sufficient to make one for each multiplication by one hundred, or even one thousand.

Each branch of science, trade, or business, will use the units best adapted to its particular purposes; but there is a superabundance of middle terms.

For certain special purposes, however, the smallest units we have are too large; thus it has been necessary to add a new metric unit of length for microscopical measurements (the micromillimetre); the grain is much too large as the smallest unit of weight for medicinal purposes and in analytical chemistry, the milligram being far more suitable; the cubic centimetre is too large as the smallest unit of volume in medicine, where the minim is greatly to be preferred.

Experience has shown that the use of decimal fractions is a source of frequent errors, and that in the practice of medicine and pharmacy the decimal point is dangerous, not only from want of familiarity with its right use, but chiefly because it is so often illegible, or accidentally misplaced, omitted, or duplicated. This undeniable fact must not, however, be regarded as an insurmountable obstacle to the use of the decimal *system* of weights and measures in medicine and pharmacy, but simply as an argument against the use of the decimal *point*. Use the smallest units and write whole numbers instead of fractions. In constructing prescriptions it is better to write "15 milligrams" than to write "0.015 Gm."

No decimal fractions were formerly used in writing prescriptions, because the grain was a small enough unit so long as alkaloids and other extremely potent remedies were unknown; and later, whenever the quantity required was less than a grain, *common fractions* were used to express it.

Weighing and Measuring.—When the greatest possible accuracy is required, as in some of the operations of physicists and chemists, matter is measured as to its amount by weight rather than by volume, because a given weight of any substance always expresses the same amount without regard to temperature, and because volumes cannot be easily measured with great exactness. In laboratory work, weighing is generally both convenient and accurate; but volumetric analysis is also convenient, and affords correct results.

Medicines are either solid or liquid. The liquid medicines are necessarily taken or administered in doses by measure. Hence they should also be prescribed by measure, and that is the uniform practice in the English-speaking countries. This practice is consistent, accurate, and convenient. In other countries, however, the liquid medicines are prescribed by weight, although the doses can, of course, not be apportioned otherwise than by measure. This is not only inconsistent, but gives very inaccurate results, for the prescriber cannot express definite volumes by weight, nor can he calculate the volume of a mixture composed by weight.

The practice of prescribing, dispensing, and administering liquid medicine by volume is dictated by common sense, and its results are the most accurate that can be obtained.

Many advocates of the metric system seem to labor under the mistaken idea that metric prescriptions cannot or ought not to be written, except exclusively by weight; and, on the other hand, a number of those who do write prescriptions expressing all quantities in grams, actually intend that the liquids so prescribed shall be measured, writing grams when they really mean as many cubic centimetres, overlooking or ignoring the different densities of different liquids.

Specific Weight and Specific Volume.—The relation of the weight of a mass to its volume is called its specific weight; the specific weights of solids and liquids are expressed in water units, and of gases in hydrogen units. Thus, the specific weight of water being 1,000, the specific weight of any solid or liquid is found by dividing the weight of a given volume of it by the weight of the same volume of water. Specific weight is commonly, though inaccurately, called "specific gravity," and the number used to express the specific gravity of a solid or liquid, is that number which expresses how many times the weight of that liquid contains the weight of an equal volume of water. The specific weight of ether is called 0.750, because it weighs 0.750 times as much as an equal volume of water weighs. This mode of expression is the most convenient form in which the relative weights of equal volumes of various solids and liquids can be stated and compared.

To physicians and pharmacists, the reciprocal relations of weight and volume are of great practical importance. The abolition of the use of measures of capacity in the pharmacopœial formulas for tinctures, syrups, and other liquid preparations, in the last revision, further increases the importance of the subject. It has become especially desirable to have some convenient means of expressing and comparing the relative volumes of equal weights of different liquids, and of computing readily the volume of any definite amount by weight. For this purpose the writer of this article proposed, in 1883,* to use the term "specific volume" to designate the comparative volumes of liquids, and to express their specific volumes in the same manner as their specific weights are expressed, namely, in water units. Thus the specific volume of ether is 1.333, because a given quantity by weight of ether is 1.333 times as bulky as an equal quantity by weight of water. The specific volume of any substance is obtained by dividing one by its specific weight.

$$\frac{1}{\text{sp. w.}} = \text{sp. vol.}$$

To find the volume of any number of grams of any liquid, multiply by the specific volume; the product is the answer expressed in cubic centimetres.

The utility of a table of specific volumes will be readily appreciated, and such a table should be contained in the Pharmacopœia.

As the volume of any substance is affected by heat, the specific weights and specific volumes must be ascertained and expressed at definite temperatures. The water generally taken as a standard or unit of comparison is water at 4° C. (39.2° F.), at which temperature it reaches its maximum density; but many of the pycnometers, hydrometers, and other instruments used for taking specific weight, are adjusted with reference to water at 15° C. or at 15.6° C. as unit. At the same time, the standard temperature at which specific weights are taken, and to which our "tables of specific gravities" refer, is usually 15° C., but sometimes 15.56° C., 16.67° C., 14° C., and other temperatures. This is confusing. The standard temperatures to which our instruments are adjusted, the temperature which a liquid is assumed to have when its specific weight is taken, or at which it has the specific weight given for it, and the temperature of the water referred to as unit—all should be the same temperature. The writer has recommended for this purpose the temperature of 22° C. (71.6° F.), because that is slightly above the common room temperature at which we do our work, and therefore most convenient, as well as most useful and real under ordinary conditions.

Every volume unit of the metric system has a parallel weight unit, with which it is commensurate when referring to water. Thus:

1 litre of water weighs 1 kilogram.
1 decilitre of water weighs 1 hektogram.
1 centilitre of water weighs 1 dekagram.
1 millilitre of water weighs 1 gram.

This close relationship between the units of weight and of volume is of the greatest practical value. It enables us to find the weight of any volume of any liquid by simply multiplying the volume units by the specific weight, or to find the volume of any given weight of any liquid, by multiplying the weight units by the specific volume. The weight of one litre of any liquid, expressed in kilograms (or the weight of 1 c.c. expressed in grams), is the number expressing its specific weight. The volume of 1 kgm. of any liquid, expressed in litres (or the volume of 1 gm. expressed in cubic centimetres), is the number expressing its specific volume. Conversely, the number which expresses the specific weight is the weight of one litre in kilograms (or the weight of 1 c.c. in grams), and the number which expresses the specific volume is the volume of 1 kgm. expressed in litres, or of 1 gm. in cubic centimetres.

Commensurate units of weight and volume do not exist in any other system of weights and measures except the metric system and the British Imperial system. The British Imperial system, however, has only one pair of commensurate units—the fluidounce and the ounce—one fluidounce of water at 62° F. weighing one avoirdupois ounce. But it happens that six winepints of water at 60° F. weigh 100.0032 avoirdupois ounces, or only 1.4 grains more than 100 avoirdupois ounces, and hence we can most readily find the weight (in avoirdupois ounces) of six winepints or 96 United States apothecaries' fluidounces of any liquid, by multiplying its specific weight by one hundred, the answer being sufficiently accurate for nearly all purposes.

Weights and Measures in Prescriptions.—In writing prescriptions all solid substances are prescribed by weight, and all liquids by measure, and when solids and liquids are combined to form a liquid product, it is best, because most accurate, to adjust the total quantity to some definite volume. Thus, if a solution be prescribed containing corrosive chloride of mercury, potassium iodide, syrup, and water, it is, of course, impracticable for the prescriber to predict or calculate what will be the volume of the finished solution if he prescribes a given amount by weight or volume of the syrup and water; the only correct method in such a case is to prescribe water "q.s." to make a stated volume of finished solution.

When the old system of weights and measures is used, the most useful weight units are the grain and the ounce; but the drachm is also convenient and very much used. The scruple ought not to be used, because the sign employed to indicate it looks too nearly like the sign for the drachm. There ought to be a new unit of weight smaller than the grain, for prescribing and stating the doses of remedies intended to be administered in minute quantities, the new unit to be about gr. $\frac{1}{60}$, which is about 1 mgm. The units of capacity are the fluidounce, the fluidrachm, and the minim.

In writing prescriptions in which the quantities are expressed in units of the old system, these units are represented by certain universally recognized signs or abbreviations; the abbreviation "gr." (which should always be written with a *small* initial) denotes grain or grains; "ʒ" denotes drachm or drachms; "ℨ" denotes ounce or ounces; "℈" denotes scruple or scruples; "♏" denotes minim or minims; "fʒ" denotes fluidrachm or fluidrachms; and "fℨ" denotes fluidounce or fluidounces. The quantities directed to be taken are here to be indicated by *Roman* numerals, always placed *after* the signs or abbreviations, as follows: gr. x.; ʒ ij.; ℨ ss.; ℈ ij.; ♏ ix.; fʒ iij.; fℨ xij. The sign "ss." is used to express one-half, being an abbreviation of the Latin word *semis*.

When the metric units are employed in writing a prescription, it would save human lives to abstain from using the decimal point, and to use no other units but the gram and milligram for weights, and the fluigram or cubic centimetre for measures. The gram is abbreviated to "Gm," a *capital* initial always being used; the milligram should be abbreviated to mGm; and the fluigram to fGm (or the cubic centimetre, which is the same as a fluigram, to C.c.). The numerals indicating the number of weight units or volume units to be taken, should be always placed *before* the signs or abbreviations representing the units, and in writing them the *common* (or Arabic) numerals should be used, thus: 10 Gm.; 50 mGm.; 30 fGm. (or 30 C.c.).

When quantities expressed in units of one system are to be transposed into their corresponding equivalents in units of the other system, the following equivalents are sufficiently accurate and the most useful:

$\frac{1}{60}$ grain is equal to 1 mGm.
1 grain " " 64 mGm.
1 drachm " " 4 Gm.
1 ounce " " 32 Gm.

1 Gm. is equal to 16 grains.

1 minim is equal to $\frac{1}{60}$ fGm.
1 fluidrachm " 4 fGm.
1 fluidounce " 32 fGm.

1 fGm. is equal to 16 minims.

For further information concerning weights and measures, the reader is referred to the "Manual of Weights and Measures" by the writer of this article; Lowis A. Jackson's Work (London); "The Metric System," by F. A. P. Barnard; the Reports of Thomas Jefferson ("Works of Thomas Jefferson," vol. vii., pp. 472–495) and John Quincy Adams (Washington, 1821); the paper of Alfred B. Taylor on "Octonary Numeration and Its Application to a System of Weights and Measures," read before the American Philosophical Society, October 21st, 1887; and the Report of the Committee on Coinage, Weights, and Measures of the House of Representatives, January 7th, 1879 (45th Congress, 3d Session, H. R. Report, No. 53).

Oscar Oldberg.

WEIL'S DISEASE.—An acute infectious (?) disease characterized by sudden onset with severe symptoms, prostration, a typical temperature, early-occurring jaundice, enlargement of liver and spleen, gastro-intestinal disturbances, and nephritis.

Though first described by Weil in 1886, and taken by him from amongst the diseases characterized by and associated with jaundice, the disease had been previously noted and described under various names: "Typhus hépatique bénin," "bilious typhoid," etc. After his first description it was seen that the disease had prevailed and was prevailing sporadically and not infrequently in the countries of Europe. No distinct descriptions of its occurrence in America are met with. There seems no doubt at present that the affection is distinct from such infections as typhoid, yellow fever, recurrent fever, diseases with which it was frequently confounded; its differentiation from acute yellow atrophy, simple infectious jaundice, and various intoxications is not so clear. Accurate post-mortem reports are few, owing to the benign character of the disease. Recent bacteriological investigations are not convincing.

Etiology.—Incidence of season, sex, age, and occupation. The majority of cases are met with in the warm months of the year, June to September. Ninety per cent. of those affected are men, usually at about the age of twenty-five to thirty years (third decade). Butchers, meat handlers, sewer and drain workers seem especially prone to infection. Outbreaks in garrisons and prisons occur not infrequently.

Specific Cause.—Although recognized by many as a morbid entity, and though a seemingly definite infection or intoxication, the question as to the specific cause of the disease is most unsettled. The abrupt onset without prodromal symptoms, the occurrence of some cases within a few hours of the ingestion of noxious material, sewer gas, sewage, tainted foods, etc., before bacteria could possibly have developed sufficiently to cause an infection, suggest strongly a ptomaïn poisoning or intoxication. One very typical case followed an overdose of santonin.

The febrile course; the peculiar febrile relapse occasionally seen; the inflammatory complications described in some instances—iridocyclitis, parotitis, adenitis, pleuritis, pneumonia—are more suggestive of a bacterial or infectious agent.

Infection is evidently through the alimentary canal, although it is not easy in some epidemics to exclude the possibility of entrance through the respiratory tract; the

* See Proceedings of the American Pharmaceutical Association, 1883.

present-day theory, however, of insect transportation of infectious material is readily applicable in this connection. The occurrence of several cases at any one time is probably due to exposure of all to the same infecting agent, rather than to infection of man from man. The frequent reports of epidemics among residents of garrisons and prisons after bathing in contaminated streams, after working in privies and sewers, or after living in unhygienic surroundings, seem confirmative of this idea.

Jaeger, Conradi, Vogt, *et al.*, have isolated a variety of proteus bacillus (B. proteus flavescens) from the urine and stools of four cases. No positive results have been obtained from the very few blood cultures made so far, and one must hesitate to accept the idea of a proteus infection being the constant cause. As in pneumonia, meningitis, and other infections there may be a variety of organisms capable of producing similar changes and symptoms. A variety of toxins or ptomaïns may, like phosphorus, exert a special influence upon the liver substance.

It is possible that the infecting substance enters the biliary system and liver directly from the intestine, being helped on its way by violent intestinal contraction. Further irritation by pancreatic secretion is a possibility under these conditions. In view of the fact that the symptoms appear simultaneously, it seems more probable that the infection starts from the intestines and is generalized by the blood. The relapse, as probably is the case in typhoid, may be due to reinfection from the gall-bladder.

Pathological Anatomy.—We have no recent descriptions of the post-mortem findings. The disease is rarely fatal. Auffrecht designated his cases as "acute parenchymatous disease," finding only "granular degeneration and cloudy swelling of cells of liver, kidney, and spleen." Acute gastro-enteritis, acute nephritis, splenic hypertrophy with inflammatory infiltration, advanced destructive changes in the liver, with fatty and leucocytic infiltration, proliferation of bile capillaries resembling the early changes in acute yellow atrophy, are described. The larger bile ducts are patulous. Obstruction is due to desquamative products obstructing smaller vessels. Inflammatory lesions in other organs present nothing distinctive.

Symptoms.—*General Description.*—Few diseases present a more typical course. The close similarity in all descriptions is striking. Later observers do not agree with Weil in considering the relapse or recrudescence of symptoms frequently seen a necessary characteristic. No prodromal symptoms are recorded or seem to exist. The suddenness of onset is one of the most important features of the disease. The majority of collected cases give a history of sudden collapse, while the patient is at work or on duty in apparent good health. A chill is frequent, severe headache, unconsciousness, delirium, prostration, vomiting, diarrhœa, abdominal pain are all present at the onset. Severe pain in the muscles of the legs is an almost constant symptom. Fever probably exists from the first, reaching 103°–105° F. By the second day all symptoms are exaggerated; by the third or fourth day jaundice, more or less intense, is already present; enlargement of liver and spleen, and albuminuria have appeared. The fever remains high, with slight morning remissions. The disease is at its height by the third or fourth day. From the fifth to the eighth day improvement takes place, the temperature falling by lysis, the hepatic and splenic enlargement diminishes, the albumin in the urine becomes quickly less, the nervous and other symptoms rapidly disappear. In Weil's four cases, after a fever-free interval of from one to seven days, a recrudescence of fever, lasting five or six days, took place, the other symptoms not, however, returning. As mentioned above, other observers do not consider this recrudescence an absolute characteristic of the disease. Convalescence is slow, lasting for from four to ten weeks. Traces of jaundice remain for days or weeks after the acute symptoms have subsided.

Analysis of Symptoms.—Complications.—Onset: The characteristic suddenness of onset is practically never missed. The majority of those affected are in bed by the second day of illness.

Temperature: The rapid rise has been noted. Occasionally a distinct fall takes place on the second day, only to be followed by an immediate rise to the maximum temperature, which is usually observed between the second and fourth days. A morning remission is early seen. The average duration of fever is from six to ten days, the fall to normal taking place by lysis; 106° F. may be given as the maximum, 103° F. as the average temperature. In thirty-seven per cent. of cases the recrudescence, or, better, relapse, is observed. Unlike the fever of onset that of the relapse is characterized by a gradual rise, rarely reaching the height of the first. The most common time of the relapse is from one to eight days after normal temperature has been reached. Cases with relapses as late as from the eleventh to the fourteenth day of apyrexia have been observed. The average duration of the relapse is five or six days.

Jaundice: Jaundice is of course always present. It is rarely seen before the second day, and is as a rule distinct by the third or the fifth day. It is usually well marked, but rarely as intense as in marked cases of obstructive jaundice. By from the ninth to the thirteenth day it may have disappeared. Traces persist, however, for several weeks. Increase of the jaundice during the relapse is rare. Bile-stained urine, colorless fæces are seen in the first few days, but as the obstruction of the bile flow is not complete and not in the main ducts, these characteristics are not extreme or long persistent. Itching is rather infrequent.

Condition of Liver, Spleen, and Kidneys: A recognizable enlargement of the liver is *not* a constant feature; it probably occurs in fifty per cent. of cases. When present it appears with the jaundice, usually at the fourth day. Reduction in size takes place with the lytic course of the fever. Re-enlargement during relapse is distinctly uncommon. Tenderness of the swollen liver is often noted.

In seventy-five per cent. of cases the spleen is noticeably enlarged, and can be readily palpated by the fourth day. The growth of the splenic tumor is rapid. Its shrinkage with the fall of fever is equally quick. Re-enlargement with relapse is more common than is the case with the liver. Marked albuminuria (acute nephritis) is present in about fifty-two per cent. of cases. The albumin is often excessive. Oliguria is a regular, anuria an occasional condition. Œdema is recorded but once in the cases collected. Casts and red blood cells are present in abundance. Bile reaction is marked. Distinct symptoms of uræmia are unusual. The renal condition clears up rapidly with the disappearance of the other symptoms. It may reappear with relapse. Traces of albumin, etc., can always be detected in the remaining percentage of cases. A polyuria during convalescence is usual. Hemorrhage from the bladder has been observed.

The gastro-intestinal tract is always disturbed. Vomiting is a frequent early symptom; diarrhœa an almost constant one. Distinct gastro-enteritis probably always occurs. Bloody stools are recorded. Symptoms of gastro-enteric disturbance quickly subside, and do not reappear with a relapse. The color of the stools has been noted.

The pulse keeps pace with the fever in the early days. Distinct slowing of heart's action takes place as apyrexia is approached. Endocardial murmurs are mentioned. The nervous symptoms described are those common to severe infections: delirium, convulsions, jactitations; they may outlast the fever, but are not observed in the relapse. Peripheral neuritis, hemiplegia, ophthalmoplegia have been seen toward the end of the acute symptoms.

Pains in the calves of the legs, present in half of the cases, may be neurotic or neuromuscular.

Intense prostration and slowness of convalescence are characteristic features of the disease.

Iridocyclitis as a late complication has been twice observed; retinal hemorrhage once.

Parotitis is a more frequent complication. In one instance it was double and suppurative.

Pneumonia and bronchopneumonia occur; a bronchitis at the onset is quite frequently seen. Pleurisy and pericarditis have been found in one fatal case.

Bleeding from the nose, apparently as a late symptom, seems a not unusual event.

In addition to the jaundice the skin in many instances has shown macular roseola-like rashes and petechiæ. Herpes labialis is an occasional feature.

Diagnosis.—The disease is no longer confused with yellow fever, recurrent fever, or malaria. It is evidently distinct from typhoid fever. Abortive typhoid fever, as some have classed the disease, never shows the severe regular symptoms of Weil's disease. Early jaundice in typhoid fever is rare, and then only in severe cases. The Widal reaction may be utilized as a means of confirming the diagnosis. Many of the reported cases give a history of previous typhoid infection; none of the autopsied cases have shown typhoid lesions.

Epidemic jaundice, and jaundice with fever, are probably closely related to Weil's disease, which may be described merely as a more intense acute condition. Some observers consider simple jaundice the result of an infection. Enlarged liver and spleen, albuminuria and fever, though slight, can usually be found in these cases.

Acute yellow atrophy with its prodromal symptoms, lack of fever, longer duration, reduction of liver volume, and fatal ending, seems a different condition. Weil's disease may, however, be related thereto. The pathological changes of the latter disease show much more distinctive conditions. Prognosis is favorable when once the diagnosis has been clearly established.

Treatment is purely symptomatic and needs no discussion. *Norman B. Gwyn.*

WEST BADEN SPRINGS.—Orange County, Indiana.

Post-Office.—West Baden Hotel.

Access.—Viâ Ohio and Mississippi Railroad to Shoals, thence by stage or viâ Louisville, New Albany, and Chicago Railroad to Orleans, fifty-six miles north of New Albany, thence by stage to springs. These springs are located in a fine agricultural section, only one mile from the French Lick Springs. The following analysis was made by E. T. Cox, analyst:

One United States gallon of Spring No. 5 contains (solids): Sodium carbonate, gr. 9.69; magnesium carbonate, gr. 6.05; calcium carbonate, gr. 18.62; iron carbonate and aluminum carbonate, gr. 3; sodium sulphate, gr. 31.87; magnesium sulphate, gr. 27.80; calcium sulphate, gr. 108.39; sodium chloride, gr. 81.12; potassium chloride, gr. 6.13; magnesium chloride, gr. 9.20. Total, 301.87 grains. Gases: Carbonic acid, 9.26 cub. in.; sulphureted hydrogen, 2.08 cub. in.; oxygen, 5.28 cub. in.; nitrogen, 15.97 cub. in. The water is used commercially. *James K. Crook.*

WESTPHAL'S SYMPTOM. See *Knee-Jerk.*

WEST SPRINGS.—Union County, South Carolina.

Post-Office.—West Springs. Hotel and cottages.

Access.—From Spartanburg viâ Glenn Springs Railroad, twelve miles southeast to Glenn Springs, thence four miles southeast to West Springs. West Springs are located about 2,000 feet above the sea-level, and are surrounded by picturesque hills covered by extensive forests of spruce, pine, cottonwood, beech, oak, and other trees. The soil is very fertile and many varieties of fruits and vegetables grow in great profusion. Several gold mines are in operation among the near-by hills. There are several springs in the neighborhood, but only one is in use. It yields about four hundred gallons of water per hour. The temperature of this water is 62° F. According to an analysis made in 1893 by M. B. Hardin, analytical chemist, one United States gallon of the water contains (solids): Calcium sulphate, gr. 16.26; potassium sulphate, gr. 1.33; sodium sulphate, gr. 2.75; calcium carbonate, gr. 6.35; magnesium carbonate, gr. 1.17; sodium chloride, gr. 0.21; iron sesquioxide and alumina, gr. 0.03; silica, gr. 2.78; organic matter, a trace. Total, 30.88 grains.

The water is used considerably by South Carolina physicians in diarrhœa and dyspeptic troubles. It is said to possess excellent virtues in chronic catarrhal conditions of the genito-urinary tract—*i.e.*, in gonorrhœa, gleet, leucorrhœa, etc. *James K. Crook.*

WETEMIS MINERAL SPRINGS.—Klickitat County, Washington.

Post-Office.—Blockhouse.

Access.—From The Dalles, Oregon, thirty-five miles by wagon road; also from Goldendale, Washington, eighteen miles distant, by private conveyance.

These springs are new to the public, and no hotel or other accommodations for visitors have yet been provided. Those who visit them during the season, from May 1st to October 15th, are content to enjoy the pleasures of camp life, as excellent grounds for this purpose are at hand. The elevation of the location is 500 or 600 feet above the sea-level, but only a few feet above the Klickitat River, which at this point flows through a grand and picturesque canyon, a thousand feet below the level of the surrounding country. From the brink of the canyon on either side stretches a rolling plateau covered with magnificent forests of pine and fir. A few miles to the southwest lies the wheat-growing region of the Klickitat River, while less than thirty miles north Mount Adams, the second highest peak of the Cascade Range, raises its lofty summit to an elevation of 12,424 feet. The canyon of the Klickitat shelters the springs from the cold winds, while during the summer months clear, warm weather prevails, with occasional rains. The temperature seldom falls lower than —10° or —12° F., while during some winters it does not even reach the zero point. There are three large springs here and several smaller ones, but the water has never yet been analyzed. We are informed that most persons suffering from rheumatism and diseases of the stomach, who have visited the springs, have been much benefited by the water, and some of them apparently cured. Cases of phthisis do well in the neighborhood. Fine hunting and fishing may be enjoyed in the vicinity. It is probable that the spring will soon be developed.

James K. Crook.

WET-NURSES.—At the present day the wet-nurse is by no means the absolute necessity she was in many cases before artificial feeding had reached its present stage of scientific development, so that Holt says that "when one begins with healthy digestive organs, artificial feeding is very simple and almost invariably successful." He refers to the difficulty of securing a suitable wet-nurse and the expense, from $20 to $35 a month in New York, while conceding that she may be essential in certain emergencies, such as acute inanition or acute gastro-enteric intoxication, and that she should be employed in foundling asylums whenever possible. A practitioner may therefore at any time have to decide whether he shall recommend a wet-nurse for a certain infant, and if he decides that question affirmatively he will probably have to determine how to get one, and then to pass on her qualifications for that duty. The physician who wishes to decide this question correctly must approach it from the proper point of view and study it, as he should his obstetrics, from the direction of anatomy and physiology. He will then be firmly impressed with the sound doctrine that, as a rule, maternal nursing is best for the mother and the child. Nor should he forget this fundamental principle, although his decision in the individual case will necessarily be influenced by the many modifying conditions which have always to be allowed weight in settling medical questions. Among these are the feelings, circumstances, and expectations of the family. Other points to be weighed in settling such a question are the residence of the parents, especially in the summer months, the time of year when the child may be ex-

pected to be undergoing dentition, its apparent vigor, and its freedom from hereditary tendency to disease; also any special peculiarities of development manifested by former children of the same parents, if known. Fortunately the structure and traditions of society in this country have not yet become so artificial that we need discuss the custom which prevails in French cities of handing over a baby to a wet-nurse in a remote country district, a practice the demoralizing results of which are traceable in the degeneration of those rural populations most noted for supplying these substitute mothers.

In considering this general subject of wet-nursing the physician may well devote some attention to those causes which, with ordinarily healthy women, especially in the upper walks of society, lead to the inability of such to nurse their babies. In general terms it may, in our own country, be attributed to the increasing artificiality of the life our women lead, and doubtless in part to the great wear and tear of existence in the climate of the United States. In saying this we do not overlook the fact that a more healthful and rational mode of life for the young has been coming into vogue of late. There is, doubtless, a great improvement in the matters of exercise, dress, and food over those which were usual in this country forty or fifty years ago; but the results of such changes must be slow in their development. The great stress and strain are the result of the multitudinous anxieties, cares, and ambitions which are constantly wearing upon the woman of to-day, and of the struggle for improved social position and for wealth, which bore much less heavily upon our grandmothers. Another cause, which it is not easy to estimate correctly, but which is undoubtedly influential, is the want of homogeneity in our people, and the fact that, owing to our migratory national habits, so many are constantly changing their abodes in a country possessed of such a variety of climates, that the race, blended as it is of many nationalities, has in comparatively few parts become identified with its environment. What physician but has been cognizant of many cases in which menstruation has been interrupted in healthy young women for months after immigration? If a change of climate and an unsettling of the mode of life can effect such an alteration in one phase of the generative function, why should they not be powerful in interfering with another phase of it, viz., in causing a diminished activity of the mammary glands?

Having given due weight to the considerations suggested, the medical man, before looking up a wet-nurse for his patient, may well fortify himself by a few thoughts on the objections to wet-nursing, and the very serious dangers it involves. I propose in this place to do no more than call attention briefly to the more prominent of them, trusting that they will be sufficiently brought out incidentally in treating of the different branches of the subject. There is, then, primarily the moral hazard to both mothers, for neither can fully escape the consciousness that her child is deprived of its natural right. Then note the loss to the employing mother of the stimulus of nursing in securing full and healthy involution of the uterus, and consequent freedom from disease of the pelvic organs; also the degree of immunity furnished by maternal nursing against undue frequency of conception and childbearing. On the side of the nurse it is to be remembered that her milk may prove unhealthy for her foster-child, even though it may respond satisfactorily to all the artificial tests we can apply; that grief or fierce passions may make it for the time dangerous to the nursling. Even with the greatest care in choosing them, it is almost impossible to avoid the selection of nurses who are the subjects of syphilis or tuberculous disease. And, finally, the physician and the mother can never be too watchful against the baleful effects springing from the secret use of alcoholic stimulants and of opiates.

Among the risks attending the procuring of a wet-nurse are those due to the irresponsible and mercenary character of the agencies from which they are often obtained. I think it may safely be said that the most desirable women are not to be found in these places; but that, in New York City, one of the two following plans is preferable for securing one: An advertisement in one of the daily papers will commonly bring to the door a superabundance of applicants, of whom a few selected by the family may be asked for references and handed over for medical examination. Or, secondly, inquiry may be made at one or more of the public hospitals or special charitable institutions that maintain a lying-in service, with the great incidental advantage that some accurate account of the nurse's medical history, at least during the puerperal period, can usually be had from the medical officers.

It is undeniable that under some circumstances the employment of a wet-nurse is to be recommended, and it is equally true that this advice is often given under the influence of considerations quite other than simply what would be most beneficial to the mother, the infant, or even the proposed nurse. The doctor should realize that, in order to nurse her baby, a mother must restrict herself in many ways, must be regular in her hours, which involves the loss of many pleasures which women covet, must in fact sacrifice herself for her child. Nursing, when undertaken, is a duty, the demands of which are imperative and cannot be postponed with safety to either party concerned. Diet, exercise, clothing, mental and moral habits should all be subordinated to the proper discharge of this function, though fashion and social ambition are leagued in strong opposition. This is the view that the physician should uphold and encourage. He can do more than any one else in the community to foster in the mind of every woman whom he attends during pregnancy or confinement the idea that lactation is the necessary and proper complement and rounding-out for her of the great physiological cycle which begins with conception; and the woman who follows this advice and makes these sacrifices will not need a physician to point out to her the benefits which accrue to herself and her offspring, physically, mentally, and morally, from the course adopted.

The conditions which preclude maternal nursing are briefly summed up by Lusk, as follows: "Nursing may be rendered impossible by a lack of milk, by flattened, misshapen nipples, and by the health of the mother. It should be prohibited in phthisis, in epilepsy, and in cases of syphilis contracted shortly before the birth of the child."[1] Bumm says that from fifteen to twenty per cent. of mothers cannot nurse their children.

It is well for the physician to appreciate the influence exerted by the monthly nurse, who should in this matter be his ally, and not, as is too often the case, the wily and underhanded opponent of his best efforts to make his patient nurse her babe. So potent is this influence that certain of these women come to be known as always having their charges nurse their infants, and others as always finding that they cannot do so, a reputation which may well guide the physician in passing on their qualifications.

If such care of herself as I have indicated is to be expected in the case of a mother nursing her own child, let us now apply the rule inversely and see what we should look for in a woman who is proposed as nurse to another's child, and what rules should be laid down for her guidance when acting as wet-nurse.

One of the first questions to be decided is whether we should refuse our recommendation to an unmarried woman, who may prove in all other respects well qualified. A great deal can be said on both sides of this question, but as it hinges largely upon the moral point involved, my own view is that, in so far, it is one the decision of which should not be thrown upon the medical man. The mother, or female head of the family in which the wet-nurse is to serve, would never consent to surrender her convictions on such a point, nor would a prudent physician care to assume the responsibility of introducing such a woman in opposition to the ideas of the family. Still he may be asked for an opinion as to how far, or in what ways, the fact of the applicant being single would influence her desirability as a wet-nurse, and he

should be ready to state them. We cannot be guided by foreign opinion, for we all recognize the fact that pregnancy in the unmarried is not regarded with the same leniency here as in many parts of Europe, and that consequently the status and morale of such as have incurred it are relatively lowered. We therefore feel that such a woman, while an object of pity and deserving of all charitable consideration, is not unadvisedly to be brought into a family in a position which is regarded as superior to that of other servants, where she will come into close relations with the children and the mother, and where weakness of character and lower tone might have the most serious results. On the other hand, where the family is disposed to overlook these drawbacks, especially where there are no older children, or to regard the interests of the nursling as paramount to, or as dominating all other considerations, it may be looked upon as a favorable feature that the unmarried wet-nurse is not subject to the claims of a husband or a family, which are often advanced at most inconvenient seasons, and with the palpable design of profiting by the necessities of the employer; also that, except in the case of the very depraved, lactation is less likely than in the married to be interrupted by a recurrence of pregnancy. In the unmarried there would, besides, usually be such advantages as accrue from the engagement of a primipara.

The age of a wet-nurse is not immaterial, and, while not unmindful of recorded facts, or those known to individual experience, where young girls or women advanced in life have proved excellent nurses, it still remains a safe rule to avoid the extremes of the child-bearing period and to give the preference to those between twenty and thirty, or, possibly, thirty-five years. This would be, of course, with the view of avoiding immaturity and constitutional vices of tardy development on the one hand, and, on the other, the disabilities connected with physical exhaustion or possible degeneration.

The age of the milk should bear some relation to the age of the child to be nursed, for, though a deficiency of the laxative qualities of the colostrum may be made good by suitable medicines, there is always danger, if the milk is much older than the child, that the supply may not last as long as desired. On the other hand, the quality of the secretion is, after the first few weeks, comparatively uniform for months, so that it will be little likely to disagree on that account even when the child is older.

As between a primipara and pluripara, other things being equal, the choice would be in favor of the latter, for the reason that her previous experience should have taught her something about the proper care of an infant, and some estimate might likewise be made of the probable continuance of the milk supply in her case.

We now come to the physical examination of the proposed wet-nurse. The physician should make this as thorough as he has opportunity for, although he will seldom in private practice be able to complete it by examining the genitals. Still, if the woman has been confined in a hospital, valuable information on this point may be obtained from the house physician. A general survey of the applicant's physique, expression, cleanliness, etc., should be followed by special observation of the temperature, eyes, teeth, tongue, breath, fauces, skin —especially on the neck and breasts; also of the lungs and heart and the lymphatic glands of the neck and at the bend of the elbow. One should try to ascertain whether pregnancy does or does not exist, and the inquiry should be made whether menstruation has taken place, albeit the latter question may often not elicit a truthful answer and the fact will have to be learned by subsequent careful observation. It is especially important to ascertain the presence or absence of indications of any form of tuberculosis, of anæmia, or of syphilis. Rheumatism also must not be forgotten. The breasts should receive special attention; they should be full and hard three hours after nursing (Holt). The size and firmness of the mammary glands themselves should be distinguished from accompanying adipose deposits; the skin should show the course of the large veins running from the areolæ, and it should be free from cicatrices or discolorations pointing to former abscesses or eruptions; the nipples should be of good size and prominence, without evidence of irritability or of loss of substance from former ulceration. Pressure should cause the milk to flow readily in numerous jets. A specimen of it should be obtained for chemical and microscopical examination, and, finally, the woman's own child, if nursed by herself alone, should be seen and carefully examined. Nothing can be better evidence of the value of the mother as a nurse than the condition of her own child; but it behooves the physician to be on the watch for substitution and other deceitful practices. Should it be possible, let him watch the child nurse. Then he can learn whether the milk flows easily and in abundance with but moderate effort on its part, and whether the child lets go of the nipple with an air of comfort, its lips dripping with the over-abundance of milk, or whether it repeatedly rejects the nipple unsatisfied and disappointed.

The milk itself should, of course, be examined as to both its physical and its chemical qualities. As to the former, Eustace Smith writes as follows: "The milk should be opaque and of a dull white color; under the microscope it should present fat globules of medium size, not too small. As a rule, the number of fat globules is a rough indication of the quantity of casein and sugar, though not always a trustworthy guide."[2] A more systematic and thorough method is quoted by Jacobi from F. Conrad (Bern, 1880). He draws the milk himself two or three hours after the last nursing, making use either of the breast-pump or of pressure by the thumb and index finger. This latter manipulation, after a little practice, causes no pain and makes it possible to appreciate the abundance and easy discharge of the secretion. He then determines: (1) The reaction, which should always be alkaline. (2) The specific gravity, which should be from 1.025 to 1.035; with an average of 1.031. (3) The microscopical appearance. The milk globules should be well formed, separate from each other, from 0.0088 mm. to 0.198 mm. in size, and those of medium size should predominate.[3]

Bumm quotes J. Koenig's recent analyses as showing the following chemical constitution: Sugar of milk, 6.21; milk fat, 3.78; albumin and casein, 2.29; salts, 0.71.

A wet-nurse having been chosen and her milk found to agree with her foster-child, the interests of all require that her mode of life should be so ordered as to keep her in the best condition for discharging this function. The error most likely to be committed is in changing too much her diet and régime, partly because the employers do not realize how the way of life and the kind of food to which she has been accustomed differ from their own, and partly because the nurse, finding food and other comforts in kind and quantity far exceeding those of her own home, and having withal a hearty appetite and the plausible excuse that the baby depends upon her, overindulges herself. The not uncommon result is that she grows enormously fat and at the same time loses the power to furnish the abundant supply of good milk which constituted her value. Rotch tells us that by improper feeding the quality of the milk may be changed so as to resemble cow's more than human milk in the amount of solids. This state of things leads to an attempt, probably surreptitious, to force a greater secretion by drinking beer or other alcoholics, and the downward course is begun which is not unlikely to end in the discharge of the nurse, either immediately before or after the death of the baby in convulsions. A rational management should forestall such catastrophes. In the first place, then, make the nurse bathe thoroughly and sufficiently. See that she has enough, but not too much, food of a nutritious kind and largely liquid, with an amount of exercise proportioned to her previous habits of life. Do all that is possible to secure her peace of mind and good spirits, especially by attending to the welfare of her own child, if it is living. Without going into particulars as to diet, we may say that it should be so ordered by the medical adviser as to be fully capable