inclination of the reflectors R' R' suffices (on the principle of Wheatstone's reflecting stereoscope) to effect the coalescence of the double images without any additional prisms.* This form of instrument admits of adjustment of the eye-mirrors (R' R') to suit both the different separation of the eyes met with in different individuals, as also any deviations of accommodation.

THE BRITISH PHARMACOPŒIA, WITH REFERENCE TO WEIGHTS AND MEASURES.

By W. PHILLIMORE STIFF, M.B., Physician to the County Lunatic Asylum, near Nottingham.

[Read at the Nottingham Medico-Chirurgical Society, Oct. 10th, 1862.]

EVERY medical man will rejoice that the proposal to consolidate the three metropolitan *Pharmacopœias* into a British one has been acceded to by the Colleges. At the same time, the decision that has been arrived at by the Council of Medical Education to publish it in English only, and consequently without an official Latin version, will be regretted by many, as tending in the first place to render the necessity for the study of that language less imperative than heretofore upon the student of medicine, and in the next to make the standard of British pharmacy inaccessible to foreign philosophers, with the exception of those few who are acquainted with the English tongue.

Three years and a half have been occupied in its preparation; and the work may be considered complete, as far as regards the substances and compounds to be employed in medicine. The method of weighing remedies—the first and most important proceeding in pharmacy—is, however, left undetermined, and the publication deferred to an indefinite period. The difficult question of weights and measures has created a complete deadlock, and brought the labours of the Committee to a stand-still. Legislative interference is called for, if not to settle, at least to compromise, the vexed question.

The readers of the BRITISH MEDICAL JOURNAL have been put in possession of the Report of the *Pharmacopœia* Committee of the Medical Council, at p. 582 of the last volume; and two very instructive leaders have been published as commentaries upon that document. It will be seen that the authors of the new *Pharmacopœia*, like some of their predecessors, propose an alteration of the weights in common use, nothing less than a new unit, differing from the imperial one, and made by dividing the avoirdupois ounce into 480 parts, instead of 437½. This would have the effect of introducing into daily practice two different kinds of grains, one being about one-eleventh less than the other; two distinct scruples; and as many as three drachms—viz., the avoirdupois of 27.3 grains, the apothecaries' of 60 grains, and the new drachm of 54.6 grains.

Briefly expressed, the alteration is this; that whereas the present imperial grain accumulates into ounces and pounds of different values, the converse now takes place, and the ounce diminishes into two sorts of grains. The change becomes still more important from the fact that, as medicines are taken in the smaller quantities, every new prescription will be affected by it; whilst at present the inconvenience of having two sorts of pounds, one of 7000 grains and the other of 5760, is practically unimportant to the physician, who seldom brings them into comparison.

The subject of weights, measures, and coinage is deserving of much more attention than it has yet received from the profession; and the unsatisfactory condition of the former gave rise to the efforts of the Committee to

remedy it. It is apparent to every one that there is no necessity for weighing drugs by a standard distinct from the imperial; nor strictly equitable that the apothecary shall buy at 16 ounces, and sell at 12 ounces, of the pound.

At first sight, the apparently simple and feasible plan of abandoning apothecaries' weight, and adopting avoirdupois in its entirety, presents itself. This is very popular with some writers. Two great objections meet us—the awkward fractional division of the ounce; and the ever recurring confusion that would arise between the present drachm of 60 grains to be abandoned, and one of 27.34375 grains to be established. It has been proposed to use the grain only, and divide the ounce decimally; but we cannot abolish the imperial drachm. This scheme would result in the use of the old drachm for old prescriptions, the imperial drachm by the public, and decimal divisions by the prescriber.

The Committee, by recommending a different course altogether—viz., the adoption of a unit of new value; and by referring to the legislature for powers—have raised two very important questions, which assume larger proportions under discussion:—1. What system of metrology ought we to adopt? 2. By what scale shall we calculate our weights and measures? I therefore propose to give a brief summary of the more salient points bearing on these subjects, with which also the question of the coinage is intimately connected. I will not detail the history of the subject, which has engaged the attention of mathematicians and statesmen in this country for nearly a century; but will remind you that it assumed considerable importance in consequence of the loss of the standards of weight and measure in the fire which destroyed the Houses of Parliament. The problem of their restoration was referred in 1838 to a commission consisting of the Astronomer Royal, the President of the Royal Society, Sir John Herschel, Peacock, Dean of Ely, and other men of great eminence. In 1841 they reported, "that the first point that has called for our special notice is the general question of decimal scale. In introducing this subject, we beg leave to invite the attention of the Government to the advantage and facility of establishing in this country a decimal system of coinage. In our opinion, no single change which it is in the power of a Government to effect in our monetary system would be felt by all classes as equally beneficial with this, when the temporary inconvenience attending the change had passed away." They recommend that the pound be divided into a thousand parts, and a new coin equivalent to two shillings introduced. In 1843, another commission proposed to carry out the report of 1841. In 1847, in accordance with a vote of the House of Commons, the tenth of a pound was struck, the coin now so well known as the graceless florin.

Notwithstanding recommendations identical with these propositions, the Government has declined any further extension of this plan in this country; but the issue of a tenth of a penny has been conceded to the inhabitants of Malta and others. The next step was the granting of letters patent to Lords Montague and Overstone and Mr. Hubbard, instructing them to consider how far it was practicable to introduce the principle of decimal division into the coinage; and they reported finally, Lord Montague excepted, to the following effect:—"That it does not appear desirable under existing circumstances, while our weights and measures remain as at present, and so long as the principle on which their simplification ought to be founded is undetermined, to disturb the established habits of the people with regard to the coins now in use by a partial attempt to introduce any new principle into the coinage alone."

Considerable obloquy has been cast upon the reporters for their alleged one-sidedness, as it was generally understood that they were unfavourable to the

* This instrument was manufactured by Messrs. Murray and Heath, of 43, Piccadilly.

objects of the commission. With their report, however, the public have great reason to be satisfied, as it deprecated and scattered to the winds the unscientific pound, florin, and mil scheme of the Decimal Association. It will be observed that their report is condemnatory only of partial and incomplete change, made without reference to weights and measures. These have since formed the subject of an inquiry that has resulted in a series of proposals of vast importance, and to which I shall have occasion again to refer, after pointing out the imperfections and perplexity of our present system.

I am not aware that there are any complete official tables of weights, measures, and money, published by authority, in Great Britain. We gain our information usually from works on arithmetic, where the tables are arranged according to the caprice of the authors, who do not always explain in a satisfactory manner the origin of the standard of admeasurement, but refer us to the length of the arm of some king, or to other obsolete traditions. We know that the standard of length is one yard; it is* fixed by reference to the length of the pendulum vibrating seconds, in the latitude of London, in a vacuum at the level of the sea; the former being to the latter in the proportion of 36 imperial inches to 39.1393; but it is not clear that a philosophical reason can be given for selecting a fractional portion of the length of the pendulum. The yard is subdivided into 3 feet, or 36 inches. The inch is the smallest lineal measure to which a legal name is given in our system. This is too large to remain an indivisible unit, and hence confusion soon arises. Mechanics divide it into eighths, officers of revenue into tenths, engineers into twelfths, others into sixteenths, and microscopists into thousandths. The inch is also known as the middling, the big, and the little inch. It is also taught in schools that three barleycorns make an inch, without respect to the size of the barleycorns. Had M. Lescarbault, the village surgeon, who calculated the transit of the intra-mercurial planet, been educated in this school, he would probably have been anticipated in his discovery by a philosopher of some other.

Having obtained our unit, it might be supposed that, by a simple process of multiplication, we could complete our calculations of admeasurement. Such, however, is not the case. The first denomination above it is the rod, pole, or perch, of $5\frac{1}{2}$ yards; and above this, in an irregular series, we have chains, furlongs, miles, and leagues; and besides these there are in ordinary use palms, hands, paces, fathoms, nails, and quarters. But with this variety we are not in a position to measure the land we tread on. Gunter steps in with his chain of a hundred links; which chain is 22 yards in length, and each link composed of 7 inches and $92\frac{1}{100}$ ths of an inch. Expecting, then, the result in Gunter's decimals, or at least in standard square yards, the surveyor reduces his work into perches, rods, and acres. The Board of Trade makes its reports on railway bills to the House of Commons in chains and miles. Measures of length also vary according to material and object.

There is some complexity in stating the standard of capacity. The imperial gallon contains 277.273843570 cubic inches; and the Winchester differs from the standard bushel.

The same want of uniformity, precision and simplicity, attends the weights. The standard of weight is a pound which however, apothecaries do not adopt, and hence arose the effort of the Medical Council to introduce a change by altering the value of its lowest unit the grain. Unfortunately, avoirdupois weight commences with a fractional quantity; it requires $437\frac{1}{4}$ grains to make an ounce; and after passing the stone which may mean 8,

14, 16, or almost any other number, we arrive at the hundred weight, of which strange to say, there are two, a long one of 120 and a short one of 112 pounds; not a light and a heavy one; the real hundred weight being only in legal use in Canada.

Mr. Hankey, M.P., states that the mere substitution of 100 pounds for the cwt., and the decimal scale of weights, would save the labour of two hundred clerks in the customs, and salaries to the amount of £10,000 a year. It would take up too much time to enumerate the names of various weights and measures in use. Sir Charles Pasley has published a list of them, the specifications of which nearly fill five octavo pages; they all differ from each other, are in daily use to the prejudice of the public, but to the advantage of the dealer, who buys in one market and sells in another. If we inquire how wheat is sold, we shall find that in some markets the imperial measure is used; in others local; and in some places it is sold by weight. It will be sufficient to state the names of some of them. There are bushels, gallons, coombs, loads, bolls, hobbets, strikes, bags, stones, etc.; not only differing from each other but amongst themselves. One example will suffice—there are twenty sorts of bushels. Not only liability to error, but injustice sometimes results; for instance, a tradesman when found guilty of selling flour by short weight, writes to the papers that he is the injured individual, and with the assistance of a secretary in London says, that the fault is occasioned through the present inaccurate state of the copies of the exchequer standards, and that there is no provision for their being tested. Her Majesty's Exchequer do not make use of the ordinary legal weights, but have obtained an Act of Parliament to divide the ounce into its decimal parts for the purpose of saving time and labour in the Bank of England, and for facilitating transactions between the Mint, the Bank and the public, thus abolishing pounds, dwts, and grains. Fifteen years ago, the Custom-House introduced into active operation a decimal system, by which the pound avoirdupois was divided into a hundred parts: so that now the public use the grain; the Mint the thousandth-part of an ounce; and the Customs the hundredth-part of a pound.

It will not be denied that the subject of the coinage is less important to the medical profession than to other classes of the community. I will, therefore, briefly refer to it. Having obtained our standard of weight through the standard of measure, we are in a position to weigh gold, but new terms meet us again. Standard gold is divided into twenty-four parts called carats, consisting of twenty-two pure and two alloy; and a pound of this is coined into forty-six sovereigns, and eighty-nine one-hundred-and-twentieth parts of another. The weight of a sovereign is 5 dwt. 3.27444967 grains.

Not one gold or silver coin weighs integers; there are fractions over in each, so that the public cannot test them by the imperial weights.

Our mode of computation follows no fixed rule. It is sometimes fractional, at others binary, quarterly, decimal, duodecimal, etc. Take for instance, the columns of £ s. d. We commence by omitting altogether the lowest coin current, the half-farthing, and divide the sum of the first column by four. Further, the next denomination has two columns, decimal in detail, and duodecimal in the aggregate; and the shillings column is decimal in detail, and vicesimal in the aggregate. This is productive of arithmetical difficulty and gives rise to an infinity of combinations in a variety of unnecessary rules, such as compound addition, subtraction, multiplication, division, reduction, fractions, etc. Thus, the artificial rule of practice has been invented to obviate lengthy calculations. It had been estimated that one twentieth of all the time given to primary education is thrown away by the present system. Some boys never learn the pence table, and those who do would be much better employed in studying the elements of geometry. Ladies have a horror of the

* Or rather was, for the Act authorising the scientific verification of the standard has been repealed.

intricacies of arithmetic; they avoid the study of accounts and take refuge in ready reckoners. In illustration of this point, it has often been observed that the shops of haberdashers and drapers are generally served by men. Mr. Tuffnell believes the reason of this to be that it is extremely difficult to get women sufficiently versed in arithmetic, to be able to make the rapid calculations that are necessary with respect to almost every article that is sold in these shops. In France, people are served by women who calculate with facility their decimal coinage. At the University of London, many of the questions are rendered tedious by the requirement of reduction and other unnecessary processes. As an example of the artificial difficulties propounded there, take the following: What fraction of 12s 6d must be added to five-sevenths of a guinea to make a pound sterling? Such is the existing state of things, which may be termed a medley of irrelevant combinations. Even printers sometimes find a difficulty in setting up fractional types; and in one of the best works on arithmetic published in Great Britain, the *Irish Treatise*, dozens of the terms of the fractions are undecipherable.

Let us now contrast with this the metrical system. Instead of falling back on fractional divisions of the pendulum, and on troy grains, a fundamental measure is obtained from the dimensions of the earth itself, by dividing the quadrant of the terrestrial meridian, from the pole to the equator, into ten million parts. This is called the meter, which, singularly enough, approximates nearer to the length of the pendulum vibrating seconds than does the yard itself, our present empirical standard. The meter or unity is subdivided into a thousand parts. The square meter is applied to land measure, the cubic to measures of capacity; for weight the gramme is used, it being the cube of the hundredth-part of a meter filled with water; and this same weight is used for the purpose of the coinage, five grammes forming the silver unit, which is divided into a hundred parts, thus completing one symmetrical, harmonious, decimal system of metrology, applicable to all countries.

To express the multiples and divisions of these units, the meter and the gramme, Greek and Latin words denominating tens, hundreds, and thousands are prefixed, rendering the system easy of comprehension; so that the scale and its names may be mastered by a boy or a woman in one lesson. Upon this point, I cannot do better than quote the eloquent description by a foreigner, John Quincy Adams.

"The theory of this nomenclature is perfectly simple and beautiful. Twelve new words, five of which denote the things and seven the numbers, include the whole system; give distinct and significant names to every weight, measure, multiple, and subdivision of the whole system; discard the worst of all the sources of error and confusion in weights and measures, the application of the same name to different things; and keep constantly present to the mind the principle of decimal arithmetic, which combines all the weights and measures, the proportion of each weight or measure, with all its multiples and divisions, and the chain of uniformity which connects together the profoundest researches of science with the most accomplished labours of art, and the daily occupations and wants of domestic life in all classes and conditions of society."

The metrical units are of convenient size, easy for calculation, and are near the value of some of those now employed. The meter is about a tenth more than a yard, the gramme about four grains and a half less than a scruple, and the franc about two pence less than a shilling. Let us examine the attributes of the latter. It corresponds to ten pence of our money. Two names only are required in describing it, the unit and its cent. The alloy with which it is combined is in the proportion of one-tenth; its weight is five grammes; all its multiples are multiples of weights, so that a man carries his

weights in his pocket; nay more, the modulus of the coin is a fixed metrical length, and a portion of the system. Thus twenty coins of French money (one franc) and nineteen of two francs form a meter; but none of the diameters of gold, silver, and copper pieces are the same. The new bronze coins are peculiarly convenient for measuring. They each weigh the same number of grammes as they represent centimes, and their diameters represent fifteen, twenty-five, and thirty millimeters.

The conversion of our own moneys into these would be a simple proceeding. Ten new farthings would be a penny, ten pennies a shilling, ten shillings the new golden unit.

The metrical system is adopted in France, Switzerland, Belgium, and Sardinia. It was decreed by the new government of the Æmilian provinces soon after their liberation, and subsequently in Naples. It came into force in Mexico on the 1st of January, 1862, with no other modifications than those required by the peculiar circumstances of the country; and I believe that a law has been passed for its introduction into Spain. The Germanic confederation has borrowed from it their unit of weight; and one of the last steamers from Rio de Janeiro brought an account of an imperial decree sanctioning the law voted by the two chambers, bringing into operation the metrical system throughout the whole extent of the empire of Brazil. Ten years are allotted to allow of its becoming successively obligatory in the different portions of the country. Some nations have adopted a decimal scale of money other than the metrical, as in America, dollars and cents; in the Netherlands, guilders and cents; in Greece, drachmai and lepta; in Russia, rubles and copecks. These are not mutually convertible, and the Americans are now making efforts to assimilate their dollar with the five-franc piece. No great inconvenience has been felt in carrying out changes from the non-decimal scale—changes that were necessitated by the confusion existing, and the losses occasioned where numerous and complicated denominations were in vogue.

Let me enumerate some of the more striking advantages of the decimal scale considered *per se*. It is in accordance with the Arabic system of notation; decimals can be worked in all respects as whole numbers; it is in use amongst many millions of people; and Providence has furnished us with ten fingers as natural units of computation.

To these add the advantages of the metrical tables, and I think you will agree that the subject is deserving of more attention than it has received at the hands of the Committee of the *Pharmacopœia*. It has been stated on high authority, that the advance upon the old system is as great as that of the Copernican over the Ptolemaic. Those who may not consider it of this importance, will at least agree with me that it is as far superior to the old Roman reckoning as the fifty-seven codes are to the pandects of Justinian.

The alleged disadvantages are, that a great inconvenience would attend the change; but, as this is the necessary accompaniment of all improvements, I will not attempt to refute it. A more valid objection is, that you cannot divide decimals into thirds, and that on this account duodecimals are preferable. But how is this supposed advantage obtained? By taking two new factors and four more figures into account! Twelve can be divided by six, four, three, two, and one. Ten can be divided by five, two, and one. If twelve has gained by the addition of two new factors, it does not possess the power of being divided by five, and is exactly in the same position as ten in not being divisible by six figures. To put this question in a practical point of view, I would ask whether any gentleman here present ever found any serious inconvenience from the fact that he cannot divide his ten fingers into three equal parts; nay, is there not a disadvantage in indefinite binary divisions,

as tending to destroy the unit? The Americans in practice very inconsistently divide their dollar into halves, quarters, eighths, and sixteenths, which gave one clever Yankee the opportunity of making seventeen bits instead of sixteen out of his dollar.

The College of Physicians has done good service to the community, by protesting officially against the plan of the Medical Council; and the British Medical Association goes still further, and asks for the adoption of the metric system, which is more than it is likely to obtain. The natural solution of the difficulty appears to me to be this—carry out the programme of the Statistical Congress by publishing calculations for medical purposes in the old special weights and measures, in conjunction with an additional column expressing the relative weights of the metrical. Indeed, during the preparation of this paper, the report of the Select Committee of the House of Commons has advised that this plan shall be rendered legal. I therefore recommend this Society to urge that the *Pharmacopœia* scheme be abandoned; that the present weights and measures be retained as less inconvenient than many others that have been suggested; and that, once for all, a calculation be made of their equipoises and equivalents in the metrical system, and placed in juxtaposition throughout the new *British Pharmacopœia*. The members of the profession will then become familiar with the use of both, and able to decide by experience on the merits of each, and thus be better prepared to advise the legislature, when the time shall arrive, for a general remodelling of our present incongruous system.

NOTE. In this article I have made reference only to the summary of the conclusions arrived at by the Committee of the House of Commons on Weights and Measures, as published in the daily papers; the Blue Book itself, with the details, not having yet reached me.

VENETIAN WATER CISTERNS. The city of Venice is wholly supplied with rain water, which is retained in cisterns. The city occupies an area of about 13000 acres. The annual average fall of rain is 31 inches, the greater part of which is collected in 2077 cisterns, 177 of which are public. The rain is sufficiently abundant to fill the cisterns five times in the course of the year, so that the distribution of water is at the rate of 312 gallons per head. To construct a cistern after the Venetian fashion, a large hole is dug in the ground to the depth of about nine feet. The sides of the excavation are supported by a framework made of good oak timber, and the cistern has thus the appearance of a square truncated pyramid with the wider base turned upward. A coating of pure and compact clay, one foot thick, is now applied on the wooden frame with great care; this opposes an invincible obstacle to the progress of the roots of any plants growing in the vicinity, and also to the pressure of the water in contact with it. No crevices are left which might allow the air to penetrate. This preliminary work being done, a large circular stone, partly hollowed out like the bottom of a kettle, is deposited in pyramid with the cavity upward: and on this foundation a cylinder of well-baked bricks is constructed, having no interstices whatever, except a number of conical holes in the bottom row. The large vacant space remaining between the sides of the pyramid and cylinder, is filled with well-scoured sea sand. At the four corners of the pyramid, they place a kind of stone trough covered with a stone lid pierced with holes. These troughs communicate with each other by means of a small rill made of bricks, and resting on the sand; and the whole is then paved over. The rain water coming from the roofs of the buildings runs into the troughs, penetrates into the sand through the rills, and is thus filtered into the well hole by the conical holes already described. The water thus supplied is limpid, sweet, and cool. (*Scientific American.*)

Transactions of Branches.

EAST YORK AND NORTH LINCOLN BRANCH.

ON THE GENERAL DISUSE OF VENESECTION IN THE TREATMENT OF ACUTE DISEASES.

By ROBERT HARDEY, Esq., Hull.

[Read May 22nd, 1862.]

OF late years, this question has frequently presented itself to my mind, How has it come to pass that I and my professional brethren generally have nearly repudiated those systemic and general bleedings which, twenty-five or thirty years ago, we found so potent in the cure of a variety of maladies, and more especially in the treatment of acute disease. My cogitations on this subject have been, I confess, unsatisfactory; nor have I, as yet, arrived at any very definite conclusions with reference thereto.

During the last autumn, my interest in this question was again revived by conversations held with my esteemed friends, Dr. Sandwith of Beverley and Dr. Cross of Scarborough, both of whom I found still continued the practice of venesection.

These conversations, with the non-solution of my own doubts, have led to the production of the present paper, in which I am desirous, by opening up a subject which in itself is of deep interest, to lead to a discussion of its varied practical aspects, and perchance to some useful suggestions for our future guidance.

For the maintenance of sound health in the individual, or in communities at large, there are certain conditions which are generally esteemed essential. The most important of these are a sufficient supply of pure air, an adequate amount of wholesome food and pure water, temperate and cleanly habits, and dwellings situated in a healthy locality, with effective drainage.*

The conjoint operation of these agents on the body is the creation of a healthy blood, which, circulating through the system, is supplying to the different organs suitable materials for the normal discharge of their varied functions; and health is the result. The absence of these, or of some of them, necessarily leads to a vitiated condition of the blood, and, by consequence, to a lowered state of the systemic powers.

To myself, therefore, it seems certain that, ere we can arrive at satisfactory conclusions as to our disuse of venesection, we must first inquire whether these ordinary conditions or essentials to health, are in as vigorous operation now as when we depleted so heroically. This I propose doing in a brief way. Let us then inquire:

1. Has the surrounding atmosphere deteriorated in any of its appreciable or essential characters since 1825 or 1830? If I take up two works in which the atmosphere is treated of (say one dated 1833, and another 1860), I find named therein the same essential constituents composing it, and in precisely the same proportions; viz., in 100 cubic inches, oxygen, 20 parts; azote or nitrogen, 80; with a small amount of carbonic acid gas (say 1 to 1.25 parts in the 100); and vapour of water in a variable amount, and subject to laws of its own; its average proportion being about 1.5 per cent. of the whole weight.

It is a remarkable fact that the proportions of oxygen and nitrogen do not sensibly vary, either through the whole surface of the globe, or the heights of the surrounding atmosphere. This was demonstrated by M.

* In addition to these essentials, the following are most important auxiliaries; viz., mental sanity and quietude, healthy out-door exercise, a sufficiency of good clothing, etc.