Avoirdupois Pound fixed as 7000 Grains. The Imperial Gallon. The Standard Yard and Pound destroyed in 1834. New Standards constructed. The Avoirdupois Pound made the Standard Imperial Pound. The Weights and Measures Act of 1878. The Troy Pound no longer a Legal Weight. Tables of British Weights and Measures, as now authorised.

ALTHOUGH by the royal proclamation of 1587 the number of legal pounds had been reduced to two, yet the avoirdupois pound, composed of 16 troy ounces, appears to have continued in use for some time, as it is given in a work,

called the *Concordancy of Dates*, published by Arthur Hopton in 1610. This book, which, though much smaller, is somewhat on the same plan as *Whitaker's Almanack*, devotes a chapter to the weights and measures used in England, and this commences as follows :—

"In England we commonly use two kinds of weights, as Troy and Auerdupois; by the Troy weight we weigh wheat, bread, gold, silver, and such like; and this Troy weight containes in every pound 12 ounces, every ounce 20 penyweight, every penyweight 24 grains."

Hopton then gives a table of troy weight, which may be summarised as follows :—

1 pound	=	12 ounces.
1 ounce	=	20 penyweights.
1 penyweight	=	24 grains.

He then proceeds to describe avoirdupois weight.

"By the weight Auerdupois is weighed all kinde of Grocerie, all Physicall drugges, all grosse wares, as Rosin, Pitch, Tarre, Tallow, Hempe, Flaxe, &c., and all Iron, Steel, Lead, Tinne, Copper, Allome, Copporas, &c. And though the pound of this weight bee greater then the pound Troy, yet is the ounce less;

because the pound Troy hath but twelve ounces, and the pound Auerdupois sixteene ounces, as in the table ensuing. And you must note that the Auerdupois pound is divided into Graines, Scruples, Dragmes, and so to Ounces, every one having a proper Character to express the same, as is set after the Table."

The divisions of the avoirdupois pound given by Hopton are:—

1 pound	=	16 ounces	℥.
1 ounce	=	8 dragmes	ʒ.
1 dragme	=	3 scruples	℈.
1 scruple	=	20 graines	gr.

It is rather remarkable that while Hopton in his statement correctly describes the avoirdupois pound, as legalised in the reign of Queen Elizabeth, which was greater than the troy pound, while the avoirdupois ounce (about 437½ troy grains) was less than the troy ounce (480 grains); yet the pound, of which he gives the subdivisions in the table, is the *other* avoirdupois pound, composed of 16 troy ounces, referred to in the *Report of the Royal Commission of* 1496. The subdivisions of the ounce, scruples, and drachms were always based on the troy ounce, and,

although not mentioned in any of the statutes, were undoubtedly very ancient measures. According to the ordinance of King Edward I., apothecaries' drugs were to be weighed by the lesser or troy pound, while Hopton mentions "drugges" among the articles sold by avoirdupois weight. But the confusion between the different kinds of pounds is not surprising, and Queen Elizabeth and her councillors were wise in legalising only one kind of avoirdupois pound.

In another useful work by Arthur Hopton, on land surveying, entitled *Baculum Geodeticum, or the Geodetical Staff*, he gives a full description of British measures of length, which may be summarised thus :—

3 barley-corns	=	1 inch.
12 inches	=	1 foot.
18 inches	=	1 cubit.
3 feet	=	1 yard.
1¼ yards	=	1 ell.
11 cubits	=	1 perch.
40 perches	=	1 furlong.
8 furlongs	=	1 mile.

It will be observed that Hopton includes the cubit in his table as a measure still in use,

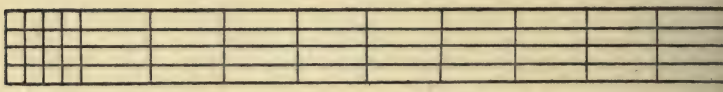
although it had been superseded by the yard since the time of Edward I. And although the cubit as a measure of length is now almost forgotten, it is curious that it still gives evidence of its existence in the building trade, as nearly all bricks used in England are made on cubit measure. The English stock brick is $\frac{1}{2}$ cubit in length, $\frac{1}{4}$ cubit in width, and $\frac{1}{8}$ cubit in thickness; actually they are made a little less each way, $8\frac{3}{4} \times 4\frac{1}{4} \times 2\frac{3}{4}$ inches, so as to allow for the mortar joint. And not only is the size of bricks based on the cubit, but brickwork is usually measured by the perch or rod of 11 cubits, a very ancient British measure. A rod of brickwork is one rod in length, one rod in height, and three bricks in thickness. A rod therefore contains $22 \times 66 \times 3$, or 4356 bricks.

It is usual for building surveyors to measure brickwork by the rod, and convert into feet, thus giving themselves unnecessary trouble; it is an instance of the survival of an old custom at the present time long after its origin has been forgotten.

Early in the seventeenth century an important invention was made by Professor

Edmund Gunter, of Gresham College, London, with the object of facilitating the measurement of land. As has already been explained (see p. 36), the acre, the unit of land measure, had been represented by the area of a rectangle, of which the length was a furlong or 40 perches, and the breadth 4 perches. The acre may therefore be shown graphically thus :—

AREA OF 1 ACRE.

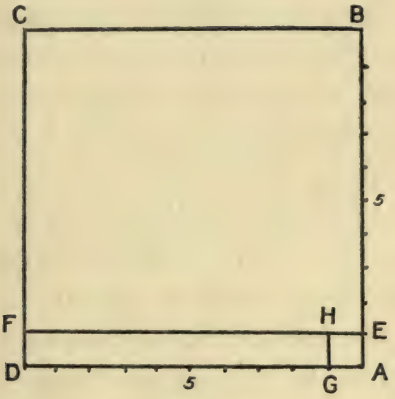


1 furlong = 10 acres' breadths = 40 perches.

Gunter conceived the idea of making a measure, which he called a "chain," equal in length to the acre's breadth, and then dividing the chain into 100 parts, which he called "links." A mark was made at every tenth link, to facilitate reading the number of links. The chain as designed by Gunter, has always been used by land surveyors since the time of its invention, and has proved to be a most useful instrument for the measurement of land.

The principle of Gunter's chain can best be explained by the diagram on p. 79.

Let *ABCD* be a square, representing an area of land equal to 10 acres. Divide the sides *AB*, *AD*, into 10 equal parts; each of these parts will be the length of a chain or acre's breadth. Through *E*, the first of these divisions on *AB*, draw *EF* parallel to *AD*, and through *G* draw *GH* parallel to *AB*.



Then it is evident, that as the square *ABCD* represents 10 acres, the rectangle *AEFD* represents 1 acre, and the small square *AEHG* represents 1 square chain, or $\frac{1}{10}$ acre.

Now let the side *AB* represent 1 chain of 100 links, then the square *ABCD* is 1

square chain, or $\frac{1}{10}$ acre, the rectangle *AEFD*, is $\frac{1}{100}$ acre, and the small square *AEHG* is $\frac{1}{1000}$ acre.

Again, let the line *AB* represent a length of 10 links; then, in the same way, the square *ABCD* represents $\frac{1}{1000}$ acre, the rectangle *AEFD*, $\frac{1}{10000}$ acre, and the square *AEHG*, $\frac{1}{100000}$ acre.

It can be seen, therefore, that by measuring with Gunter's chain, the area of a rectangle of land can be obtained in acres, and decimal parts of an acre in a very simple manner. For example, let us take a rectangle, of which the length is 14 chains 73 links, and the breadth 5 chains 32 links; then, if these numbers are written decimally and multiplied, we obtain the area in square chains; and, as 10 square chains are equal to 1 square acre, by moving the decimal point one place to the left, we get the area in acres, thus:—

14·73 × 5·32 = 78·3636 square chains = 7·83636 acres.

This is a far simpler method of calculating land area than the old system of measuring by perches and feet.

The invention of the chain by Gunter was

a brilliant idea, but it was not the introduction of a new standard of measurement. It was the adoption of a very ancient unit of length, the acre's breadth, and the division of it in such a way as to make it more practically useful. I have dealt at some length with the matter of Gunter's chain, because it is an excellent example of the kind of improvement that can be made with advantage in a system of weights and measures.

After the careful adjustment of the standards of weights and measures in the reign of Queen Elizabeth, no change of importance was made for many years, but several Acts of Parliament were passed to ensure uniformity.

But in the fifth year of Queen Anne, A.D. 1707, an Act was passed with reference to the wine gallon, which must be alluded to. In the year 1700, a question had arisen respecting the duties to be charged on wine, and as to the legal content of the wine gallon. It will be remembered that the standard corn gallon had been fixed by King Henry VII., and the standard ale gallon by Queen Elizabeth; but these sovereigns had not dealt with the wine gallon. It appeared that a wine gallon con-

taining 231 cubic inches had been in use for a very long period, but its origin had been lost sight of. I have already shown (see p. 31) that this was probably the wine gallon which was legalised by the Assize of Weights and Measures in the reign of King Edward I., but, rather curiously, the fact that the size of the wine gallon had been fixed by this king appears to have been forgotten.

The matter was referred to the Court of Exchequer, and it was decided that the best solution of the difficulty was to pass the Act of Parliament mentioned above, by which it was enacted :—

"That any round vessel, commonly called a cylinder, having an even bottom and being seven inches diameter throughout, and six inches deep from the top of the inside to the bottom, or any vessel containing 231 cubical inches and no more, shall be deemed and taken to be a lawful wine gallon."

A standard gallon was constructed in accordance with this law, and continued to be the standard measure for wine until 1824.

Another measure that was standardised in the reign of Queen Anne was the coal bushel,

which up to that time had been a customary but not a legal measure. By an Act passed in 1713, it was enacted that "in accordance with the practice and usage in the port of London for many years past, the coal bushel shall be made round, and with a plain and even bottom, and be 19½ inches from outside to outside, and to contain one Winchester bushel and one quart of water, according to the standard of the Winchester bushel of 13th and 14th of King William III., cap. 5." The Act of William III. here referred to had defined the Winchester bushel as a "round measure with a plain and even bottom, 18½ inches wide throughout and 8 inches deep, according to the standard in the Exchequer"; the standard in the Exchequer being that which was constructed in the reign of Queen Elizabeth. The coal bushel continued to be the standard measure until 1824.

In 1758 a Parliamentary Committee was entrusted with the duty of constructing a new standard yard, and a new standard troy pound, and they took the greatest care to make these as accurate as possible. The yard was based on the Exchequer standard

yard which had been constructed in the reign of Queen Elizabeth (see p. 72), checked by the length of a yard measure which had been made by the Royal Society in 1742. The troy pound was also made with great accuracy. This parliamentary committee also investigated the weight of the avoirdupois pound which had been legalised by Queen Elizabeth, and found that it was nearly equal to 7000 troy grains; but this appears to have been an accident, as, in the time of that queen, there does not seem to have been any attempt to make the avoirdupois pound commensurable with the troy pound.

The next occasion for a careful revision of British weights and measures was early in the nineteenth century. Several committees of the House of Commons, and commissions specially appointed for the purpose between 1814 and 1821, went very carefully into the whole matter, and the results of their investigations were embodied in an Act of Parliament, passed in the fifth year of King George IV., A.D. 1824, entitled, An Act for Ascertaining and Establishing Uniformity of Weights and Measures.

This Act, the most important that had been

passed since the thirteenth century, repealed all the laws upon the subject that had been enacted from the time of King Edward I., and codified the law respecting British weights and measures. It was ordained that the standard yard which had been constructed by the Parliamentary Committee of 1758 was to be called the "imperial standard yard," and that all measures of length were to be based upon it; also that the troy pound made by the same committee was to be called the "imperial troy pound," and all measures of weight were to be derived from it.

The Act also laid down that in future the avoirdupois pound, composed of 16 avoirdupois ounces, was to be exactly equal in weight to 7000 troy grains. This was the first time that the weight of the avoirdupois pound was defined in the laws of England in terms of the troy pound.

The Act then ordained that all existing gallon measures were to be done away with, and that one gallon only was to be the legal standard measure for all purposes. This new standard gallon was defined as the volume of 10 avoirdupois pounds of distilled water at the

temperature of 62° Fahrenheit, with the barometer at 30 inches. The gallon was further defined as a measure containing exactly 277·274 cubic inches of distilled water. The new standard gallon was therefore slightly larger than the Winchester gallon of King Henry VII., as the latter contained 272¼ cubic inches.

The acre and other land measures were to be in accordance with the standard yard.

Copies of the new imperial standards of weights and measures, duly certified, were ordered to be sent to all parts of the United Kingdom, and the standard yard and standard troy pound were placed in charge of the Clerk of the House of Commons.

In 1834, ten years after the Weights and Measures Act was passed, the Houses of Parliament were destroyed by fire, and the standards were lost. There was, however, amply sufficient information available to enable them to be reconstructed with scientific accuracy, and new standards were made in the course of a few years. But one change of considerable importance was made; the new standard pound was the avoirdupois, and *not* the troy pound.

An Act of Parliament was passed in 1855, legalising the new standards, and they are now kept for safe custody at the Standards Office of the Board of Trade.

These are the only legal standards for British weights and measures, but very accurate copies of the yard and pound, known as "parliamentary copies," are kept in the Standards Office, in the Houses of Parliament, at the Royal Observatory, Greenwich, at the Royal Mint, and by the Royal Society. If, therefore, the original standards were lost, there would be no difficulty in constructing new ones.

The last important Act dealing with British weights and measures was passed in 1878, and this superseded the Act of 1824, and other Acts which had been passed between 1824 and 1878. It made certain changes in the system, as the troy pound was done away with, and the imperial pound of 7000 imperial grains was made the only legal pound. The troy ounce was also made illegal for general use, and was only to be employed for buying and selling gold and silver, and precious stones, and for selling drugs retail.

The British weights and measures now legal

in the United Kingdom are as given in the following tables :—

(1) *Measures of Weight.*

16 drams	=	1 ounce.
16 ounces	=	1 pound.
14 pounds	=	1 stone.
8 stones	=	1 hundredweight.
20 hundredweights	=	1 ton.
also		
7000 grains	=	1 pound.

(2) *Measures of Capacity.*

4 gills	=	1 pint.
2 pints	=	1 quart.
4 quarts	=	1 gallon.
2 gallons	=	1 peck.
4 pecks	=	1 bushel.
8 bushels	=	1 quarter.
36 bushels	=	1 chaldron.

(3) *Measures of Length.*

12 inches	=	1 foot.
3 feet	=	1 yard.
5½ yards	=	1 rod, pole, or perch.
4 perches	=	1 chain of 100 links.
10 chains	=	1 furlong.
8 furlongs	=	1 mile.

(4) *Measures of Land.*

40 square perches	=	1 rood.
4 roods	=	1 acre.

A figure showing the acre has been given on p. 78.

The above are the *only* British weights and measures legal for general use, but there are certain others which, by the Act of 1878, may legally be employed for special purposes. These are :—

1. For weighing gold and silver and precious stones.

The Troy Ounce of 480 *Grains.*

Quantities larger than 1 ounce are always described in ounces, *not* in pounds. Quantities less than 1 ounce are given in decimals of an ounce, *not* in grains.

2. For the use of apothecaries, and for selling drugs retail.

A. Measures of Weight.

20 grains	=	1 scruple.
3 scruples	=	1 drachm.
8 drachms	=	1 apothecaries' ounce.

B. Measures of Capacity.

60 minims	=	1 fluid drachm.
8 fluid drachms	=	1 fluid ounce.

It will be seen that the distinction of weights for different kinds of articles is exactly the same as it was in the days of King Edward I.; the troy pound no longer exists, but the troy ounce is still used for gold, silver, and drugs (see p. 28), while the imperial pound, which corresponds to the "greater pound" of Edward I., is used for "all other things." This shows the tenacity with which old customs are maintained in England, and is an indication of the difficulty that would be encountered, if a serious attempt were made to do away with the existing British system of weights and measures, and to substitute for it the French or Metric system. If Parliament were ever so unwise as to pass a law making the Metric system compulsory in the United Kingdom, the certain result would be that the law would not be obeyed. A new kind of crime would have been created, but no government, and no courts of justice could compel a free people, like the British nation, to adopt a system of weights

and measures to which they were not accustomed and which they did not want. As I have already remarked, weights and measures can be regularised by Government, but cannot be revolutionised.

CHAPTER VII

CONCLUSION

Recapitulation of the Changes made in British Weights and Measures since Anglo-Saxon Times. There is now only one Pound, one Gallon, and one Bushel. Impossibility of altering the British Standards. Suggestions as to Improvements. No Change, however small, should be made hastily.

HAVING in the preceding pages given an outline of the history of British weights and measures during the past ten centuries, I will briefly recapitulate the changes which have been made from time to time in the direction of simplification and improvement.

First, to take the measures of weight. There have been in use in England, at different times, five kinds of pounds, which may be enumerated thus :—

1. The pound of 12 troy ounces, or 5760 troy grains.

2. The pound of 11¼ troy ounces, or 5400 troy grains.
3. The pound of 15 troy ounces, or 7200 troy grains.
4. The pound of 16 troy ounces, or 7680 troy grains.
5. The pound of 16 avoirdupois ounces.

Of these, the first appears without doubt to have been the original British pound, based on the Roman pound, and possibly introduced by the Romans during their occupation of Britain. It was the "lesser pound" of Edward I., and was first called "troy pound" in the laws in A.D. 1414. The troy pound appears never to have altered from the time it is first mentioned, up to the date of its abolition by the Weights and Measures Act of 1878.

The ounce, the $\frac{1}{12}$ part of the troy pound, has also never altered, and has always consisted of 20 pennyweights. Up to the reign of Queen Elizabeth, the pennyweight was divided into 32 wheat grains; but since then it has been divided into 24 barley grains, now called imperial grains.

The second pound, consisting of 11¼ ounces,

was the pound used for coinage, and probably dates from Anglo-Saxon times. As the principal royal mint was in the Tower of London, it was called the "tower pound." The tower pound was abolished by Henry VIII. in 1527, as it was no longer required, and after that time the troy pound was used as the money pound.

The third pound, consisting of 15 ounces, was the "greater pound" described in the statutes of Edward I. It was used in weighing avoirdupois, or bulky goods, and is last mentioned in 1574; it ceased to be a legal weight in the reign of Queen Elizabeth.

The fourth pound, of 16 troy ounces, was also used for avoirdupois goods. The date of its introduction is unknown, but it ceased to be a legal weight in the reign of Queen Elizabeth.

The fifth pound, composed of 16 avoirdupois ounces, was legalised by Queen Elizabeth as the standard avoirdupois pound; but there is little doubt that it was used in England for some time previously, though the date cannot be definitely fixed. This pound was not divided into grains, but, when legalised in 1587, it was nearly equal to 7000 troy grains: and in

1824 its weight was slightly altered, so as to make it exactly equal to 7000 grains. Since 1878, when the troy pound was abolished, the imperial pound of 16 ounces, or 7000 imperial grains, has been the *only* British pound.

With regard to measures of capacity, the bushel and the gallon, and probably also the quart and the pint, have been in use from the earliest times, but their contents have varied. There have been six different gallons, viz. :—

1. The original corn gallon, containing 8 troy pounds of wheat.

2. The wine and corn gallon of King Edward I., which probably contained about 230½ cubic inches.

3. The corn or Winchester gallon of King Henry VII., containing 272·25 cubic inches.

4. The ale gallon of Queen Elizabeth, containing 282 cubic inches.

5. The wine gallon of Queen Anne, containing 231 cubic inches.

6. The imperial gallon of 1824, containing 277·463 cubic inches.

It is difficult to state accurately what was the capacity of the original gallon measure, containing 8 pounds of wheat, as it depends on

whether the amount of wheat was to be taken by heaped or struck measure. If the former, the gallon would have been about 235 cubic inches; if the latter, about 261 cubic inches. The original corn gallon appears to have been superseded as a legal measure by the gallon of Edward I., but probably continued to be used as a customary measure.

The gallon of Edward I. was superseded as a corn gallon by the Winchester gallon of Henry VII., but was continued as a wine gallon by the standard wine gallon of Queen Anne.

The ale gallon, previously to being legalised by Queen Elizabeth, was probably a customary measure.

All the existing gallons were abolished by the Act of 1824, and since that year the British imperial gallon, which contains exactly 10 imperial pounds of distilled water at a temperature of 62° Fahrenheit, has been the *only* British gallon legal for all purposes.

There have been five different bushels, as follows :—

1. The original corn bushel, containing 64 troy pounds of wheat.

2. The bushel of King Edward I., probably containing about 1845 cubic inches.

3. The Winchester bushel of King Henry VII., containing 2124 cubic inches.

4. The coal bushel of Queen Anne, containing 2218·48 cubic inches.

5. The imperial bushel of 1824, containing 2219·704 cubic inches.

The first of these bushels appears to have succeeded as a legal measure by the second; but, as I have shown (see p. 53), probably continued to be used as a customary measure by the citizens of London until the reign of Henry VII., when the Winchester bushel was made the legal measure for corn. Both the Winchester bushel and the coal bushel were done away with by the Act of 1824, when the imperial bushel, containing 8 imperial gallons, or 80 pounds weight of distilled water, was constituted the *only* legal bushel for all purposes.

Of the British measures of length, the mile, the acre's length or furlong, the acre's breadth or chain, and the perch or rod, seem never to have altered since the times of the Anglo-Saxons. The yard or double cubit appears to have taken the place of the single cubit,

when the royal iron standard yard was constructed in the thirteenth century.

The foot, which up to that time had been an uncertain measure, was then definitely fixed as being one-third of the standard yard.

The acre, the unit of land measure, has never altered since the earliest times, and it can never be changed, as upon it depends the whole system of land tenure in England.

Notwithstanding the perfection to which the British system of weights and measures has been brought, it may fairly be asked whether any improvements are possible with a view to further simplification. This is a matter deserving careful consideration.

It is clear that the units of the system, the imperial pound, the standard yard, the gallon, which depends upon the pound, and the acre, which depends upon the yard, should never be altered. But, as regards the subordinate measures, there are certain small changes, which might possibly be made with advantage, and without interfering in any way with the continuity of the British system.

First, as regards measures of weight.

(*a*) The term "avoirdupois" might be

dropped. As there is now only one kind of pound, the word is no longer required, and is misleading, as causing it to be thought that there are two different kinds of weight.

(*b*) The term "dram" might possibly be given up, as quantities less than $\frac{1}{4}$ of an ounce can best be expressed in grains.

(*c*) The troy ounce, the unit of weight for gold and silver, might be called simply a "troy," so as to avoid the confusion possibly caused by having two different kinds of ounces.

(*d*) Apothecaries weight might be done away with, as drugs can perfectly well be sold by the imperial ounce and the imperial grain. It is a grave defect in apothecaries weight that the ounce for things liquid is not the same as for things solid.

Secondly, as regards measures of capacity.

The measures of capacity used by apothecaries might be brought into the table of measures of capacity, legal for all purposes.

Thirdly, as regards measures of length.

The rod, pole, or perch might be given up, as its place in land measurement has been taken by the chain of 100 links.

Fourthly, as regards measures of land.

The square perch and rood might cease to be legal measures, as areas of land less than an acre can best be expressed as decimal parts of an acre. The areas given on the ordnance survey maps of the United Kingdom are always expressed in this manner.

But even such small changes as the above should not be adopted without careful investigation as to whether any public inconvenience might be caused which would be greater than the advantage to be gained by the proposed simplifications. Any change in weights and measures is a serious matter, and not one to be taken in hand lightly.

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