

fact than in the early stage of the chronic type of bulbar paralysis, because the disease renders the facial muscles fixed and expressionless in a very short time.

The paralysis of lips, tongue, and soft palate is naturally not often associated with atrophy—first, because this phenomenon requires time; and, second, because it is the supranuclear part of the nerves which is usually affected. The nucleus itself may be directly affected, though rarely, and in such cases the characteristic atrophy with electrical changes may be found in the affected muscles.

The symptomatology is much more variable than in the chronic bulbar form, and naturally varies with the extent and seat of the lesion. The same eccentric grouping of bulbar nerve paralysis, with paralysis or paresis and sensory disturbance in the trunk and extremities spoken of under vascular lesions of the bulb in general, is to be expected.

Pathological Anatomy.—By far the commonest cause of the acute form of bulbar paralysis is thrombosis with softening. Both hemorrhage and embolism do occur, but with nothing like the same frequency. Poliencephalitis inferior acuta may determine the symptoms above described, and like symptoms are also ascribed to the pressure of a dilated atheromatous basilar artery.

Certain authors have observed the occurrence of an acute bulbar paralysis associated with weakness of the extremities during the course of typhoid; sometimes with a fatal outcome. In the latter cases streptococci and other organisms were found in various parts of the central nervous system without any very marked histological changes.

Prognosis.—Death may result, in very acute cases, within a short time from inhalation pneumonia or cardio-respiratory paralysis. In less severe cases the symptoms are slowly regressive and may gradually disappear, although restoration of function is seldom absolute in all the affected parts.

Treatment.—In cases suspected to be of syphilitic origin the prompt and free use of specific medication is demanded. Otherwise treatment should in the main follow the lines indicated in the therapy of cerebral vascular lesions in general. In the cases which arise in the course of an encephalitis of the ponto-medullary region antiphlogistic and derivative measures are appropriate. Very large doses of calomel may serve a useful purpose even in cases not syphilitic.

It is very important to make every effort to keep up the nutrition from the beginning. As paralysis of the muscles of deglutition may be absolute even from the outset, artificial feeding often becomes indispensable. In the later stages of surviving cases electricity may prove useful.

LABIO-GLOSSO-LARYNGEAL PARALYSIS OF PSEUDO-BULBAR AND CEREBRO-BULBAR ORIGIN.

In very rare cases after a patient has experienced a number of minor apoplectiform attacks a condition resembling the labio-glossolaryngeal paralysis of bulbar origin, without any implication of the bulb itself, may result.

The pathologic substratum of such cases is a diffuse atheromatosis of the cerebral vessels, which causes a gradual destruction of the cortical representations of the facial, hypoglossal, and motor trigeminal nerves.

To produce a fairly complete analogue of the genuine bulbar type both cortices must undergo considerable destruction in the regions above indicated, with secondary changes in the cortico-bulbar projections. As these changes are all distinctly supranuclear, atrophy and electrical changes in the affected muscles are wanting.

Clinically, while the above picture is in the developmental stage, the patient is observed to have a series of mild shocks which differ in nowise from the ordinary. It is only when the cumulative effects of these various shocks are manifest in a bilateral paralysis or paresis of the muscles of the face, tongue, and jaws with accom-

panying disturbance of speech, swallowing, etc., that the resemblance to the bulbar paralysis begins. Even then the likeness is not complete, since severe disturbance of the respiration and of phonation is ordinarily absent.

The mental state of such patients differs markedly from that observed in the genuine form of bulbar paralysis in that some type of psychosis, or even dementia, is usually present. So-called bulbar crying and laughing is, on the other hand, commonly present, and may be very marked.

The paralysis is not necessarily limited to the face and tongue areas, so that hemiplegia or diplegia may be present.

A further type—the cerebro-bulbar—described by Oppenheim, differs from the above only in the fact that with the cerebral arterial break-down is associated a similar condition in the bulb. The lesions are never large and the bulbar symptoms are of gradual onset.

Symptomatically, bulbar phenomena are found associated with marked mental deterioration. Both bodily and mentally the patient is in a most deplorable state. With the usual disturbance of speech, mastication, and deglutition is associated spastic paralysis of the extremities on one or both sides. Attacks of dyspnoea and Cheyne-Stokes respiration either come on spontaneously or result from excitement, from paroxysms of spasmodic hiccough, or from attempts at motion. The optic nerves may undergo neuritis with consequent atrophy. The bladder and rectum may or may not be involved.

The prognosis in both the pseudo-bulbar and the cerebro-bulbar forms is very grave, although life may be prolonged for a considerable period of time.

The treatment recommended is that already described elsewhere.

ASTHENIC BULBAR PARALYSIS.

(Myasthenia Gravis Pseudoparalytica.)

To Erb (1879) is due the credit of calling attention to a symptom complex which so closely simulated that about to be described under asthenic bulbar paralysis that it must be considered its nosological analogue. It was not, however, until the appearance of Oppenheim's case in 1887 that this singular disease began to attract the attention which has been increasingly accorded to it up to the present moment.

Etiologically, little or nothing definite is known about it beyond the fact that it appears to result from the action of some toxic agent upon a congenitally predisposed nervous organism. Its association with tumors of the mediastinum and of the thymus gland has been noteworthy in specific instances. The predominance of the disease in early life is striking, but persons of advanced years are by no means exempt.

PATHOLOGY.—Up to the present time the most searching anatomic investigations have failed to reveal any organic changes in the medulla, bulbar nerves, or muscles. Congenital nervous defects and peculiarities have been observed in connection with certain cases, and a certain amount of stress has been laid upon the same as regards their morbid value, but it remains extremely doubtful if such stress has been rightly placed. The disease, in last analysis, appears to be a true neurosis.

SYMPTOMATOLOGY.—This comprises the usual dysarthria, dysphagia, and masticatory weakness with their associated palsy of the lips, tongue, palate and jaw observed in the ordinary types of bulbar paralysis. Added to this is a paralysis of the upper part of the face with imperfect closure of the eyelids. The paralysis also extends to the trunk and extremities, and attacks of dyspnoea are frequent. In a certain number of cases the involvement of the eye muscles, notably ptosis, is the earliest and most striking symptom. Atrophy and reaction of degeneration in the affected nerves and muscles are absent throughout the entire course of the disease regardless of its duration.

Jolly in investigating the behavior of the affected

nerves and muscles to electrical stimulation observed a peculiarity which he designated "myasthenic reaction." He found that where a tetanizing faradic current was applied (either to nerves or muscles) at intervals of a few seconds, the muscular contraction grew progressively weaker and gradually vanished completely, but that the muscle regained its irritability after a short rest. He further found that if the current were passed through a muscle without interruption for the space of a minute or even less, the muscular contraction gradually died away, but was again obtainable by the same sort of stimulation after a minute's rest.

Analogous phenomena have been observed in voluntary attempts to use the muscles of the jaw or extremities. A patient may take one bite of an article of food and then be totally unable to bring the jaws together with any force, but after resting a while may regain enough strength to chew for a few moments.

The course of the disease is very peculiar. The complete development of symptoms may require many months, although in certain cases the time required has been much briefer. Remissions are common, and the full development of symptoms may be followed by a regression, but so treacherous is the malady that when recovery seems fully established, there may be a fresh outbreak of the most rapid character and the symptom complex again be complete in a startlingly short time. Intercurrent attacks of dyspnoea and tachycardia and febrile movements are common.

The disease has on the whole so many peculiarities that differentiation is not difficult. The combination of bulbar symptoms with weakness of the muscles of the trunk and extremities, the frequent involvement of the external ocular muscles (manifested mainly by ptosis), the retention by the affected muscles of their normal volume, the absence of reaction of degeneration in the presence of the peculiar "myasthenic reaction" mentioned above, the characteristic tiring of affected muscles on voluntary motion, the lack of definite sensory and sensorial disturbance, the absence of mental weakness and disease, and the complete lack of any tangible pathologic substratum in the brain, nerves, or muscles unite to form a clinical and anatomical picture that is *sui generis*.

The prognosis is always serious. Nevertheless the most alarming cases may end in complete recovery. Recovery is, however, never assured until there has been a freedom from symptoms for a period of many months, to the present time the majority of cases have terminated up fatally.

TREATMENT.—The proper care of this type of bulbar paralysis requires unusual skill. A complete rest treatment, such as is followed in the severest form of neurasthenia, should be carried out in bad cases to the minutest detail. The patient should be allowed to do almost nothing for himself, even to swallowing food, which, by the way, should be selected so as to combine the maximum of nourishment with the least tax upon the digestive organs. Even the use of the stomach tube for artificial feeding is not devoid of danger, as its introduction may induce fatal suffocation. If mastication can be permitted with safety in a given case, care should be taken to allow the patient to rest between mouthfuls.

The drug treatment consists in the administration of tonics. In certain cases the preliminary production of diaphoresis has been beneficial. Against the use of electrical stimulation it cannot be too strongly cautioned.

Joseph W. Courtney.

PRESCRIPTION-WRITING.—A medical prescription is a written order to the pharmacist to take certain quantities of certain medicines, deal with them in certain pharmaceutical ways, "put up" the product in certain form for dispensing, and label the package with certain directions for use. Correctness in prescribing, therefore, relates to the three several matters of the *selection of the ingredients or composition of the prescription, the fixing of quantities or computation of the prescription, and the*

actual *writing of the order* in technical style, or *expression of the prescription*. These several topics will be considered *seriatim*, in the order named.

I. THE COMPOSING OF A PRESCRIPTION.—Assuming that a prescription is intended, as always should be the case, to fulfil a single therapeutic purpose only, then the first point that presents is whether, under the circumstances of the case, a *single* medicine of the appropriate kind should be prescribed, or a *team* of such medicines. As regards this point, no general rule can be laid down—the matter will depend partly upon the nature of the therapeutic indication, and partly upon the respective peculiarities of the individual drug and the individual case. Thus to provoke *emesis*, a single drug is commonly prescribed; to excite *diuresis*, a team; while for *purging* the medicine will be single, if it be castor or croton oil, but multiple, if the selection be from among the resinous cathartics. The advantage of a team of similar medicines in prescription may be, on the one hand, a more *effective*, or, on the other, a more *kindly* accomplishment of the specific purpose in view, or it may be both possibilities combined. Thus, by a wise association in prescription of allied drugs, a maximum of therapeutic effect is attainable with a minimum of by-derangement. Having fixed upon the active member, or team of members, of the prescription, the next point is whether the medicinal working of the same may not be made even more effective or more kindly than would otherwise be the case, by the further addition to the prescription of some special substance. Such increase in both lines—effectiveness and kindness—may result by a chemical action upon the drug, on the one hand, or by a medicinal impression upon the system of the subject, on the other. Thus, as an instance of the working of a chemical action, stands the fact that the efficacy and kindness of operation of a dose of *salicylic acid* are both enhanced by the addition to the acid of a solution of a sodic carbonate, whereby the salicylic acid, which under its own form is both insoluble and irritant, becomes the more soluble, and at the same time far less harsh, body, sodium salicylate. As instances of an associated medicinal impression by an unrelated drug affecting the operation of the active member of a prescription may be cited the rather mysterious enhancement of the diuretic action of digitalis by the associate action of calomel, and the neutralizing of the gripping of the rougher cathartics by the associated antispasmodic action of the pungent volatile oils, or of neurotics, such as belladonna or hyoscyamus. In the category of additions to a prescription for the purpose of enhancing *kindliness* of operation, belong *flavoring* substances. For an agreeable, or, at least, a not offensive potion, is not merely *pleasanter* than an ill-tasting one to swallow, but is also, by the very reason of non-offensiveness, far less likely than a nauseous dose to destroy appetite or derange digestion. The art of prescribing pleasant mixtures is therefore one of genuine advantage to the patient, as well as to the prescriber! Agreeability of taste is, of course, far more important in the case of fluid than of solid mixtures, and is attained, in the case of fluids, in part by wisdom in the selection of the active member of the prescription, and in part by the addition to the prescription of *sugar*, or of *syrup*, or of preparations of the more pleasantly flavored *aromatics*. Lastly, in composing a prescription, comes the thought of a possibly necessary substance to give *volume*, or, in the case of a powder or pill, to give *form*, or, in the case of a fluid mixture, to serve as a diluent, or as a solvent. The character and relative proportion of such a member of a prescription will vary so greatly in different cases, that no general rule affecting the selection of vehicles can be formulated. Members of a prescription for the several purposes named are commonly referred to as, respectively, the *basis*, the *adjuvant*, the *corrigent*, and the *excipient*, or *vehicle*, of the prescription. In the association of different substances in a prescription, no matter what the purpose of the several ingredients, regard must always be had for the mutual *chemical* relations of the things so brought into mutual contact, lest undesirable

reactions take place in the compounding (see *Incompatibility, Medicinal*).

II. THE COMPUTING OF AMOUNTS IN PRESCRIPTIONS.

The first point in the matter of amounts in prescriptions is, in general, *not to order more of the medicine than present prognosis seems to call for*. Not unnaturally, the laity instinctively argue that the remedy should fit the case in *measure* as well as in *mode*, and hence, that an excess of medicine in the prescription is *prima-facie* evidence of a deficiency of skill on the part of the prescriber. They, furthermore, naturally object to the *paying* for the superfluous. Apart from these considerations, there are also many and obvious objections to a course that leaves half-used parcels of medicine to accumulate in a house, at the risk of inappropriate application on subsequent occasions, at ignorant hands. Hence, in cases in which an exact forecast of the amount of a medicine likely to be required is impossible, it is wiser to order no more than will surely be within bounds, letting the prescription be renewed if the amount prove too little. Assuming due regard to be paid to this principle, then the determination of amounts in a given prescription proceeds, by theory, thus: the amount of *basis* will be the product of the two factors, *quantity of dose* and *number of doses* required, and the several amounts of the other ingredients will be deduced from the amount of the basis, in accordance with the respective requirements of relative proportion. In putting this theory into practice, however, the important consideration has to be regarded, that quantities must be such as can conveniently be expressed in terms of the system of weight or of measure employed in the prescribing. This consideration determines, in general, the use of *round numbers*, and, in particular, of *such round numbers* as best conform to the relation between denominations in the particular system of weight or of measure followed in the prescription. For example, in general, no prescriber would fix a dose to be expressed by such a number as *one and one-tenth*, whether referring to grains or grams, nor would he ever estimate upon an aggregate of such an awkward number of doses as *seven*, or *eleven*, or *nineteen*, or *twenty-three*. And, for example again, in particular, the prescriber by the *apothecaries'* system of weight or of measure, recognizing the generally *duodecimal* ratio of the denominations of these scales, instinctively proportions the numbers of his prescription on a *duodecimal* basis. His ratios, that is, are as one to some one of the numbers 2, 4, 6, 8, 12, 18, 24, 60, 120, 180, 240, 480. On the other hand, if the *metric* system be the system followed, the *decimal* basis of this system almost of necessity entails the use of decimal ratios in proportioning amounts in prescription. Quantities are in this case fixed upon that are to each other as one to some number of this series of numbers: 2, 5, 10, 20, 25, 50, 75, 100, 200, 250, 500, 1,000. This fundamental difference in the figures to be used in working by the metric system as compared with the *apothecaries'* is a point very commonly overlooked by novices, in this country, in the art of prescribing by metric denominations. Because already fixed in the *duodecimal* habit through previous practice with the *apothecaries'* system, such novices are apt to compute in *duodecimal* ratios quantities which they then set down in terms of *decimally* related denominations—a proceeding wherein theoretical stupidity begets, as it should, practical disaster. For, by this proceeding, as it is hardly necessary to point out, there is wholly missed the one point of advantage which the metric system has to offer, namely, ease of computation by *decimal ratios*. A medicine, then, whose dose in prescription by *apothecaries'* weight is taken at *one grain*, is—or should be—in prescribing by metric weight, taken at *five centigrams*, and not at the *six centigram* amount by which the American metric prescriber, translating from terms of *apothecaries'* weight, so commonly figures. As well might an original metrician—to coin a convenient word—who essays a prescription by the *apothecaries'* system, first fix his dose, by his old metric habit, at five centigrams, and then, blindly insisting on exactly that quantum, despite its unsuitableness to the foreign system of weights, pre-

scribe in grains on the absurd basis of a *seven-eighths-grain* dose!

Such are the essential points of the theory of computing prescription amounts, and having due regard to these points, the prescription of *solid* mixtures for make-up into pills, powders, troches, suppositories, etc., is easy enough; but in the prescription of *fluid* mixtures many additional considerations enter into relation, as follows: In the first place, although it is not essential, yet it is elegant, and hence customary, to have a prescribed mixture aggregate *just a bottleful* of some one of the sizes of the medicine phials of the shops. Regard must therefore be had to the several sizes of such bottles. In the United States medicine phials are made of capacities conforming to *apothecaries'* measure, which capacities are severally as follows: *one, two, and four fluidrachms*, and *one, two, four, six, eight, and twelve fluidounces*. This fact of the conformity of medicine bottles to *apothecaries'* measure, makes, in this country, the prescribing of fluid mixtures readier by the *apothecaries'* than by the metric system. Phials for metric prescription should be of the natural metric capacities, severally, of *twenty-five, fifty, one hundred, two hundred, etc., cubic centimetres*.

The second special point affecting amounts in the case of fluid mixtures relates to the case of solids in solution, the point being the physical fact that, in dissolving a solid of a given measure in its condition of dry powder *does not augment the volume of the solvent by the full amount of such measure*, but, on the contrary, increases such volume so little that, in the ordinarily comparatively weak solutions used as medicines, the increment can safely be disregarded in the estimation of amounts for prescription.

The third point relates to the system by which, in a given case of a fluid mixture for internal giving, the *individual doses are to be measured*. This consideration does not obtain in the case of solids, since, in such case, doses are defined by a stated number of pills, powders, or troches—are, that is, already apportioned by the apothecary. But in the case of a fluid mixture, the medicine is necessarily dispensed in bulk (except when put up in capsules), and doses must be measured out by the administrator at the bedside. The point then presents itself of practical bearing, whether, in a given case, the dose is to be measured by a method of precision—by use of a graduated pipette, if the dose be quite small, or of a graduated vessel if of ordinary or large dimension—or whether the determination is to be by the conventional *drop* on the one hand or *spoonful* on the other. If a graduate is to be used, then the point now in question does not present itself; but if the *drop* or the *spoonful* is to measure the dose, then the consideration arises, in the apportioning of amounts in prescription, of the respective actual *dimensions* of these variable measures, under the conditions obtaining in the individual case. As regards the *drop*, it must be remembered that this measure varies in dimension, not only according to the viscosity and specific gravity of the fluid dropped, but also according to the *shape, extent, and character* of the surface from which the drop delivers itself, and even, furthermore, in the case of drops delivered from a phial, according to the *degree of fulness of the bottle* on the occasion of the dropping. A bottle with a flanged mouth, such as the ordinary medicine phial, yields, with the same fluid, a comparatively large drop when full or nearly so at the dropping, and a comparatively small one when at least half empty, the difference in the respective drop dimensions in the two instances being even as considerable as that between the numbers five and three. The reason for this difference in size of drops is that, from a full bottle, the contents begin to run out when the bottle is but slightly tipped, and accordingly, because of the position of the free edge of the lip, the nascent drop creeps into the re-entrant angle formed by the under surface of the lip and the side of the neck, and there has a chance to grow to a comparatively goodly size before gravity determines the fall. On the other hand, a phial half empty must be tipped to the horizontal before the

contents can run out, in which position the narrow rim of the lip points directly downward, and so presents but a small surface area for the fluid to cling to. Under these circumstances the fall will necessarily be in comparatively small drops. As regards the *spoonful*, it must be remembered that this measure, like the drop, is subject to variation, so that, in the case of prescriptions containing powerful medicines, amounts should be calculated on the basis of the *maximum capacity of the measure*. Whatever, then, may be the variation from the calculated dose in actual mensuration, will be on the safe side of a *shortage* instead of a possible *excess* of amount. Now a given spoon will naturally hold more of a *viscid* than of a *thin* fluid, and, in practical mensuration, will more readily hold its full complement when the fluid is poured *into* it, as from a bottle, than when the spoon is made to dip up the fluid from an open vessel. Hence, in the case of a *syrupey* mixture, with the dose to be taken *directly from the phial*, the conditions obtain where the spoonful will be at its maximum; while, on the other hand, in the instance of a thin watery dilution standing in a tumbler, with the dose to be dipped up by means of the spoon, the measure, although the same in name, may be very different indeed in fact. Another point, which should thoroughly be understood, relates to the size of the average spoon of to-day as compared with the spoon of the same denomination of two generations ago. Coming down from our ancestors is the estimate of the *tablespoonful* as the measure of half a fluidounce, or 16 c.c., and of the *teaspoonful* as that of a fluidrachm, or 4 c.c. These alleged equivalences, true of the average of spoonfuls of former days, are still handed down as present truth from teacher to student, and so come to be almost universally applied in prescription calculations. If, however, the reader will take from any chance pantry a sample of the average commoner kind of teaspoon, such as is generally relegated for service in the nursery, and will provide for himself an accurate graduate and a phial of water, he can learn for himself, in two minutes, the fact that the teaspoonful will run much nearer *six* to the fluidounce than the traditional *eight*—will equal the quantity of *five* rather than of *four* cubic centimetres. And, by the same token, the average tablespoonful of our own present spoons is of the dimensions of *three* rather than of *four* to the two-fluidounce measure—of *twenty* rather than of *sixteen* cubic centimetres. And indeed, in the case of thick fluids, such as strongly syrupey mixtures, or a fixed oil like castor oil, where also the fluid is poured into the spoon, the spoonful will considerably exceed even these larger estimates. In view of these facts, this writer, in his teaching, has always advised for prescription purposes the estimate of the equivalence of the teaspoonful as at 5 c.c., or at the rate of six to the fluidounce; and of the tablespoonful at 20 c.c., or at the rate of three to two fluidounces—six to four fluidounces.

By basing calculations on such assumed equivalences, any error in actual mensuration will be, as it should be, in the direction of a measure smaller rather than greater than intended. Furthermore, it is a happy fact that these equivalences give numerical relations far handier for purposes of calculation than the older estimates. In the case of the metric values, it goes without saying that for computation in decimal denominations, the numbers *five* and *twenty* are much more convenient for expressions of respective unit quantities than the numbers *four* and *sixteen*. And in the *apothecaries'* system the proportion of six to the fluidounce permits of a greater number of easily calculated combinations than the time-honored eight to the same measure, as is shown in the tables below.

A fourth consideration affecting the estimation of amounts in the prescription of fluid mixtures, obtains in the prescribing of a solid to be borne in solution in an inert fluid menstruum, the point being the matter of the proper proportion between solid and solvent. Of course, in the first place, the proportion must be compatible with the solubility, in the selected menstruum, of the given solid; and, also of course, in the second place, if the dose

is to be diluted extemporaneously for the taking, the concentration of the prescribed solution may be to any degree so compatible with solubility. If, however, as so often is the case, the prescription purposes a solution fit for direct administration without further dilution, then the consideration of *taste* enters into relation. An over-strong solution will be rough to the taste, and may also be irritant or even corrosive to the alimentary mucous membranes; while, on the other hand, if the solution be inordinately weak, the volume required for the carrying of a proper dose of the dissolved basis may be inconveniently large. Of course, in this matter the individual peculiarities of the constituents of a given prescription will require individual consideration; but, in a general way, the truth obtains that the *teaspoonful* is best made the carrier of not more than—in convenient round numbers of the respective systems of weight—*twenty-five centigrams*, or *five grains*; and, similarly, the *tablespoonful* of not more than, respectively, *one gram*, or *twenty grains*, of a solid in solution. In the case of fairly bland substances, whose solubilities will at the same time permit, twice these quantities may be permissible; but such proportion should not be exceeded.

From this presentation of points affecting the prescription of fluid mixtures, it appears that, in cases in which it is expected that the whole bottleful is to be used, the estimate of amounts must harmonize a trio of conditions as follows: (1) The total must be just a bottleful; (2) it must aggregate *about* the number of doses therapeutically indicated; and (3) at the same time the amount of the active basis, while being such as to yield the proper strength of solution, must also be such as to admit of ready expression in terms of the system of weight or measure employed in the writing. In the use of the metric system this triple harmonization presents no difficulties, for the simple reason that since *any* amount is equally easy of expression by this system, it is only necessary to harmonize the first two considerations, letting the amount of active basis required foot up to what it will. Thus, for instance, let it be supposed that an indication seems to call for a medication three times a day for a few days; then all it is necessary to remember is that, if the active basis be one of small dose such that a teaspoonful is the more convenient carrier, a *fifty cubic centimetre* aggregate will fulfil the conditions of an even bottleful on the one hand, and about the requisite number of doses upon the other (ten teaspoonfuls, reckoning the teaspoonful at 5 c.c.). Then the individual dose of basis may be taken unconditionally by the therapeutic indication—it may be fixed at one, two, three, four, five, six, seven, eight, nine, ten, or any odd number of centigrams, and the expression of the aggregate will be equally easy, such aggregate being simply ten times the quantity for the individual dose, respectively, as follows: 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 0.90, 1.00 gm., etc. Similarly, if the case be one where a *tablespoonful* will be the more convenient measure for the dose, then a *two hundred cubic centimetre* volume will again yield ten doses (about the number indicated) of the selected dimension, and once more the individual dose of basis may be what it please, and the aggregate will be equally easy of expression. When, however, the *apothecaries'* system is followed in the prescription, at once a complication arises, for the reason that in *apothecaries'* weight all amounts are *not* equally easy of expression—some, indeed, being so awkward to express as practically to be unavailable. Thus, for instance, although by this system, as already pointed out, ratios are naturally taken in *duodecimals*, yet such a natural *duodecimal* multiple as *seventy-two*, representing grains, is a monstrosity for expression. In computing, therefore, by *apothecaries'* weight and measure, the prescriber is bound by the clumsiness of the denomination ratios of the system, and so, for cases in which the total basis exceeds a drachm, finds available for the fulfilment of the tripartite conditioning set forth above, a certain set of combinations only. These combinations the young prescriber must learn by rote. They are easily enough figured out for one's self;

but for convenience of reference there are set forth, in tabular form below, the combinations convenient when the individual dose of basis is to be one or other of the several amounts, five, ten, fifteen, or twenty grains. If the individual dose of basis be less than a grain or two, then the total amount of basis required, being but a moderate number of grains, is easy enough of expression, and the difficulty now under consideration does not obtain.

TABLE OF CONVENIENT COMBINATIONS FOR THE PRESCRIPTION OF FLUID MIXTURES BY APOTHECARIES' MEASURE AND WEIGHT.

1. Dose to be borne in an average teaspoonful, reckoning six teaspoonfuls to the fluidounce.

Capacity of phial in fluid-ounces.	Number of teaspoonfuls contained.	AMOUNT OF BASIS TO BE PRESCRIBED IN ORDER TO YIELD TO THE TEASPOONFUL THE SEVERAL DOSES OF—			
		Five grains.	Ten grains.	Fifteen grains.	Twenty grains.
3/4	3	gr. xv.	3 ss.	3 i.
1	6	3 ss.	3 i.	3 iss.	3 ij.
2	12	3 i.	3 ij.	3 iij.	3 ss.
4	24	3 ij.	3 ss.	3 vi.	1.
6	36	3 iij.	3 vi.	3 ix.	1 iss.
8	48	3 i.	3 i.	3 iss.	1.
12	72	3 vi.	3 iss.	3 iij.

2. Dose to be borne in an average tablespoonful, reckoning one and a half tablespoonfuls to the fluidounce.

Capacity of phial in fluid-ounces.	Number of tablespoonfuls contained.	AMOUNT OF BASIS TO BE PRESCRIBED IN ORDER TO YIELD TO THE TABLESPOONFUL THE SEVERAL DOSES OF—			
		Five grains.	Ten grains.	Fifteen grains.	Twenty grains.
3/4	3	gr. xv.	3 ss.	3 iij.
1	6	3 ss.	3 i.	3 iss.	3 ij.
2	12	3 i.	3 ij.	3 iij.	3 ss.
4	24	3 ij.	3 ss.	3 vi.	1.
6	36	3 iij.	3 vi.	3 ix.	1 iss.
8	48	3 i.	3 i.	3 iss.	1.
12	18	3 iss.	3 iij.	3 vi.

3. Dose to be borne in a measured fluidrachm.

Capacity of phial in fluid-ounces.	Number of fluidrachms contained.	AMOUNT OF BASIS TO BE PRESCRIBED IN ORDER TO YIELD TO THE FLUIDRACHM THE SEVERAL DOSES OF—			
		Five grains.	Ten grains.	Fifteen grains.	Twenty grains.
3/4	4	3 i.	3 ij.	3 i.	3 iv.
1	6	3 ij.	3 iv.	3 iij.	3 viij.
2	12	3 iij.	3 viij.	3 ss.	3 xvi.
4	24	3 viij.	3 xvi.	1.
6	36	3 i.	3 i.	3 iss.	3 ij.
8	48	3 ss.	3 i.	3 iij.	3 ss.
12	96	3 vi.	3 ij.	3 iij.	3 iv.

4. Dose to be borne in a measured half-fluidounce.

Capacity of phial in fluid-ounces.	Number of half-fluidounces contained.	AMOUNT OF BASIS TO BE PRESCRIBED IN ORDER TO YIELD TO THE HALF-FLUIDOUNCE THE SEVERAL DOSES OF—			
		Five grains.	Ten grains.	Fifteen grains.	Twenty grains.
1	2	gr. x.	3 i.	3 ss.	3 ij.
2	4	3 i.	3 ij.	3 i.	3 iv.
4	8	3 ij.	3 iv.	3 iij.	3 viij.
6	12	3 iij.	3 viij.	3 ss.	3 xvi.
8	16	3 iv.	3 xvi.	3 iij.	3 xvi.
12	24	3 ij.	3 ss.	3 vi.	3 i.

III. THE EXPRESSING OF A PRESCRIPTION.—A prescription is an order, dated and signed, to the pharmacist to take certain quantities of certain several substances; to perform upon them certain pharmaceutical operations; to label the package with certain directions concerning

use, and to address it with the name of the patient. Upon this order the author may also have occasion to set down certain injunctions, such as "not to be renewed," or, "not to be shown to the patient," etc. In form, prescriptions are commonly written after the following paradigm:

[Not renewable without authority.]
For Mr. A. B.
Take
Of substance A, quantity x.
Of substance B, quantity y.
Of substance C, quantity z [etc.].
Do so-and-so [with them].....
Label [the package].....
[Signed] C. D., M. D.,
No. 1 Blank Street.
[Dated] November 22d, 1886.

Instead of a written signature, a very common and a very good plan, followed by many practitioners, is to have prescription blanks printed for their personal use, bearing the imprint of name, address, and office hours. In such case the imprint is commonly at the head of the paper. In language, a prescription is commonly written in part in Latin, and in part in the vernacular. In the United States the use of the Latin is commonly confined to such portion of the prescription as has to do with directions to the pharmacist for the compounding and "putting up" of the medicine; but in many other countries the directions for use are also written in Latin. This latter foreign custom has nothing to commend itself, but, on the contrary, is intrinsically objectionable on the score of opening an unnecessary doorway for the entry of mistakes. For such directions must, of necessity, finally appear in the vernacular in the label upon the package which is to serve for the patient's guidance; so that, to write them in the prescription in Latin is to entail their translation back into the vernacular at the hands of the pharmacist for the purpose of transcription, all at the risk of mistakes. Far better is the American custom, whereby the prescriber can—and always ought—set down, in the vernacular, in full necessary detail, the directions for administration, which directions are then simply to be copied, exactly as written, in the labelling of the package. Another, and quite universal, custom is to express by abbreviation or by symbol, in the pharmaceutical portion of the prescription, what might be called staple words. Thus, in the foregoing paradigm, take is expressed by the symbol "R," which, originally the astronomical sign "♃," of the planet Jupiter (symbolical of the prayer to the deity Jove which in ancient times headed prescriptions), now bears its present peculiar form in order to do duty also as the initial letter of the Latin word *recipe*, signifying *take thou*. Next, titles of denominations of weight or measure are expressed by the commonly employed symbols for such denominations, and numeral adjectives by the so-called Roman numerals in the use of the apothecaries' system of weight or measure; but by the ordinary Arabic numerals when the prescription is by metric weight or measure, as is practically a necessity for the expression of the related integral and decimal fractions by which metric quantities are signified. Next, the word *misce*, signifying *mix thou*—the most commonly occurring word expressing requirement of pharmaceutical manipulation, is expressed by its initial letter *M.*, and similarly, and lastly, the word *signa*, signifying *label thou*, by its initial letter *S.* Other commonly employed abbreviations are "aa" for *ana*, latinized Greek for the phrase of each; "no." for *numero*, signifying to the number of; "q. s." for *quantum sufficit*, signifying as much as may be necessary, and "p. r. n." for *pro re nata*, signifying according to need.

It thus appears that all of the prescription requiring full dress in Latin is comprised in the titles of substances prescribed, and in the directions for the compounding. And for the correct latinizing of such items a critical knowledge of the Latin language, though, of course, of great advantage, is yet not indispensable. For, so far as relates to the expression of medicine-titles, all that is necessary is to know how to set these titles in proper case;

and, as concerns the expression of pharmaceutical directions, it is to be remembered that, in the great majority of instances, the directions for compounding requiring specification in prescription writing, are simple and set, so that their Latin phrasing is easily compassed by the knowledge of a few arbitrary words and phrases. Indeed, for all but seldom occurring exceptional directions, the latinizing can be effected by the words and phrases in the following list, properly coupled with Latin words signifying forms of medicines, presumably already learned.

LIST OF ODD WORDS AND PHRASES OF COMMON OCCURRENCE IN THE EXPRESSION OF PHARMACEUTICAL DIRECTIONS, IN PRESCRIPTIONS.—1. Verbs, in imperative mood; "object" to be in the accusative case (analogue of the English objective):

Adde, add. Filtra, filter.
Cola, strain. Mæcera, macerate.
Divide, divide. Misce, mix.
Extende, spread. Solve, dissolve.
Fec, make. Tere, rub.

2. Verbs, in subjunctive mood, taking a subject or a predicate, nominative:

Bulliat, let [it] boil.
Fiat, let [it] be made [into].
Fiant, let [them] be made [into].

3. Verbal adjective (participle) to agree with its noun in gender, number, and case:

Dividendus (masculine); -a (feminine); -um (neuter), to be divided.

4. Prepositions: noun following to be in the accusative case:

Ad, to; up to. In, into. Supra, upon.

5. Prepositions: noun following to be in the ablative case:

Cum, with. Pro, for.

6. Miscellaneous Words and Phrases:

Ana, of each. Guttatim, by drops.
Bene, well. Non, not.
Bis, twice. Semel, once.
Dén or deinde, thereupon. Simul, together.
Et, and. Státim, at once.
Gradatim, gradually. Ter, thrice.

In the instance of a pharmaceutical operation which cannot be expressed in Latin by the application of the foregoing vocabulary, the wise course, even for the Latin scholar, is to forego elegance and write the direction in the vernacular. Otherwise it might chance that the prescription overstep the pharmacist's capacity for translation, to the obvious defeat of the compounding.

As regards the rendering, in proper Latin case, of the titles of the ingredient substances of a prescription, the points are as follows: There are, in Latin, six cases in the declension of nouns and adjectives, but of these cases four only are concerned in the latinizing of medicine titles. These four are, respectively, as follows: The nominative case, corresponding to the English nominative, is the case in which titular words stand in simple statement—by which, in short, names are learned. Thus we recognize prepared chalk by the Latin title *Oreta preparata*, wherein the two words of the title are in the nominative case. Next, the genitive case corresponds to the English objective case after the preposition of, and is the case in which titular words most commonly stand in prescription writing. For, in the first place, compound titles, even in simple statement, commonly afford an instance of the genitive, as in the case of the title *tincture of opium*. Here the phrase of opium is rendered in Latin by the word *opium* set in the genitive case. Then, in the second place, in prescribing, the order for the "taking" of a given ingredient is, in the enormous majority of instances, a direction for the taking of a specified quantity of the substance in question. A prescription for a phial of laudanum, that is, will read: "Take of tincture of opium one-half fluidounce." In such case

the titular word of the preparation itself—in this instance the word *tincture*—will have to stand in the genitive, since now it, also, follows the preposition of. With the exception, therefore, of a few conditions when titular words stand, in prescription expression, in the accusative, the rule is that all titular nouns and adjectives which, in simple statement of the title, stand in the nominative, require, in prescription orders, to be set in the genitive.

The third Latin case that concerns the prescriber is the accusative, the Latin analogue of the English objective following a transitive verb. Titular nouns and adjectives take the accusative under the two following circumstances: First, when the order is not the common one to take a certain specified measure or weight of the thing, but to take the thing itself in a conditioned entirety. A common instance of this circumstance is where yolk or white of egg is an ingredient of a prescription. Here by the condition of things it is easiest to measure quantity by the natural measure of the egg substance itself. Hence, in prescribing yolk the order is commonly to take the yolk of one egg, or of two, or of three eggs, as the case may be; in which case the title word *yolk*, standing as the direct object of the transitive verb *take*, requires to be put in the accusative. Another commonly occurring instance where the accusative must appear, is where the prescriber writes for a certain number of a ready-made medicinal entity, such as pills or troches, of standard composition, and hence of independent title. Thus, to prescribe the pharmacopœial compound cathartic pill, the simplest way is to order directly the desired number of the already made pills, which the pharmacist keeps in stock. Such prescription, therefore, reads: "Take compound cathartic pills to the number of" so many, and so the word for pills, with its dependent adjectives, appearing as the immediate object of the verb *take*, stands in the accusative. The second circumstance determining the setting in the accusative of titular nouns and adjectives occurs, in one form of writing, in cases in which the prescription orders that a given substance be taken up to the attainment of a certain total bulk or weight. This form of order most commonly obtains in the prescription of fluid mixtures, where it is often convenient to order in specified quantities the necessary amounts, respectively, of basis or adjuvant; but, as regards the inert vehicle simply to direct the compounder to "take" the vehicle substance until the whole mixture shall attain the measure of the desired bottleful. In such case the order for the vehicle may be phrased in either of two styles—in the one of which the titular words will appear as usual in the genitive, but, in the other, in the accusative. The phrase in the latter style is according to the model, *take so-and-so up to [the measure of] so much*. Here the title of the substance "taken" is the immediate object of the verb *take*, and therefore stands in the accusative; the phrase *up to the measure of* being expressed by the preposition *ad*. The other style of phrasing the order is after this model: *Take of so-and-so as much as may be necessary to attain the measure of so much*. Here the title of the medicine once more follows the preposition of, and hence appears in the genitive. In the rendering of the order in this style, the Latin phrase *quantum sufficit ad* (commonly abbreviated to *q. s. ad*) is the translation of the English "as much as may be necessary to attain the measure of."

The fourth and last Latin case that concerns the prescriber is the ablative, a case corresponding to the English objective after certain prepositions. The prepositions governing the ablative that occur in prescription writing are *cum*, "with," and *pro*, "for." The former of these occurs in a few titles, as for instance, *Hydrargyrum cum Creta*, mercury with chalk; *Emplastrum Picis cum Cantharide*, pitch plaster with cantharides; and the latter in the much-used phrase *pro re nata*, "according to need." But as regards the ablative, the special point obtains that the circumstances of prescription phrasing never require the rendering in the ablative of a title word which in the title appears in a different case. The few instances of

