Aids to practical dispensing / by C.J.S. Thompson.

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BY

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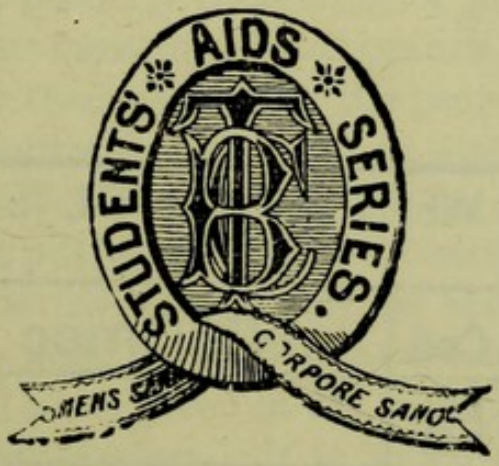

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PREFACE

THE difficulty of attempting to describe the technicalities of a practical art in writing is obvious. The object of this work, therefore, is mainly to lay before those students who have not had the opportunity of much practice, the various methods employed in dispensing medical prescriptions, and to enable them to become familiar with the necessary processes.

It is a frequent complaint of students, especially those in country places, where they are seldom called upon to dispense prescriptions, that they have not had the advantage of being properly trained, or of gaining sufficient experience in this most important branch of the pharmacist's calling. For their assistance the preparation of mixtures, and the difficulties that may be met with in dispensing liniments, tablets, pills, and pill-coating, etc., are specially noticed. The pill excipients mentioned have been tested by practical experience, and may be relied upon. Special attention has been devoted to the more difficult operations, and practical hints given in the making of emulsions, suppositories, and plasters. It is hoped the following pages will be found useful to the medical as well as the pharmaceutical student, who has not always an opportunity of acquiring the necessary knowledge of the dispenser's art by practical experience.

C. J. S. T.

CONTENTS

CHAPTER VII

CHAPTER VIII

CHAPTER IX

CHAPTER X

CHAPTER XI

CHAPTER XII

APPENDIX

AIDS TO PRACTICAL DISPENSING FOR STUDENTS

CHAPTER I

Practical hints to the dispenser—Weighing and measuring—The prescription—General posology—Ambiguous abbreviations.

THE art of compounding or dispensing medicines is now recognised as forming an important branch of the medical art, the dispenser being entrusted with the preparation and distribution of the numerous drugs employed in modern treatment, and which form the armament of the physician in combating disease. Thus his position is one of responsibility, and demands the most scrupulous care, accuracy, and attention, which must never be relaxed while in the performance of his duties. The art of dispensing is essentially a practical one, which cannot be acquired by the aid of books alone, and the student must remember that actual experience and close attention to detail is absolutely necessary in order to become a capable dispenser of medicines. Although experience and practice are very necessary, it should also be borne in mind that there are other important requisites required to become a good dispenser. He should not only have a general knowledge of the laws and principles of chemical science, but must also be capable of applying them to his everyday work. Further, it is essential to acquire a thorough knowledge of the British Pharmacopœia and its preparations, and the doses

of the various drugs and chemicals used in medicine. An excellent plan to impress these on the memory is to copy them down alphabetically, writing first the Latin name, followed by the translation, and then the dose. The symbols denoting the weights and measures used in medical prescriptions must also be learnt. These, together with a knowledge of Latin, botany, materia medica, and the characters and reactions of chemicals, are some of the requirements that are absolutely necessary to the dispenser.

Points to Remember.—From the commencement of his career the student should endeavour to cultivate neat and methodical habits in the dispensary, and would do well to keep the following points in mind.

Always concentrate your thoughts and give your whole attention to the operation in hand, and do not allow them to be diverted by conversation or any other matter until it is completed.

When dispensing a prescription, you cannot be too careful and particular even over the most trifling operation, and cannot too early take pains to acquire an expert and workmanlike method in whatever you undertake.

Nothing gives a worse impression to an examiner or employer than to see a dispenser's counter littered and crowded with bottles, measures, and the implements he has been using. One may safely conclude if a man is careless in regard to these little matters, he will not be particular in others. It is well, then, to remember that each bottle or jar should be replaced on its shelf at once after use.

Let the dispensing counter be kept clean, and the measures, mortars, etc., that have been used put away by themselves, and not left about.

See that the pans of the dispensing scales are wiped perfectly clean each time after using.

These at first may appear to be trivial little matters in themselves, but they will be found to be none the less important in the training of a reliable dispenser, in whose vocabulary the word 'mistake' should be unknown. Neatness is another essential point to note. The student should take a pride in wrapping a powder or a bottle in the neatest possible manner. Always trim round the margin of a label before affixing it, and if the directions are to

be written, let the characters be clear, distinct, and neat. Try and cultivate quick methods of manipulation, and aim at completing your work in a cleanly manner without leaving any trace behind.

Weighing and Measuring.—There are few things more calculated to lessen confidence and raise suspicion in the public mind than a careless measurer, who, when he proceeds to measure a certain quantity of a liquid, first nearly fills the measure, then, finding he has poured out too much, empties some back, and probably has to make it up again to the desired quantity. With a little care the student may avoid this bad habit. When measuring a fluid, the bottle containing it should be held in the right hand, the measure being in the left, grasped by the thumb and forefinger. After extracting the stopper from the bottle with the disengaged fingers of the left hand, raise the measure to the level of the eye, and gently pour the liquid into it until the desired graduated mark is reached. Then compare with the mark on the other side, holding the measure perfectly level. Habitual accuracy not only gives the dispenser confidence in himself, but helps to inspire it in others. The same care should be observed in weighing a powdered substance. A little should first be placed in the right-hand scale pan, and added to gradually by means of a small spatula, until the exact amount is reached to balance the scale. Solid extracts should be weighed on a small piece of paper. In all cases the scale pan should be wiped perfectly clean directly after use. It is a good plan to train the eye to judge of the quantity to be weighed.

The Prescription.—When a prescription is handed to a dispenser to be prepared, his first duty is to read it through carefully and thoroughly master the contents, then proceed to copy it, and write the label. The student must be ready to meet with such difficulties as illegible writing and words often abbreviated to a single letter, but experience will soon help him to overcome these. After reading the prescription the principal points should be fixed on the mind. If it is for internal administration, note especially the dosage, and then if it presents any unusual difficulties. Should it be a mixture, observe if it is to be made up with water to a certain quantity,

or if a definite quantity of water is to be added, as, for example:

℞ Potass. bromid. .. .. ʒij.
Spt. ammon. co. .. .. ℥ss.
Syr. aurant. .. .. ʒi.
Aquæ .. .. ad ℥vi.
Misce. Fiat mist.

or,

℞ Sodii bicarb. .. .. ʒi.
Tr. calumb. .. .. ʒvi.
Spt. chlorof. .. .. ʒii.
Succ. tarax. .. .. ℥ii.
Aquæ .. .. ℥v.
Misce. Fiat mist.

When powders or pills are ordered, note if the collective weight of the ingredients is to be divided, or if the quantities ordered are to be placed in each. Should a distinct overdose of some powerful drug be discovered, or any important omission be detected, the prescriber should be communicated with at once if possible, and the matter explained or rectified. On no account should the dispenser take upon himself to make an alteration in the quantity of an ingredient ordered in a prescription without first using every endeavour to consult the prescriber and obtain his consent. The prescription may be composed of incompatible ingredients that will make an ugly mixture, but in such cases the competent dispenser must rely upon his skill to present it to the patient in the most palatable and sightly form. After a prescription has been prepared, it is always a safe rule for the dispenser to read it through once again, to check the ingredients, and so make quite certain he has made no omission.

General Posology.—In dispensing, in this country the rule that all liquids are to be measured and solids weighed is strictly observed. It is the custom with some prescribers to order certain liquids in drops, and the minim and the drop are often confused by the student, but one is by no means equivalent to the other. Drops vary in size according to the composition and consistency of the liquid, and even the same liquid may give different-sized drops, a great deal depending upon the shape of the vessel or bottle in which it is held. According to some

experiments made with the object of testing this, it was found that 136 drops were required to form 60 minims of tincture of opium when dropped from a full 1-ounce lipped phial. When three-quarters full, 130 drops equalled 60 minims, and when half full 126 drops, so that as the number of drops decreased their size consequently increased. The faster a liquid is dropped, the larger the drops will be in size. The fluid grain measure of the British Pharmacopœia is the bulk of one grain of water at normal temperature, and, it should be recollected, is more than the minim, but it is not used in dispensing. Therefore it is well to bear in mind that there is no fixed definite relation between drops and minims.

The dispenser is supposed to be guided by the British Pharmacopœia as to the maximum dose of its drugs and preparations he may safely dispense, yet it is a difficult matter in some cases to know where to draw the line as to what should be considered a dangerous dose. Some people have a peculiar idiosyncrasy for a certain drug, and a small quantity has a very powerful effect on them, while it would be quite harmless to others. As the most careful are sometimes liable to make a mistake, so the busy medical man, who, perhaps, after a long and wearying round of patients—worried first by one and then another—may inadvertently by a slip of the pen make an error in his prescription. Such errors as pills being ordered for an infant, eight ounces of a mixture to be taken three times a day, and solid ingredients to be made into a mixture without the aid of water, etc., are by no means uncommon in the experience of every dispenser. It is therefore necessary to constantly exercise a most watchful care, in order to detect any error or excessive dose the prescriber may have unintentionally made. The dispenser's first duty in discovering any serious error in a prescription is undoubtedly to communicate with the prescriber, and draw his attention to the fact. If it is impossible to communicate or see the prescriber, as delays are dangerous and excite suspicion in the mind of the patient, he should use his own discretion, and he is justified in taking upon himself to moderate the dose to one of safety, taking care to inform the prescriber of the fact at the earliest opportunity. The

matter is one that always requires tact and discretion in dealing with, and it is in this manner the pharmacist in his capacity of skilled dispenser, exercises an important check between the patient and the medical man. The following errors have been met with in actual experience :

℞ Liq. ammon. acet. conc. .. .. ℥i.
Pilocarpin. nit. .. .. grs. viii.
Liq. morphiæ mur. .. .. .. ℥i.ss.
Syr. simplic. .. .. ℥ss.
Aquæ .. .. ad ℥viii.
Misce. Fiat mist. Capiat ℥i. ter horis.

It will be noted the dose of pilocarpine nitrate is unusually large, and the prescriber, on being communicated with, reduced it to $\frac{1}{4}$ grain, and the dispenser was thanked for the care exercised.

℞ Liq. ammon. acet. .. .. .. ℥i.
Ext. cannabis indic. .. .. .. ℥i.
Syr. aurant .. .. ℥i.
Aquæ .. .. ad ℥iv.
Misce. Fiat mist. Capiat ℥i. ter die.

As the maximum dose of extract. cannabis indic. is 1 grain, the quantity ordered—viz., 15 grains three times a day—appeared somewhat alarming. On communicating with the prescriber it was discovered he had written 'ext.' for 'tinct.,' and the correction being made, the tincture was dispensed.

In cases where large doses are ordered, not only the actual quantity, but the frequency of its administration should be considered. It is an excellent rule for the dispenser when measuring any powerful poison, such as acid. hydrocyan., to have the quantity checked by someone else before adding it to the mixture. The dispenser should make a habit of rinsing out a measure when he has finished using it.

The student can never err on the side of safety. Some medical men have a habit of employing the sign denoting the scruple when ordering liquids, as, for example, acid. hydrocyan. ℈i, or liq. strychinæ ℈ss, which, of course, is dispensed as 20 and 10 minims respectively. The sign Oj. represents 20 ounces, and Oss. equals 10 ounces. In cases where minute doses, such as $\frac{1}{10}$ grain or $\frac{1}{20}$ grain of a

powerful alkaloid is ordered in a mixture, a certain weighable quantity should be dissolved in a definite amount of water, when the subdivision into the necessary quantity is rendered easy by measuring.

When prescribing mixtures, medical men sometimes leave the quantity of syrup or other sweetening agent to the judgment of the dispenser, relying upon his knowledge to use sufficient to make the mixture palatable. In all cases when q.s. is written, the exact quantity used by the dispenser should be noted in the prescription-book for future guidance, in order that the flavour shall not vary when the mixture is repeated. The same rule applies to prescriptions for pills or powders, in which q.s. is ordered of a certain ingredient. In all such cases the quantity used should be noted in the prescription-book.

Ambiguous Abbreviations.—The manner in which some prescribers abbreviate the names of drugs when writing prescriptions often leads to doubt in the mind of the student. Thus ext. col. might mean extract of colocynth or extract of colchicum. Hydr. chlor. might be taken to mean calomel or corrosive sublimate, an error which would lead to very serious results. Potass. sulph. might be read to mean sulphate of potash or sulphurated potash. In such cases the dose is often a guide to the dispenser, but when there is room for doubt the prescriber should be communicated with.

When aq. menthæ is ordered, aq. menthæ pip. is usually dispensed, and when liq. tarax. is written, it is generally taken to mean succ. tarax. B.P.

CHAPTER II

Mixtures—Iron mixtures—Bismuth mixtures—Quinine mixtures—Aids to dispensing special drugs—Solubility of salts—Solutions for dispensing—Incompatible mixtures—Summary of incompatibles—Straining—Drops and draughts.

Mixtures.—Assuming the student is now able to read and translate a prescription, and is familiar with the use of the implements employed in compounding medicines, it will be well first to consider the mixture, as perhaps, the

most common form employed for the administration of medicine at the present time. The term 'mixture' is applied to a fluid medicine to be administered by the mouth in doses usually of 1, 2, or 4 tablespoonfuls, according to direction. It may vary in size from 1 to 20 ounces or more, but the more common quantities ordered are 4, 6, and 8 ounces. It may be composed of salts soluble in water or other aqueous menstrua, such as vegetable infusions and decoctions; insoluble salts to be suspended with the aid of mucilage, together with tinctures and syrups, etc.; or the latter alone, diluted with water. Distilled water must always be used in dispensing. The dispenser having read through the prescription and copied it, must next consider the best means of preparing it. Should it contain solids which are soluble in water, such as potassium bromide or sodium bicarbonate, the first operation is to dissolve them in part of whatever menstruum the mixture is to be made up with. If insoluble salts are ordered, like magnesia or bismuth carbonate, they must be triturated in a mortar with a portion of the liquid before the other ingredients are added, but the use of the mortar should always be avoided except when absolutely necessary. As an instance of this, when powdered rhubarb is ordered in a mixture, it must be triturated in a mortar with the liquid ingredients; but should it be prescribed in conjunction with sodium bicarbonate, which it often is, the necessity for using the mortar is obviated if the powders are first well mixed together with a spatula on a piece of paper, then placed in the bottle, the liquid being added a little at a time, and the bottle well shaken. Salts in large crystals, such as sodium sulphate, should be crushed to powder, and care taken to see they are perfectly dissolved. In cases where a soluble and insoluble salt are ordered together, the former should be dissolved first, in order that the liquid may be strained if necessary before adding the insoluble substance.

The solid substances being disposed of, the liquids may then be added, and the mixture made up to the required quantity as prescribed. If the mixture has been prepared in a bottle, it is always a wise precaution to measure it before sending out, as it is not safe to trust entirely to the reputed size of a bottle. Dispensing bottles often

vary considerably, according to where they have been manufactured, some holding less, and others more, than the reputed quantity. It is well to bear in mind that all volatile ingredients, such as hydrocyanic acid, should be added to the mixture last of all. The dispenser must note before commencing to prepare a mixture, if any of the ingredients are likely to react on one another when mixed together. This may be prevented to some extent in many cases, by diluting the ingredients as much as possible before bringing them in contact.

As a general rule, it should be noted, that chemical action among the ingredients of a prescription should be prevented or retarded as far as possible, unless the reverse is clearly intended by the prescriber. It is in such a contingency the dispenser's knowledge of practical chemistry is required, and must be brought into use.

The following prescription is a case in point, and is one often met with :

℞ Ammon. carb. .. .. grs. xl.
Syr. scillæ .. .. ʒvi.
Vin. ipecac. .. .. ʒi.
Mucil. acaciæ .. .. ʒiv.
Aquæ .. .. ad ℥iii.
Misce. Fiat mist.

If the syr. scillæ and ammon. carb. are directly mixed together, considerable effervescence will naturally result, owing to the action of the free acid in the syrup on the alkaline salt. This reaction may be retarded if care is taken to first dissolve the ammon. carb. in as much water as possible, then mix the other ingredients, and lastly, add the syr. scillæ very gradually, shaking the bottle between each addition of syrup. A similar reaction takes place in the following mixture, for which the dispenser should be on his guard, or an explosion may result after the bottle has been corked :

℞ Alum. sulph. .. .. grs. xxxv.
Ammon. carb. .. .. ʒi.
Tr. belladonnæ .. .. ʒii.
Glycerini .. .. ʒiii.
Infus. senegæ .. .. .. ad ℥vi.
Misce. Fiat mist.

In this case the alum. sulph. and ammon. carb. should both be diluted as far as possible before mixing, as, owing to the acid nature of the former salt, CO_2 is liberated when brought in contact with the ammon. carb.

The following is another mixture, the preparation of which calls for attention :

℞ Potass. chlorat. .. .. ʒi.
Acid. hydrochlor. .. .. ♏xvi.
Glycerini .. .. ℥i.
Aquæ .. .. ad ℥viii.
Misce. Fiat. mist.

Under ordinary circumstances the dispenser would first proceed to dissolve the potassium chlorate in some water and then add the other ingredients, but the intention of the prescriber in this case is evidently to administer a solution of chlorine. Therefore the potassium salt should be placed in the bottle first, the hydrochloric acid being added to it and the bottle then corked. Allow it to stand for a few minutes until the gas has evolved, then commence to add the water in small quantities at a time, well shaking the bottle to aid the solution of the gas after each addition.

The student will find it of great assistance to commit to memory the solubilities of some of the ordinary chemicals commonly met with in prescriptions, such as sodium bicarbonate, gallic acid, etc. The solubility of the former in water, according to the British Pharmacopœia, is 1 in 10. If the quantity ordered in a mixture is more than the water will take up, the undissolved portion should not be strained out, but a 'shake the bottle' label should be affixed. The solubility of gallic acid is 1 in 100 in cold water, in boiling water 1 in 3 ; but as it rapidly recrystallizes out on cooling, it is unnecessary to use hot water to dissolve it when dispensing. The best method is to rub the acid down as fine as possible, triturating with cold water, and dispense with a 'shake the bottle' label. Potassium citrate forms an excellent solvent for gallic acid. A solution in rectified spirit 1 in 8 is a useful method of keeping gallic acid, as thus dissolved it will mix with water in any proportion without separation.

An instance in which an alkaline solution acts as an

admirable solvent is shown in the following prescrip tion :

℞ Pulv. glycyrrhiz. .. .. ʒj.
Liq. potass. .. .. ʒii.
Syr. aurant. .. .. ʒvi.
Aquæ .. .. ad ℥vi.
Misce. Fiat mist.

If the powdered liquorice be first well shaken with the liq. potass., solution is effected, and on the addition of the water and syrup, the whole will form an almost clear brown mixture.

When potassium iodide is ordered in combination with spirit of nitrous ether, decomposition takes place which is often a source of trouble to the student, and he looks in awe, when on adding the spirit, at the gradually increasing ruddy hue caused by the liberation of the iodine from the potassium salt. This may be avoided if care be taken to first neutralize the spirit of nitrous ether with a little potassium bicarbonate and the mixture will remain colourless. Potassium bromide is also incompatible with spirit of nitrous ether.

The following mixture gives trouble unless care is exercised in its preparation :

℞ Acid. salicylic. .. .. ʒii.
Tr. lavand. co. .. .. ʒiv.
Vin. colchici .. .. ʒi.ss.
Sodii bicarb. .. .. ʒiii.
Syr. aurant. .. .. ℥i.
Aquæ .. .. ad ℥xii.
Misce. Fiat mist.

Dissolve the acid in about 4 ounces of water, and also make a solution of the sodium bicarbonate, then mix the two gradually and allow to stand until effervescence ceases, when the other ingredients may be added. Salicylic acid and quinine throw down an insoluble precipitate. A mixture containing sodium salicylate and carbonate of ammonia when first made is quite colourless, but in a few hours will become yellow, and on keeping turns dark brown. If the patient is informed when a mixture of this kind is dispensed, that it is liable to change in appearance, it often saves trouble and subsequent explanations.

Iron Mixtures.—The preparations of iron are a fruitful source of trouble when ordered in combination with other drugs. It is well to remember they are incompatible with alkalies and their carbonates, also magnesia, and lime and their carbonates. They also turn black or darken all vegetable astringents containing tannic acid, and are decomposed by mucilage.

The tincture of perchloride of iron is frequently prescribed in combination with quinine, for which it forms an admirable solvent. When ordered in a mixture with solution of acetate of ammonia, care should be taken to test the latter before mixing, in order to make sure it is perfectly neutral, otherwise the result will be thick and turbid in appearance instead of forming a clear dark-red mixture. The incompatibility of tincture of iron and mucilage of acacia is well known, yet the two are not infrequently prescribed together. If the tincture and mucilage are directly mixed together an unmanageable jelly is produced, which it is impossible to form into a presentable mixture; but this result is obviated if the tincture be well diluted with water before adding the mucilage. By this means the difficulty is overcome. A favourite combination with some prescribers is that of solution of dialysed iron with Fowler's solution, made up with glycerin and water. In preparing this mixture, care must be taken not to add the solution of arsenic until the iron has been well diluted, otherwise a precipitate will be thrown down.

The scale preparations of iron are easily soluble in wate r on agitation, with the exceptions of the potassio-tartrate and pyro-phosphate, both of which it is necessary to rub down in a mortar with warm water. The inconvenient froth caused in shaking up citrate of iron and quinine with water will rapidly subside on the addition of a few drops of alcohol.

A mixture sometimes met with which may give an unsatisfactory result is the following:

℞ Ferri. et quiniæ cit. .. .. .. ℈ii.
Spt. chlorof. .. .. ʒi.
Spt. ammon. co. .. .. .. ʒiii.
Infus. quassæ .. .. ad ℥viii.
Misce. Fiat mist.

The best method is to dissolve the citrate in about 4 ounces of the infusion, and well dilute the spirits of ammonia and chloroform with more infusion before adding them to the mixture.

When a bottle is brought to be refilled with a mixture, if used again, it must be thoroughly cleansed and washed. The neglect of this precaution is often the cause of mixtures (especially those composed of vegetable infusions) becoming thick and decomposing in a very short time. In cases where the tinctures of Indian hemp, guaiacum, or other resinous preparations are ordered to be mixed with water, it is customary to triturate the tincture first with a small quantity of mucilage of tragacanth or acacia, otherwise, on standing, the resin will be thrown out of solution and adhere to the sides of the bottle. It a small quantity only of a resinous tincture be prescribed, the addition of the mucilage is unnecessary.

Bismuth Mixtures.—When heavy and insoluble salts such as bismuth subnitrate, cerium oxalate, or heavy carbonate of magnesia, etc., are ordered in a mixture, the addition of mucilage is necessary to aid their suspension. As a rule the prescriber looks after this, and will order either the mucilaginous medium or an equivalent quantity of the powdered gum, as in the following instance :

℞ Bismuth. subnit. .. .. ʒi.
Sodii bicarb. .. .. ʒi.ss.
Pulv. tragacanth. .. .. ʒss.
Tr. card. co. .. .. ʒiv.
Syr. zingib. .. .. ℥i.
Aquæ .. .. ad ℥viii.
Misce. Fiat mist.

In this case advantage should be taken of the alcohol present, in the form of tincture of cardamons, to mix it first with the powdered gum tragacanth direct. Thoroughly incorporate, and then add the water gradually with vigorous agitation until a mucilage is formed, in the same manner as the mucil. tragacanth. of the British Pharmacopœia is prepared. Should no alcoholic preparation be included in the mixture, the best method of forming a satisfactory mucilage is to place the powdered gum in a dry mortar, then add at once about 2 ounces of water, at the same time triturating the whole very

rapidly, and continuing until the mucilage is formed, when it may be thinned down. Gum tragacanth is employed in preference to gum acacia to suspend bismuth salts, as with the latter a hard mass may be formed, which often cakes at the bottom of the bottle.

Quinine Mixtures.—Quinine sulphate is a drug very frequently met with in prescriptions. Its solubility in water is only 1 in 1,000, and 1 in 200 of rectified spirit; but it is readily soluble in acids, the usual proportions being about 1 grain to 1 minim of the dilute acids of the Pharmacopœia. It is incompatible with all alkalies and their carbonates and iodides. Infusions, containing tannin, throw down a precipitate of tannate of quinine. Like other alkaloids, it is precipitated by potassium iodide and tannic acid. When ordered without a solvent, it should be rubbed down in a mortar as fine as possible, gradually mixed with the liquid menstruum, and dispensed with a 'shake the bottle' label. It is usually prescribed in combination with a dilute acid. When dissolving, the quinine should first be shaken up with a small quantity of water, and then the acid added, otherwise it may form into a hard mass that will cause trouble. The following mixture, containing quinine sulphate with sodium salicylate and potass. iodid., requires care in preparation :

℞ Quin. sulph.	grs. xviii.
Sodii salicylas	ʒi.
Potass. iodid.	grs. xl.
Acid. nit. mur. dil.	ʒi.
Syr. aurant.	℥vi.
Aquæ	ad ʒvi.

Misce. Fiat mist.

Dissolve the quinine sulphate in the acid, and dilute with 3 ounces of water and the syrup, then dissolve the potassium iodide and sodium salicylate in the remainder of the water, and mix the solutions gradually.

The following mixture is one that is often met with :

℞ Quin. sulph.	℈i.
Acid. sulph. dil.	♏xl.
Potass. acet.	ʒii.
Syrup. limonis	℥i.
Aquæ	ad ℥viii.

Misce. Fiat mist.

In dispensing this combination it is impossible to prevent a heavy precipitate of quinine acetate being thrown down. It should therefore be labelled with directions to shake the bottle. Another mixture in which the quinine is precipitated is as follows :

℞ Quin. sulph. .. .. grs. xii.
Acid. sulph. dil. .. .. ʒss.
Syrup. simpl. .. .. ℥ss.
Infus. rosæ ... . ad ℥vi.
Misce. Fiat mist.

In whatever manner this is prepared, a turbid and unpleasant-looking mixture is the result, owing to the tannate of quinine thrown down.

An unsatisfactory combination is that of sulphate of quinine, aromatic spirit of ammonia, and water. The quinine may be dissolved in the spirit, but on the addition of water a flocculent precipitate results. When the tincture of quinine is prescribed with alkaline carbonates, it should always be diluted as much as possible before mixing.

℞ Quin. sulph. .. .. grs. xx.
Ac. hydroch. dil. .. .. ♏xl.
Am. carb. .. .. grs. xl.
Aq. chlorof. .. .. ʒvi.
Misce. Fiat. mist.

The only satisfactory way of dispensing this is to neutralise the acid with the am. carb., rub the quinine down with mucilage, and then mix together.

The following mixture may be taken as an instance in which the dilution of the ingredients is most desirable :

℞ Ferri. et quin. cit. .. .. ʒi.ss.
Potass. citrat. .. .. ʒi.ss.
Tr. nuc. vomic. .. .. ♏xl.
Syr. simpl. .. .. ℥i.
Aquæ .. .. ad ℥x.
Misce. Fiat mist.

If care be not taken, a flocculent precipitate is inevitable. The iron and quinine citrate should first be dissolved in about half the quantity of water, and the syrup and tincture added. The citrate of potash should be dissolved in the remainder of the water and then added. Mixtures containing preparations of cinchona bark, in

combination with carbonate of ammonia, should be dispensed with a 'shake the bottle' label.

Butyl-chloral hydrate is only soluble about 1 in 50 in cold water, and when dispensed should be rubbed down with a little hot water to aid solution. It is more soluble in alcohol, and when ordered in combination with tinctures, advantage should be taken of their presence as solvents.

℞ Butyl-chloral hydras. .. .. ʒss.
Tr. gelsemin. .. .. ʒi.ss.
Spt. chlorof. .. .. ʒi.ss.
Aquæ .. .. ad ℥ii.
Misce. Fiat mist.

In this case, if the butyl-chloral be rubbed down with the tincture and spirit before adding the water, complete solution is effected.

The habit of using concentrated infusions is one that should be discountenanced and avoided by dispensers, except in cases of emergency, such as an urgent call up in the night. Infusions and decoctions should always be freshly prepared, as in many instances the therapeutic action of the drug may become impaired if kept and preserved in concentrated form. The colour and flavour of mixtures are also as a rule quite different when concentrated infusions have been used.

Aids to Dispensing Special Drugs.—Acetanilid is but slightly soluble in cold water. It should be rubbed down to fine powder when ordered in a mixture, and mucilage of tragacanth added to suspend it. It is readily soluble in a hot solution of tartaric acid, from which it does not recrystallise out.

Ammonium benzoate should be rubbed down to a fine powder in a mortar and triturated with the water.

Bismuth salicylate should be triturated with mucilage of acacia, and the water added to it gradually with constant stirring.

Bromoform should be suspended with tincture of quillaia.

Chloralamide is fairly soluble in water, and readily soluble in alcohol. It is decomposed by hot liquids, and alkaline solutions are incompatible with it.

Exalgin is only slightly soluble in water, but is easily

dissolved in alcohol. When prescribed with spirituous preparations, advantage should be taken of their presence to dissolve the exalgin before adding the water.

Hypnone, a colourless liquid, is generally prescribed with alcohol and water, or in capsules.

Ichthyol is sometimes prescribed in mixtures, as in the following instance:

℞ Ichthyol .. .. ʒi.
Potass. bromid. .. .. ʒii.
Aquæ .. .. ad ℥iii.
Misce. Fiat mist.

This forms a very unsightly mixture. The potassium bromide should be dissolved in a portion of the water, and the ichthyol rubbed down with the remainder in a mortar, then mixed together. A turbid brown precipitate results.

Paraldehyde, a colourless liquid, is soluble about 1 in 10 of cold water. It should be well agitated with the menstruum it is to be made up with, and dispensed with a 'shake the bottle' label.

Phenacetin is only slightly in water. When ordered in a mixture it should be rubbed down to a fine powder, and suspended with mucilage.

Salol is but sparingly soluble in cold water, but dissolves with the aid of spirituous preparations.

It should be triturated with mucilage of acacia or tragacanth to a thin cream, and the water added to it gradually with constant stirring.

Sulphonal is only slightly soluble in cold water. When dispensed it should always be rubbed down to a fine powder, and when prescribed in a mixture should be suspended with mucilage.

Solubility of Salts.—The following list shows the peculiarities of various salts the dispenser may have to deal with:

Acetates are soluble.

Arsenates are insoluble, except those of the alkali metals.

Arsenites are insoluble, except those of the alkali metals.

Bromides are soluble, except mercurous and silver

bromides; those of antimony and bismuth are decomposed by water forming oxy-salts.

Carbonates are insoluble, except those of the alkali metals.

Chlorides are soluble, except those of lead, mercury (mercurous), and silver.

Citrates are soluble, except those of manganese, the mercurous, those of silver, strontium, aluminium, barium, bismuth, cadmium, calcium, lead, and zinc.

Hydrates are insoluble, except those of barium, strontium, calcium, lead, and the alkali metals.

Iodides are soluble, except those of antimony, bismuth, lead, gold, mercury, platinum, and silver.

Nitrates are soluble.

Oxalates are insoluble, except those of antimony, chromium, iron, the stannic, and those of the alkali metals.

Oxides are insoluble, except those of barium, strontium, calcium, and the alkali metals.

Phosphates (ortho) are insoluble, except those of the alkali metals.

Sulphates are soluble, except those of antimony, barium, calcium, lead, the mercurous, and those of silver and strontium.

Sulphides are insoluble, except those of barium, calcium, strontium, and the alkali metals.

Sulphites are soluble, except those of aluminium, antimony, barium, bismuth, calcium, cobalt, copper, ferrous, lead, manganese, nickel, silver, stannous tin, strontium, and zinc.

Tartrates are soluble, except those of antimony, barium, bismuth, cadmium, calcium, copper, ferrous, lead, manganese, mercuric, mercurous, nickel, silver, strontium, and zinc.

Acids (free), decompose, and are neutralised by hydrates and carbonates.

Hydrates and carbonates decompose glucosides and precipitate alkaloids.

Oxidising agents—such as nitric, picric, and chromic acids, the bichromates and permanganates—form explosive compounds when brought into contact with alcohols, ethers, carbo-hydrates, sulphur, phosphorus, sulphides, or any organic matter.

Iodides yield precipitates with the alkaloids.

Bromides precipitate morphine and strychnine salts on standing.

Benzoates, salicylates, and borates precipitate alkaloidal salts in solution, and likewise their own corresponding acids in acid solutions.

Alkaloids are mostly precipitated by potassio-mercuric iodide, auric chloride, tannic acid, phospho-molybdic acid, picric acid, and stannic chloride.

Glucosides are decomposed by mineral acids, and ferments into glucose and allied products, which sometimes differ altogether in therapeutical value.

Acacia is precipitated by lead subacetate, alcohol, borates, sulphuric acid, iron salts, and silicates.

Tragacanth is precipitated by alcohol.

Fixed and volatile oils are all more or less incompatible with the mineral acids.

Tannins yield precipitates with gelatin, alkaloids, iron preparations, gelatinised starch, and tartar emetic.

Solutions for Dispensing.—Most of the salts frequently used in dispensing may be conveniently kept ready in solution. As a rule 10 grains of the salt in each fluid drachm of water is a useful strength for this purpose.

For others the following may be taken as a guide :

Solution of alum	.. ..	1 in 16
,,	ammon. brom.	1 ,, 4
,,	magnes. sulph.	1 ,, 2
,,	potass. acet.	1 ,, 2
,,	potass. bicarb.	1 ,, 4
,,	potass. bromid.	1 ,, 4
,,	potass. chlorat.	1 ,, 24
,,	potass. iodid.	1 ,, 2
,,	potass. nitrat.	1 ,, 8
,,	sodii bicarb.	1 ,, 16

Incompatible Mixtures.—In the course of his experience every dispenser occasionally meets with mixtures in which the ingredients are obviously incompatible. In some cases the reaction that results is intended by the prescriber ; in others it may be apparent to the dispenser that the decomposition was not foreseen, and he must therefore bring his chemical knowledge to bear on the problem in order to avoid the reaction as far as possible,

and present the mixture in the most sightly form possible.

An example of a mixture of this class is shown in the following prescription :

℞ Hydrarg. perchlorid. .. .. .. grs.ii.
Potass. iodid. .. .. ʒii.
Spt. chlorof.
Tinct. cinchonæ .. .. .. āā. ℥i.
Quin. sulph. .. .. ʒss.
Aquæ .. .. ℥ii.
Misce. Fiat mist.

In whatever method this mixture is prepared a brownish precipitate is thrown down, which presently, on shaking, separates out and adheres to the sides of the bottle in a sticky, insoluble mass, the whole forming a very disagreeable-looking compound. Martindale, in the course of some experiments as to the best method of mixing these ingredients, found that by using 1½ ounces of glycerin, in place of the same quantity of water, a fairly presentable mixture resulted. His method of preparation was to rub down the quinine sulphate with the glycerin, add the iodide, then the tincture of cinchona and spirit of chloroform, and, lastly, the perchloride of mercury dissolved in ½ ounce of distilled water.

By this means no precipitate is thrown down, except what is immediately redissolved, and a mixture of slightly opaque appearance is formed. Prepared with mucilage of acacia in the same manner, a fairly good result is obtained, but not equal to that with glycerin. Thus, by using a harmless addition, which could not well be objected to by the prescriber, the difficulty in this case is overcome. Ince published some time ago another combination, concerning which he states 'No ingenuity can render presentable after it has stood one hour.'

℞ Pulv. calcii sulphid. .. .. .. grs. xv.
Liq. hydrarg. perchlor. .. .. .. ʒvi.
Potass. iodid. .. .. grs. xl.
Potass. bicarb. .. .. ʒii.ss.
Aquæ chlorof. .. .. .. ad ℥viii.
Misce. Fiat mist.

It will be seen at a glance that, owing to the nature of the above ingredients, it is quite impossible to prevent

decomposition ultimately taking place. Another instance in which chemical reaction is unpreventable is shown in the following :

℞ Tr. ferri. mur. .. .. ʒiv.
Tr. digitalis .. .. ʒii.
Acid. phosph. dil. .. .. .. ʒss.
Potass. acet. .. .. ℥i.
Aquæ .. .. ad ℥vi.
Misce. Fiat mist.

In this case a double decomposition takes place, resulting in a copious precipitate of phosphate of iron, and forming a most disagreeable mixture in appearance.

A mixture in which the ingredients go to form an insoluble compound is sometimes met with, of this type :

℞ Lithii salicylat. .. .. ʒii.
Potass. iodid. .. .. ʒss.
Cit. ferri. et quin. .. .. .. ʒi.
Aquæ chlorof. .. .. .. ad ℥viii.
Misce. Fiat mist.

The best means of preparation is to dissolve the citrate in a little of the chloroform water, the lithia and iodide in another portion, and then to mix by small additions of the former solution.

The following is an instance in which a reaction results that would be dangerous to the patient, and in such a case the prescriber should be consulted :

℞ Morphin. sulph. .. .. grs. iv.
Spt. ammon. co. .. .. ʒiv.
Aquæ .. .. ℥i.ss.
Misce. Fiat mist.

On mixing, the morphine is precipitated, and the reaction cannot be avoided.

In the next prescription carbon dioxide is evolved on mixing the ingredients, and a precipitate of strontium carbonate is thrown down :

℞ Strontii bromid. .. .. ʒii.
Sodii bicarb. .. .. ʒii.
Aquæ .. .. ad ℥vi.
Misce. Fiat mist.

Each salt should be dissolved in a separate portion of water, then mixed and agitated until all the gas has been evolved. Dispense with a 'shake the bottle' label.

Unless care is used in dispensing the following, the menthol collects and forms a cake on the top of the liquid :

℞ Menthol .. .. ʒi.ss.
Tr. iodi .. .. ʒv.
Glycerin .. .. ℥i.
Aquæ .. .. ad ℥iv.
Misce.

To prevent separation, the iodine and potassium iodide composing the tincture should first be dissolved in water, then rub the menthol up with the glycerin, and finally add the spirit of the tincture.

In the following prescription, if the alkaline solution of arsenic be used, the mercury will be precipitated. This can be prevented by using liq. arsenic. hydrochlor :

℞ Liq. hydrarg. perchlor. .. .. ʒi.
Liq. arsenicalis .. .. ♏v.
Spt. chlorof. .. .. ♏xv.
Aquæ .. .. ad ℥i.
Misce. Fiat mist.

The incompatibility of potassium chlorate with syrup of iodide of iron should be carefully noted, as a dangerous reaction may result :

℞ Potass. chlor. .. .. grs. xl.
Syr. ferri. iodid. .. .. ʒiv.
Syr. simpl. .. .. ʒiv.
Spt. chlorof. .. .. ♏xx.
Aquæ .. .. ad ℥iii.
Misce. Fiat mist.

The above mixture after a while becomes brown in colour, and iodine is deposited in abundance. If given in this condition serious results may ensue.

A difficulty will be found in mixing the following unless gum tragacanth be used :

℞ Ammon. ichthyol .. .. .. ʒii.
Syr. ferri. iodid. .. .. .. ad ℥ii.
Misce.

If 15 grains of powdered gum tragacanth are triturated

with the syrup before adding the ichthyol, a presentable mixture may be made.

The liability of alkaloidal solutions to precipitate in the presence of an alkali should be made a careful note of, as the result may be highly dangerous to the patient.

Strychnine is precipitated by alkaline iodides and bromides. In all such cases a 'shake the bottle' label must be affixed to the mixture.

The following is an instance of a dangerous mixture which should not be dispensed unless the prescriber be consulted :

℞ Liq. strychnin. hydrochlor. .. .. ℥iii.
Potass. iodid. .. .. ℥i.ss.
Aquæ .. .. ad ℥vi.
Misce. Fiat mist.

After twelve hours the strychnine will be found to settle at the bottom of the bottle, and should the mixture not be well shaken each time it is taken, the patient would inevitably get a poisonous dose of strychnine in the last dose.

Summary of Incompatibles.—Alkaloids are nearly all precipitated by tannic acid.

Acacia mucilage is incompatible with alcohol; acid sulph., borax, persalts of iron, and subacetate of lead render it gelatinous.

Acetanilide with antipyrine forms a moist mass, with alkaline iodides and bromides insoluble compounds.

Arsenic with salts of iron, magnesia, and astringents.

Acid citric., with tartrate of potash, alkaline carbonates, acetates, and sulphurets.

Acid gallic., with spt. æther, nit. and metallic salts.

Acid hydrochloric., with salts of silver, and lead, antim. tart., and alkalies.

Acid nitric., with alcohol, alkalies, oxides, sulphate of iron, acetate of lead, and all carbonates.

Acid phosphoric., with lime water, carbonate of soda, and syrup of pyrophosphate of iron.

Acid tannic., with mineral acids, alkalies, salts of antimony, lead and silver, persalts of iron, the vegetable alkaloids, and gelatine.

Ammon. chloride with alkalies, lead, and silver salts.

Ammon. benzoas with persalts of iron, liq. potass., and acids.

Ammon. carb. with acids and acidulous salts.

Antim. tart. with gallic and tannic acids, the alkalies, lead salts, and astringent infusions.

Antipyrine with acid hydrocyanic, acid tannic, butyl-chloral hydrate in strong solutions, ferric salts in solution, astringent infusions and tinctures, nitrites in solution, sodium salicylate when mixed together in powder, and with spt. æther nit., turns a green colour. Also with mercuric chloride, phenol, and chloral hydrate.

Argent nit. with alkalies and their carbonates, chlorides, and all acids except nitric and acetic, potass. iodid., solutions of arsenic, and astringent infusions.

Beberin. sulph. with pot. bromide and pot. iodid., acid tart., tartrates, and astringent infusions and tinctures.

Bismuth. subnit. with potash, soda, and ammonia, and their carbonates.

Borax with mineral acids, and most of their salts ; also mucilage of acacia.

Cascarilla infus. with metallic salts and mineral acids.

Caryoph. infus. with salts of iron, mineral acids, and gelatine.

Cinchona preparations with ammonia, metallic salts, and gelatin.

Catechu preparations with alkalies, metallic salts, and gelatin.

Colchicum preparations with tincture of iodine, guaiacum, and all astringents.

Chloroform is thrown out of solution when prescribed with weak spirits or glycerin.

Cupri sulph., with alkalies and their carbonates, mineral salts (except the sulphates), iodides, and most astringent vegetables.

Digitalis preparations with sulphate of iron, and tincture of perchloride of iron, preparations of cinchona, and acetate of lead.

Ergot with astringents and metallic salts.

Exalgin liquefies when mixed in powder with sodium salicylate.

Ferri et ammon. citras. with mineral acids, vegetable astringents, and fixed alkalies.

Ferri et quin. citras. with alkalies and their carbonates, tannic acid, and vegetable astringents.

Ferri iodid. with acids, alkalies, and vegetable astringents.

Ferri perchlorid. with alkalies and their carbonates, magnesia and its carbonate. Vegetable astringents turn it black, and mucilage of acacia decomposes it. It darkens all vegetable infusions in colour, with the exceptions of quassia and calumba.

Gentian preparations with sulphate of iron, nitrate of silver, and lead salts.

Guaiacum with spirit of nitrous ether, and mineral acids.

Hæmatoxylum with mineral acids, metallic salts, and tartar emetic.

Hydrargyri perchlorid. with alkalies and their carbonates, antim. tart., argent. nit., plumbi. acet., albumin, potass. iodid., soap, and decoct. cinchona.

Hydrargyri subchlor. with alkalies and their carbonates, sulphides, hydrocyanic acid, bitter almonds, lime water, potass. iodid., iodine, nitric acid, salts of iron, lead, and copper, nitrate of silver, and soap. Soap should not be used as an excipient in pills containing calomel.

Ichthyol should not be prescribed with alcohol; acids decompose it, alkaline hydrates and carbonates set free ammonia.

Iodum with ammonia, metallic salts, mineral acids, and vegetable alkaloids.

Ipecacuanha with lead salts, mercury, vegetable acids, and astringent infusions.

Krameriæ with alkalies, salts of iron and lead, and gelatine.

Magnes. carbonate with acids.

Magnes. sulph. with alkaline carbonates and acetate of lead.

Morphiæ hydrochlor. with alkalies, astringent infusions, and decoctions.

Opium preparations with alkaline carbonates, salts of lead, iron, copper and zinc, liquor arsenicalis, and vegetable astringents.

Pareira preparations with persalts of iron, salts of lead, and tincture of iodine.

Phenacetin is decomposed by oxidising agents, and forms a soft paste if rubbed with acid salicylic.

Piperazin with phenocoll hyd. in quantities of over 10 grs. of the former and 15 grs. of the latter if some tincture be added.

Plumbi. acetas with sulphuric acid tannic acid and their salts.

Plumbi. subacet. liq. with hard water, mineral acids and their salts, vegetable acids, alkalies, potass. iodid.; all astringents, preparations of opium, and albuminous liquids.

Potass. bromid. with acids and acidulous salts, metallic salts, and spirit of nitrous ether.

Potass. iodid. with bismuth subnit., spirit of nitrous ether, decoction of liquorice, preparations containing starch or acid ; precipitates alkaloids.

Potass. liq. with acids, metallic salts, preparations of ammonia, belladonna, henbane, and stramonium.

Potass. permanganate decomposes at once when mixed with any organic substance.

Quinine with all alkalies and their carbonates ; astringent infusions throw down a precipitate of tannate of quinine ; salicylic acid and its salts.

Roses (infusion) with alkalies ; borax changes its colour to green.

Spirit. ether. nit. with antipyrine, iodide of potassium, sulphate of iron, tincture of guaiacum, gallic and tannic acids. It bleaches tr. card. co.

Strychnine is precipitated from solution of its salts by potash or carbonate of soda. Alkaline iodides or bromides.

Straining.—After a mixture has been prepared, before finishing it off, the dispenser should never omit to closely examine the liquid by holding the bottle against the light, in order to detect the presence of any foreign bodies, such as small pieces of straw, dirt, or dust, etc., that may have inadvertently got into it. If any matter of this kind is noticed, a small piece of tow or absorbent wool should be placed in a funnel, and the mixture carefully strained through it.

Glass, wool, flannel, and asbestos are also sometimes used as straining media. For thick liquids such as syrup or mucilage, a piece of moderately coarse muslin is more suitable. Mixtures containing insoluble salts must not be strained. However strong the temptation may be

to remove an ugly precipitate or resinous deposit to improve the appearance of a mixture, the dispenser is not justified in doing so, and depriving it perhaps of an active ingredient. A mixture should be strained only when it is desired to remove any substance that should not be present.

Drops and Draughts.—The term 'drops' is usually applied to a liquid medicine that is ordered to be taken in doses of from one drop to a teaspoonful. 'Drops' generally consist of a tincture or other spirituous preparation undiluted with water. They rarely cause the dispenser any difficulty, and are generally dispensed in glass-stoppered bottles and sent out capped with skin or leather. 'Drops' intended for application to the eyes require very careful preparation, and great exactness should be exercised in weighing and measuring. Minute quantities of such alkaloids as eserine or cocaine are frequently prescribed by oculists, and when the amount ordered is unweighable on the dispensing scale, a solution of definite strength should be made, and the exact quantity can then easily be calculated and measured off. Eye drops should be neutral, and tested with litmus paper before sending out. It is customary to dispense them in special bottles, the stopper of which forms a dropper by which they may be applied. If any of the ingredients used are affected by the action of light, the bottle should be covered with paper, or one of coloured glass used.

The 'draught' is the term applied to a liquid medicine usually of from 1 to 2 ounces in quantity, the whole of which is to be taken for a dose. At one time this was a very popular form for administering medicine, and it was customary formerly to dispense mixtures in the shape of draughts, six, eight, or twelve, as ordered, each bottle containing one dose. The compounding of draughts seldom presents any special difficulty. When several are to be prepared, the best method is to mix the whole quantity required in a glass measure instead of making each draught separately, and when complete fill up the requisite number of bottles. In cases when more than one dose is dispensed in a bottle, an equal division should be accurately marked on a slip of paper and pasted up the side of the bottle.

CHAPTER III

Emulsions—Cod-liver oil—Balsam of copaiba—Castor oil—Sweet oil of almonds—Olive oil—Liquid extract of male fern—Oil of turpentine—Spermaceti—Balsam of Peru.

Emulsions.—An emulsion is defined by Redwood as 'a mechanical mixture having a milky appearance of an oil, fat, or resin with water, the admixture being promoted and rendered more or less permanent by the presence of an alkali, or gum, or some equivalent substance, such as albumin or caseine.' As a natural emulsion, milk may be taken as an excellent example. The emulsions met with in pharmacy are produced by mechanical manipulation, and are formed by triturating an oil or some resinous substance with an emulsifier and changing its appearance by breaking up the oil globules and rendering it capable of being mixed with aquæous menstrua. A good emulsion should be of a creamy consistence, with no oil globules visible, and should not separate on standing. As no one emulsifier can be said to act with equal success in every case, it may be well to mention the most suitable agent to use in connection with the various bodies met with in pharmacy. When emulsions are met with in prescriptions they are usually required without delay, and the dispenser should know at once the best agent to employ for the purpose. The success of an emulsion does not depend upon this alone, but largely on manipulative skill, which experience and practice only can teach. The emulsifiers generally used are the gums of acacia and tragacanth and their mucilages, alkalies, yolk of egg, tinctures of quillaia or senega, etc. As general rules the student should remember, that when making an emulsion the oil to be emulsified should be added to the emulsifier; that in such cases, as when an oil and mucilage are being mixed, a second portion of oil should not be added until the previous one has been thoroughly emulsified—that is, when the oil globules are no longer visible to the eye. Trituration should be performed in

quick, regular movements, and as lightly as possible, care being taken to stir only in one direction and not to reverse it.

As an example of a simple emulsion the guaiacum mixture of the Pharmacopœia may be taken as a type. The resin should first be rubbed down to a very fine powder in a mortar—a rule which should always be observed when dealing with solid substances of a similar nature—the sugar and powdered gum acacia being triturated with it. The cinnamon water is next added gradually, the whole being well triturated until the resin is emulsified.

Cod-liver Oil.—Cod-liver oil is sometimes a source of trouble to students to render into a good emulsion. The emulsifiers generally used are gum tragacanth, gum acacia, tincture of quillaia, and yolk of egg, but the best results, as a rule, are obtained with tragacanth. The British Pharmaceutical Conference formula, in which yolk of egg and tragacanth are used, forms a good emulsion when carefully prepared.

If it is thought desirable to use gum acacia as the emulsifying agent, a good result may be got with the following proportions: Rub 24 parts of powdered white sugar and gum acacia together in a large mortar, adding sufficient water to form a thickish paste; next add gradually 48 parts of cod-liver oil in small quantities at a time, triturating regularly until the whole of the oil is emulsified; thin down slowly with 36 parts of distilled water, flavouring with suitable essential oil, such as almonds or cinnamon. The whole should then be allowed to stand for some time in the mortar, being triturated now and again until a good emulsion results.

A thin and creamy emulsion of cod-liver oil may be prepared with the aid of tincture of quillaia and an alkali. It will be found suitable for the exhibition of such soluble medicinal agents as the hypophosphites of soda or lime, etc.

Tincture of quillaia bark will be found a most useful emulsifying agent.

To prepare the emulsion, 19 ounces of lime water and 1 ounce of the tincture should be mixed together and placed in a Winchester; next add gradually 20

ounces of cod-liver oil, shaking well between each addition of the oil, and continue the agitation until the whole is thoroughly incorporated. The emulsion may be flavoured with essence of vanilla or almonds, which should first be dissolved in a few drops of chloroform and then added. When it is desired to mix a medicinal agent with this emulsion it should be dissolved in the lime water.

Balsam of copaiba may be emulsified with gum acacia, solution of potash, or yolk of egg. If acacia be employed, the powdered gum should be used, and the average quantity required is at least one-fourth of the weight of the oleo-resin about to be emulsified. The following form is one often met with, and from which a good result may be obtained :

℞	Bals. copaibæ..	℥i.
	Pulv. acaciæ	ʒiii.
	Tr. hyoscyam.	ʒii.
	Spt. ether nit...	ʒii.
	Aquæ	ad ℥viii.

Misce.

To prepare this emulsion, first place the powdered gum in a dry mortar, and add sufficient water to form a stiff mucilage ; then add a very small quantity of copaiba, and well triturate until completely mixed. More copaiba should now be added in small proportions, until the whole is thoroughly incorporated. If the emulsion appears too thick, add a little water now and again. Lastly, the remainder of the water is added, followed by the tincture and spirit. An excellent emulsion of copaiba may be made using the solution of potash of the British Pharmacopœia as the agent, in which case the use of a mortar is unnecessary. Mix the solution of potash with about ½ ounce of water in a bottle; next add the copaiba in small quantities, about 1 drachm at a time, pouring it into the centre of the alkaline solution and agitating vigorously between each addition. When all the oleo-resin is emulsified, the water should be added in the same manner, about 1 ounce at a time, and, finally, any other ingredients, the whole being well shaken.

An emulsion prepared with yolk of egg is a favourite form with some prescribers.

℞ Bals. copaibæ.. .. .. ʒiii.
Ol. santal. .. .. ♏ xx.
Ovi vitelli .. .. i.
Syr. zingib. .. .. ʒiv.
Vin. xerici .. .. ℥iii.
Aquæ .. .. ad ℥viii.
Misce.

To prepare the yolk, first fracture the egg-shell about the centre with a knife, or by means of a sharp knock on the edge of a measure, and divide it in half, allowing the albumen to escape by retaining the yolk in the shell until it has all drained off; then place the yolk in a mortar, and well triturate it. The copaiba and oil should now be added in small quantities, as described before, and when they are thoroughly incorporated, the syrup, wine, and water, having been previously mixed, should be slowly stirred in, and the whole well triturated.

Castor oil is best emulsified with gum acacia or its mucilage, and is usually made up with sugar and cinnamon water.

Oil of sweet almonds forms a good emulsion with solution of potash or other alkali, and may be emulsified without difficulty in the bottle:

℞ Ol. amygdal. dulc. .. .. ʒiii.
Liq. potass. .. .. ʒss.
Vin. ipec. .. .. ʒi.
Syr. violæ .. .. ℥ss.
Aquæ .. .. ad ℥iii.
Misce.

This is a common prescription, and the emulsion is easily formed when the right method of procedure is known. The oil should be put into the bottle with about 2 drachms of water first, then add the solution of potash, and shake well until completely emulsified. The water may then be added gradually, the bottle being well shaken between each addition, and finally the other ingredients.

Olive oil is best emulsified with powdered gum acacia, as follows:

℞ Ol. olivæ .. .. ʒii.
Pulv. acaciæ .. .. ʒi.
Aquæ .. .. ad ℥ii.
Misce.

Place the powdered gum in a mortar, and rub it down with a little of the water until it is of a creamy consistence; then add the oil gradually, taking care that each portion is completely emulsified before adding the next; finally, stir in the water about 1 drachm at a time.

Liquid extract of male fern may be emulsified with compound powder of tragacanth or yolk of egg.

Turpentine is usually emulsified with yolk of egg, and also forms a good emulsion with soap. When made in the following proportions it does not separate:

℞ Ol. terebinth. .. .. ℥ii.
Pulv. sapo. castil. .. .. ℈i.
Aquæ .. .. ℥i.
Misce.

Place the soap in a mortar, and add the turpentine gradually with rapid trituration; when completely incorporated, pour into a bottle, and add the water in small quantities at a time with frequent agitation until the whole is of creamy consistence.

The following is an example of a well-known embrocation, which consists of turpentine emulsified with yolk of egg:

℞ Ol. terebinth. .. .. ʒvi.
Ovi vitelli .. .. i.
Acid. acetic. .. .. ʒvi
Aquæ .. .. ad ℥iv.
Misce.

Stir the yolk of egg in a mortar till smooth, then gradually add a little turpentine. When this is emulsified, add a small quantity of water, then turpentine and water alternately, and, finally, the acetic acid.

Spermaceti.—To form an emulsion of spermaceti, it should first be rubbed down as finely as possible with a few drops of rectified spirit, and emulsified with the yolk of an egg. This agent is undoubtedly the best for emulsifying any solid fats, the proper method being to rub them well together in a mortar until thoroughly incorporated.

Balsam of Peru and **tincture of benzoin** may also be emulsified with yolk of egg.

The addition of borax to an emulsion often improves it, but the admixture of alcohol or glycerin is apt to cause

separation. Gum resins, such as myrrh and ammoniacum, etc., should be rubbed down as finely as possible in a mortar, and gradually triturated with water, the insoluble matter being finally strained out.

CHAPTER IV

Pills—Methods of making the mass—Excipients—General hints—Special excipients for special drugs—Pill finishing—Silvering—Varnishing—Gelatin coating—Pearl coating—Sugar coating—Chocolate coating—Phosphorus pills.

Pills.—The most general method of administering drugs in a solid form is that of the pill. Pills are compounded of various sizes, ranging from 1 to 5 grains each in weight, but rarely exceeding the latter, as it would render them too bulky and difficult to swallow. The drugs prescribed in this form are very numerous, the pill being an easy method of administering substances that cannot readily be given in solution. The ingredients usually consist of alkaloids or other active principles, vegetable extracts, resins or resinous substances, and essential oils, etc., either alone or in combination. It may be well to briefly describe the general process of making and dispensing pills according to prescription.

The first essential point is to properly combine the ingredients ordered into a solid and plastic mass of suitable consistency for rolling and moulding into globular form. The art of making a good pill mass in most cases is one in which manipulative skill and dexterity largely enters, and may be included among the more difficult operations the dispenser is called upon to perform.

The various methods of beating or working a pill mass must be learnt by practical illustration and experience. There is a large class of drugs met with in dispensing, which, owing to their constitution, present certain difficulties to the formation of a good mass. In such cases the difficulty is soon solved if the right excipient or combining medium be used, a practical hint to which will be found most helpful. The mortar used for making a pill

mass should not be too deep, while the pestle should be a straight one, and only rounded at the end. Pill machines for dispensing purposes are made to cut from one to four dozen pills of from 1 to 5 grains. The machine should always be kept clean and in good order.

In proceeding to compound a prescription for pills, it should first be noted, that all substances of a hard and crystalline nature must be reduced to a fine powder, and the more active ingredients should be placed in the mortar first. When soft extracts are to be mixed with dry powders, care must be exercised to see the former are well incorporated with the other ingredients. Essential oils, when ordered, should be added last. When a minute quantity of any powerful chemical or alkaloid is prescribed, it should be weighed first, placed in the mortar, and triturated with a little sugar of milk or other inert powder, in order to ensure its proper distribution throughout the mass. The whole ingredients having been placed in the mortar and intimately mixed, the next step is to form them into a mass of pilular consistence. As the student gains experience, he will be able to judge from the composition and nature of the ingredients, the proper excipient (if one is necessary) to use, and so avoid failure. Should the prescription include soft extracts the whole may be beaten into a suitable mass. Sometimes it may consist of powdered substances, which only need the action of some medium of a solvent nature to enable the particles to combine, or it may be composed of dry powders, which necessitate the use of a solid excipient to act as a medium in binding the whole into a cohesive mass. The method of procedure must therefore depend on the nature of the ingredients employed. When the prescriber distinctly orders a certain excipient in his prescription, it should always be used, unless the dispenser finds, as is not infrequently the case, it is absolutely necessary to substitute another. In cases where no special excipient is mentioned, the dispenser should select one that will least increase the pill in size. With the help of the excipient the ingredients should then be worked up into a plastic mass, of a consistency just soft enough to enable it to be rolled out without crumbling, and sufficiently cohesive to form a good firm pill that will retain its shape. The best

method of using the pestle in working up a small mass is with a lever-like motion. The ingredients should be thoroughly incorporated, and the mass, when finished, should present a perfectly homogeneous appearance throughout. When less than half a dozen pills are to be made, the ingredients should be massed on a pill tile in preference to a mortar. Care should be taken when using a liquid excipient that only a minimum quantity is added, or the pills, after they have been finished and stood a while, are apt to fall into a soft and sticky condition. Rectified spirit will act in this way with some drugs; it should therefore be used sparingly and with care. Much trouble is caused at times through making the mass too soft, which necessitates the addition of powdered gum before it can be rolled, and thereby increasing the bulk of the pills. This habit of adding powdered tragacanth or other gum to a pill mass should be avoided. An excipient, especially a liquid one, should be employed very cautiously, and is best added a drop or two at a time, so that the smallest quantity possible may be used. Excipients must also be avoided that may be incompatible with any of the ingredients or that would by any possibility interfere with their action. It is desirable that pills should always be made up as small as possible, and it frequently occurs when a very small quantity of drugs are ordered that the prescriber leaves the size of the pills to the discretion of the dispenser. In such cases, when the weight of the pill would not amount to a grain, it is usual to make it up with some inert powder, such as sugar of milk, and dispense as a 1-grain pill. The same rule may be followed when a minute quantity of a powerful drug is ordered. It is generally made up with sugar of milk and glycerin of tragacanth, and dispensed in 1-grain pills. The dispenser should always note the size dispensed in the prescription-book for future guidance.

When the mass has been made, scrape every particle out of the mortar, and roll it into a cylinder of the required length on the pill machine. After being cut and rounded, the pills should be made quite globular in shape by placing them under the pill-finisher and giving them a few rapid turns on a smooth surface. A good pill when

finished should be firm, yet not too hard, quite round in form, and have a perfectly smooth surface. Finally, the pills may be completed either by dusting over with finely powdered French chalk, lycopodium, or other suitable powder, varnished, or coated with silver leaf, French chalk, or gelatin, etc.

Excipients.—The following excipients will be found useful, and should be kept ready on the dispensing counter :

Glycerin and rectified spirit (2 to 1) forms an admirable liquid excipient when carefully used with most dry vegetable powders.

Simple syrup is a good excipient for such powders as rhubarb, ipecacuanha, jalap, etc.

Mucilage of tragacanth or acacia are often used for dry powders when much moisture is necessary.

Decoction aloes co. forms an excellent excipient for all combinations containing aloes and resinous gums.

Glycerin of tragacanth, a most useful general excipient, is prepared as follows :

Powdered tragacanth	℥ss.
Glycerin	℥i.ss.
Water	℥i.ss.

Mix the glycerin with the gum and heat on a water bath for ten minutes, and allow to cool.

Gum tragacanth mixed with treacle forms a good excipient :

Powdered tragacanth	℥i.
Rub with S.V.R.	℥ii.
And add treacle	℥iii.

Allow to stand.

Soap is useful in making pil. opii, and in powder forms a good excipient for creosote.

Bread-crumb may be used to make up calomel, balsam of Peru, carbolic acid, etc.

A useful excipient is prepared with glucose as follows :

Glucose	12 parts.	By weight.
Glycerin	4 ,,	,,
Water	1 part.	,,

Mix.

The following form useful excipients :

Powdered gum acacia	ʒss.
Powdered gum tragacanth	ʒi.
Glucose	ʒii.ss.
Glycerin	℥i.ss.

Mix the gums, and thoroughly incorporate with the glycerin and glucose until the mixture is quite smooth, then heat to thicken.

Liquid Honey.

Honey	2 parts.
Water	1 part.

Mix and raise to boiling point, then skim.

Lanolin with powdered kaolin is a useful excipient for all deliquescent salts such as potassium acetate, potassium iodide, etc.

Alcohol forms a good excipient for most gum resins.

Malt extract is also a very useful excipient for dry powders.

The following excipient has been recommended for massing substances such as acid carbolic and menthol, which liquefy on being mixed ; also for creosote and essential oils :

Gelatin Excipient.

Gelatin	ʒvi.
Glycerin	ʒii.
Water	q.s.

The gelatin should be tied in a bundle and soaked in warm water for a few minutes, drained, placed in a porcelain capsule, and dissolved with the glycerin by placing over hot water, then poured into a wide mouthed bottle.

By melting a few grains of the above on a small slab and mixing with the substances to be massed, with the addition of some calcium phosphate and fuller's earth or powdered soap, a satisfactory mass may be made.

Calcium phosphate is an admirable excipient for making ung. hydrarg. or other fatty substances into pills.

Confection of roses will be found useful when a solid, sticky excipient is required. It should be avoided when

sulphate of iron, tannic acid, or vegetable astringents are among the ingredients.

Kaolin ointment forms an excellent excipient for permanganate of potassium and nitrate of silver. It may be prepared as follows :

Vaselin	.. ..	℥i.
Paraffin wax	.. ..	℥i.

Melt, and add

Kaolin	.. ..	℥i.

Stir and allow to cool.

The student should avoid using more than one excipient in making a pill mass, and never mix two or three together.

Magnesia should never be added to pills containing extract. colchi. acet., and a steel knife should not be employed when perchloride of mercury is present.

General Hints.—A convenient method of keeping such extracts as taraxacum, compound colocynth, and others of a soft nature is in the form of powder. Some pill masses may also be kept in this way, such as aloes and iron, which on keeping become hard. Compound rhubarb pill, aloes and myrrh, and compound colocynth, are also easily prepared and kept in this form, which will be found most convenient for dispensing purposes.

Most resinous extracts and gum resins form a good mass with a little mucilage or spirit. For ipecacuanha, rhubarb, and powders of this class, syrup or treacle form a good excipient. Powdered rhubarb may also be massed with thin honey, or with tincture of rhubarb and simple syrup. Tincture of jalap may be used as an excipient for powdered jalap. Euonymin, leptandrin, iridin, and drugs of this class mass well with glycerin of tragacanth. For hard extracts and pills, heat is often of great assistance, and a warm mortar or pill tile will be found very useful in bringing them to a plastic consistence. When it is necessary to make very soft extracts, such as cascara sagrada, or viburnum prunifolia into pills, and the addition of powdered gum would render them too bulky, the extract after being weighed should be evaporated down over a

water-bath until almost dry. Should the extracts be already hard and dry they may be reduced to powder and worked into a mass with a few drops of spirit. When essential oils are prescribed alone, a good mass may be formed with calcined magnesia and a small quantity of soap. Most intractable ingredients may be worked into a fair mass by the aid of glycerin of tragacanth, or the mixture of tragacanth and treacle, with the addition of a little powdered gum if necessary.

Camphor and chloral hydrate when mixed together form a syrupy liquid. When this combination is ordered to be made into pills, it may be formed into a mass with powdered tragacanth.

The following combination is sometimes met with :

℞ Ferri redact. .. .. .. gr. i.
Hydrarg. cum creta .. .. .. gr. i.
Misce. Fiat pil.

The iron should be rubbed down as fine as possible, then add the grey powder, and mass with the glucose excipient.

The annexed prescription is one which has given trouble to the dispenser :

℞ Sulphur .. .. grs. iii.
Ol. terebinth .. .. ♏ iii.

The precipitated sulphur should be used and rubbed down with the turpentine, then massed with powdered soap and powdered gum tragacanth.

Special Excipients for Special Drugs.—Most dispensers have their favourite excipient for working up a certain drug, some succeeding better with one than another.

The following enumeration includes those generally employed, and which the student will find reliable.

Acetanilide (antifebrin) with glycerin of tragacanth.

Antipyrin may be made into a good pill with glycerin of tragacanth, or with powdered gum and water.

Argent. nitrate with kaolin ointment, sugar of milk, or manna. Bread-crumb should not be used as an excipient for argent. nit. on account of it containing salt.

Ammonium chloride with soluble cream of tartar.

Berberine sulph. with water, sugar of milk and glycerin of tragacanth, or compound tragacanth powder and spirit.

Benzoic acid with Canada balsam, 1 to every 4 grains, or with glycerin, 1 drop to 5 grains.

Balsam of Peru with bread-crumb, or beeswax.

Bismuth nitrate, or *carbonate*, with soluble cream of tartar, powdered tragacanth and water, or glycerin of tragacanth.

Caffeine citrate. When mixed with zinc valerianate, valerianic acid is liberated ; use an equivalent quantity of the alkaloid caffeine instead of the citrate, and mass with gum tragacanth and syrup.

Calcium sulphide with glycerin and tragacanth powder, or sugar of milk, powdered liquorice, and glycerin of tragacanth.

Calomel with confection of roses, or manna and compound tragacanth powder. Calcined magnesia should not be used with calomel.

Camphor. The gum having been first reduced to a very fine powder, it may be worked up with glycerin of tragacanth and soap, castor oil and soap, or with powdered curd soap, one-third its weight, and a few drops of rectified spirit. It forms a good mass combined with extract of henbane.

Camphor monobromata with Canada balsam, 1 to 5 grains in a warm mortar.

Camphor salicylate with suet or lard.

Carbolic acid with powdered liquorice, 1 grain to each minim, and mucilage. A firm pill may be made with powdered althæa and glycerin in the following proportions : Acid. carbolic., 2 ; pulv. althæa, 3 ; glycerin., $\frac{1}{4}$. Another method is with powdered soap, 1 ; powdered liquorice, 5 ; acid. carbolic., 1. This when properly worked makes an excellent mass. Bread-crumb is also used as an excipient.

Cerium oxalate with glycerin of tragacanth or confection of roses.

Chloral hydrate with Canada balsam, $\frac{1}{2}$ gr. to 5, or syrup and powdered tragacanth ; also with soluble cream of tartar, powdered tragacanth, and a drop or two of water.

Creosote. Various methods are employed for making

a pill mass with creosote, but success largely depends on manipulation.

1. Powdered soap and yellow wax. They should be rubbed down with the creosote in a warm mortar.

2. Digest the creosote, together with curd soap reduced to a powder, in about equal parts, by means of a water bath until they combine.

3. With calcium phosphate and hard soap.

4. With powdered liquorice and glycerin of tragacanth.

5. With bread-crumb, 2 to 1.

6. With powdered soap, 1 part; liquorice in powder, 5 parts; creosote, 1 part.

7. With gelatin excipient.

Copaiba balsam, when mixed with calcined magnesia and allowed to stand for a length of time forms a workable mass. Carbonate of magnesia or slaked lime answers equally well. Also with calcined magnesia and beeswax.

Essential oils, such as savin, cloves, etc., may be massed with calcined magnesia and powdered soap, or with calcium phosphate and soap. Soap and powdered liquorice also form a good excipient, 1 to 5.

Croton oil with bread-crumb, magnesia and soap, or powdered liquorice and mucilage.

Ergotin should be evaporated down and worked up with powdered tragacanth and liquorice powder.

Extract. cannabis indic. and other thin extracts may be massed with compound tragacanth powder and magnesia.

Fel. bovin., when very soft, should be heated over a water bath, and a small quantity of powdered tragacanth added.

Gallic acid with glycerin and compound tragacanth powder.

Hydrarg. c. creta with confection of roses. Care should be taken not to work it too hard, or the mercury will separate out from the chalk.

Hydrarg. perchlor. Triturate with sugar of milk and mass with confection of roses. Always varnish the pills before silvering.

Pepsin with glycerin and powdered tragacanth.

Potassium iodide, bromide, and other crsytalline salts should be reduced to a very fine powder, partly dissolved with a drop or two of water, and massed with a small

quantity of liquorice powder, powdered tragacanth, and drop of water. They may also be made up with powdered tragacanth and confection of roses.

Potassium permanganate with kaolin ointment or resin ointment, etc., Decomposes when mixed with organic substances.

Quinine with glycerin of tragacanth, 1 to 4, also with 1 drop of dilute sulphuric acid to every 5 grains. A good pill is made with tartaric acid, 1 grain to every 10 grains of quinine, and a drop of water. Also with lactic acid, 3 minims to every 16 grains, and confection of roses and glycerin.

Rhubarb with tincture of rhubarb (1 drop to 3 grains), treacle, or S.V.R. and glycerin, equal parts.

Scale preparations, such as *quin. et ferri cit.*, with manna or lanolin.

Tar with lycopodium or powdered liquorice.

Turpentine oil with calcined magnesia and white wax. *Chian turpentine*, 3 grains to 2 grains of sulphur, makes a good mass.

Tannic acid with glycerin, and a little powdered tragacanth if necessary.

Thymol should be reduced to fine powder, mixed with powdered soap, and massed with a drop of rectified spirit.

Sodium nitrite decomposes quickly with organic matter ; masses well with kaolin ointment.

Sulphur with soluble cream of tartar, powdered tragacanth, and a little water.

Ung. hydrarg. and other fatty substances may be made into a workable pill mass with calcium phosphate.

Zinc oxide with glycerin and glycerin of tragacanth, also with powdered tragacanth, soluble cream of tartar, and water.

Zinc valerianate with powdered acacia and spirit.

Phosphorus Pills.—The incorporation of phosphorus into a pill mass is sometimes a source of difficulty to the student. The formula of the Pharmacopœia is as follows :

℞ Phosphorus .. .. grs. 10.
White beeswax, melted .. .. grs. 125.
Lard, melted .. .. grs. 125.
Kaolin .. .. grs. 115.
Carbon bisulphide .. .. .. mins. 33 or q.s.

Place the melted lard and wax in a warm mortar and stir well. Dissolve the phosphorus in the carbon bisulphide, and carefully mix with the melted fats; add the kaolin, and mix. Keep immersed in cold water. When dispensed every 3 grains of this mass should be incorporated with 1 grain of powdered acacia and the pill varnished.

A convenient process, and one prepared with little trouble, is that suggested by Martindale:

℞ Phosphorus .. .. grs. xii.
Ol. theobroma .. .. q.s.

Heat the oil to 300° F., and sustain the heat for five minutes. Strain and weigh 1,200 grains into a wide-mouthed bottle with a rubber cork, and when cooled to 130° F. add the phosphorus. Cork and shake well until the fat begins to solidify. This mass contains 1 per cent. of phosphorus.

Another useful formula is as follows:

℞ Phosphorus .. .. gr. i.
Chlorof. pur. .. .. grs. l.
Pulv. altheæ .. .. grs. lxxx.
Pulv. acaciæ .. .. ℈i.
Glycerin .. .. ℈ii.
Aquæ .. .. ℈i.

Proceed by dissolving the phosphorus in the chloroform, mix the powdered altheæ and acacia in a mortar, add the solution of phosphorus, then the glycerin and the water; work into a mass, and divide into 100 pills. They should be varnished at once.

Carbon bisulphide is often used as a solvent for phosphorus, the mass being made up with powdered liquorice and glycerin of tragacanth. When phosphorus is prescribed in combination with other ingredients, a convenient method is to use a base of definite strength and of a suitable nature, such as that prepared with suet in the following manner:

℞ Phosphorus .. .. grs. x.
Carbon bisulphide .. .. .. ♏l.

Dissolve, and add prepared suet, 90 grains. Mix thoroughly, and allow the bisulphide to evaporate. This

base contains 10 per cent. of phosphorus, and may be combined with iron, nux vomica, or quinine, etc., forming a good and workable mass. Another method is to dissolve the phosphorus in lanoline over a water bath, then stir until cool. This mixture should be massed with powdered marsh mallow.

Phosphorus pills must be kept in a cool place and protected from the light.

The formula known as Blaud's pills is frequently prescribed. The pills are composed of sulphate of iron and carbonate of potassium, the object being to exhibit ferrous carbonate, and in the process of making requires care. Occasionally the admixture of other drugs, such as nux vomica and aloin, is ordered. A good mass is formed in the following manner, with the aid of a little powdered sugar, tragacanth, and water: The sulphate of iron should first be reduced to a very fine powder, and then mixed with the powdered sugar and tragacanth. Finely levigate the carbonate of potash in a separate mortar, and slightly moisten with a drop of water or glycerin. It may then be added to the sulphate of iron, etc., and the whole well beaten together until it assumes a green appearance and the mass is of a proper consistence.

A great deal of the success in turning out a good pill depends on the ingredients having first been reduced to a finely powdered condition.

When using some excipients, especially in the case of solvents, dexterity and quickness is necessary in working and rolling the mass. The following formula, known as Easton's pill, may be taken as an example:

℞ Ferri phosph. .. .. grs. xvi.
Quin. sulph. .. .. grs. xii.
Strychnin .. .. gr. ss.
Acid phosph. conc. .. .. .. q.s.
Misce. Divid. in pil. xvi.

The strychnine should be finely powdered and carefully triturated with the phosphate of iron until thoroughly mixed. The quinine may now be added, and the whole again well triturated. The mass is made with syrupy phosphoric acid, and as it acts as a powerful solvent it must be used with caution, about 18 or 20 drops being

usually sufficient. The ingredients should be massed rapidly, rolled and divided into pills without delay, or they soon become too hard to mould. When skilfully made the result is an excellent pill.

The compounding of pills in which creosote and oxide of silver are ordered in combination is somewhat dangerous to the unwary dispenser, and care must be exercised in mixing them, to prevent the violent chemical action that might otherwise take place.

The creosote should first be massed separately with a little soap, and the silver oxide carefully mixed with some powdered althæa or liquorice before being brought into contact with the creosote. They may then be worked up into a mass with safety. Excipients should be avoided that would act as reducing agents, and so cause an explosion. Pills containing oxide of silver should be kept in a cool place, as they are liable to take fire spontaneously. Caution should also be observed when compounding potassium permanganate to avoid using as an excipient any substance of a deoxidizing nature.

Pill Finishing.—It is customary with some dispensers to finish and send out pills simply dusted and rolled in a little powder, unless otherwise ordered by the prescriber. With others it is a rule to silver or coat all pills dispensed, and as in pharmacy too much attention cannot be paid to small details, this practice can be commended as one that is generally appreciated by the patient. As powders, lycopodium, powdered starch, liquorice, French chalk, and arrowroot are commonly used, or a mixture of the two latter forms a good powder for the purpose.

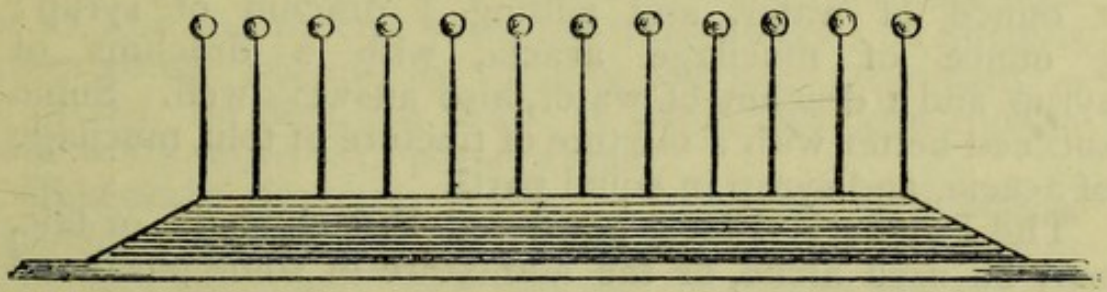
Silvering.—Pills may be silvered at a very little expenditure of time and trouble. The surface should be perfectly round, smooth, and free from powder. The apparatus necessary is of the simplest description. For one or two dozen pills all that is needed is a couple of ordinary covered pots — 1 and 2 ounce — and a 1 ounce willow box. The pills should first be placed in the box, with one or two drops of mucilage, and well shaken until thinly coated, then transferred into the large pot, into which a sheet or two of silver leaf has been introduced; agitate and rotate them for a few moments until covered with the leaf. The superfluous

silver should then be blown off, and the pills placed into the small clean pot to be finished and burnished. This is done by simply rotating them rapidly for a short time, and the process is finished. As a rule, one sheet of leaf will silver a dozen 5-grain pills. The student should remember that silvering will not hide the imperfections of a badly-made pill, but usually adds to their prominence. Pills containing sulphur and other drugs that act on the metal should not be silvered.

Varnishing.—When properly varnished, pills present a very neat appearance, and are rendered practically tasteless. The best varnish for the purpose is that composed of gum sandarach dissolved in ether or alcohol. One suggested by Martindale is made by dissolving 1 part of the gum in 1 part of absolute alcohol. It soon dries, and remains bright. A thinner varnish may be made with sandarach and ether, in the proportions of 1 part to 2. Pills to be varnished must be well rounded and free from powder. They should be placed in a covered pot, a little of the varnish added, well shaken for a few moments, then turned out on to a plate and put in a cool place to dry. Care must be taken to separate each pill, and to gently move them now and again to prevent sticking.

Gelatin Coating.—Gelatin forms an excellent soluble coating for pills, and is simply done by immersing them for a moment in a hot solution. The usual method is to stick each pill on the point of a fine needle, dip it in the solution, and then place the other end of the needle into a pin-cushion, and allow it to remain until the coating becomes hard. The drawback to this method is that each pill having to be done separately, the process takes some time. A simple and useful apparatus by means of which a dozen or two may be coated at once can be made in the following manner: Take a piece of wood about 15 inches long by 1 inch wide and $\frac{1}{4}$ inch deep, and place on it a layer of plaster of Paris made stiff, about $\frac{1}{2}$ inch thick. Insert in the plaster, with the points upwards, a number of fine needles, about $\frac{1}{2}$ inch apart, and allow it to set. A narrow tin bath to hold the gelatin solution for this arrangement about the same length, and a couple of inches in depth, can be made for

a few pence. To use the apparatus, the needle-points should be slightly greased, and a pill placed on each. They may then be immersed for a moment in the solution, carefully drawn out, and slowly rotated until the gelatin begins to set and the coating appears even. They may then be reversed and allowed to remain until dry.



GELATINE COATING.

The gelatin solution should not be too thin, and is made by dissolving 2 parts of fine French gelatin in 8 parts of water, and straining through muslin.

The following is another form which keeps well :

℞	Fine gelatin	ʒx.
	Mucilage acacia	℥i.
	Saturated solution of boric acid	℥iii.ss.

Dissolve the gelatin by gentle heat in the boric acid solution over a water bath, then slowly add the mucilage, and strain.

Pearl Coating.—A very elegant appearance and finish may be imparted to pills by coating with French chalk, a process which is now very popular. A large quantity can be coated more successfully than a small one ; consequently it is not an easy matter for any one who has not had practice to coat a dozen pills or so when ordered in a prescription. There is a considerable amount of 'knack' in pill-coating, and it takes both patience and perseverance to acquire it. Various kinds of apparatus have been suggested, and are in use for pill-coating, from rotary machines to tin dishes and cylinders ; but from personal experience, for coating small quantities the best results

can be obtained with three covered pots of suitable capacity. To coat from one to four dozen pills, one 4-ounce and two 2-ounce covered pots, with concave bottoms and closely-fitting lids, are all that is required. The pills should be well rounded, dry, hard, and free from powder.

The next thing necessary is the mucilage, which may be made by dissolving 4 grains of gum tragacanth in 1 ounce of water, and adding ½ drachm of syrup; ½ ounce of mucilage acacia, with 2 drachms of syrup and 1 drachm of water, also answers well. Some succeed better with a mixture of tincture of tolu, mucilage of acacia, and syrup in equal parts.

The Powder.—Finely powdered French chalk, or talc, may be used alone, or the admixture of some powdered starch (℥i. to ℥i.) gives the coat a whiter appearance. French chalk tinted pink with a little carmine forms an effective coating.

The Process.—Place the pills to be coated in one of the smaller pots, add sufficient mucilage, and shake well until each pill is well covered with the gum; next, transfer the batch to the large pot in which some of the powder has been placed, and rotate it continuously for a few minutes. When the coating appears to be white and even, allow the pill to stand for about ten minutes; then blow off the superfluous powder, and turn them into the remaining clean pot, and again rotate rapidly for some minutes until the coating is polished and the surface smooth. Care should be taken in the way the pots are shaken. The movements should be even and regular, and not too rapid. Pills containing essential oils, iodide of iron, etc., and those made up with excipients that do not easily dry, should not be coated, as they will become discoloured after a while. A preventive against discoloration is to varnish the pills first with a thin solution of tolu resin in ether.

Sugar Coating.—This process cannot be recommended for treating small quantities, but with practice successful results may be obtained from the following method: A simple apparatus is formed with a small flat enamelled pan, about 2 inches in depth, with a handle. The pills should first be evenly coated with a mixture of mucilage acacia and syrup in equal parts. A thin layer of fine

sifted sugar (not that in an impalpable powder) is next dusted over the bottom of the pan, and the pills placed in it. The pan must then be gently and regularly rotated, more sugar being dusted in as the other is taken up while the pan is being slightly warmed over a spirit lamp. This is continued until the pills are all evenly coated. They should then be allowed to stand for a quarter of an hour or so, and the process repeated if necessary. A finish is given to the coating by rotating the pills afterwards in a circular tin dish, the inside of which has been rubbed over while warm with paraffin wax.

Chocolate Coating.—Shake up the pills in a hollow globular vessel with acacia mucilage, and finely powdered chocolate alternately until they are covered to the desired thickness ; then shake them again in a tin box, one-half of which has been slightly warmed.

CHAPTER V

Powders—Cachets—Capsules.

Powders.—The compounding of a prescription for powders is not, as a rule, an operation of much difficulty, the essential points being accuracy in weighing the ingredients and neatness in folding. Prescriptions may be met with written in various ways, such as—

(1) ℞ Pulv. ipec. co. .. .. grs. xv.
Divid. in pulv. iii.

In this case it will be noticed a certain quantity is to be divided into three powders, or it may be in this form :

(2) ℞ Bismuth carb. .. .. grs. iii.
Sodü bicarb. .. .. grs. v.
Misce. Fiat pulv. Mitte vi.

Here we have a definite quantity ordered to form one powder, a certain number of which are to be sent,

Occasionally prescribers use somewhat ambiguous phraseology in directing how powders are to be prepared, and instances like the following are not uncommon :

(3) ℞ Hydrarg. subchlor. .. .. .. grs. ii.
Sacchr. alb. .. .. grs. x.
Misce. Fiat pulv. viii. i. omnis 3 horis.

In such cases the dispenser must use his discretion, and may usually be guided by the dose and frequency of administration as to the intention of the prescriber.

When a number of powders are to be prepared, as in example (2), the collective quantities may be weighed, mixed, and then divided into the requisite number of papers.

Salts containing a certain amount of moisture are apt to cause trouble, as in the following instance :

℞ Potass. bromid. .. .. grs. x.
Calomel .. .. grs. iii.
Misce. Fiat pulv. Mitte tales xii.

When these two substances are rubbed together they become dark in colour, but if the potassium bromide is first dried this may be avoided.

Salts in crystals must always be reduced to fine powder, and the dispenser must be on the alert for substances that are likely to decompose or liquefy.

Antipyrin and sodium salicylate become liquid when rubbed together.

When the prescriber leaves the quantity of sugar to be added to the discretion of the dispenser, he should use just sufficient to insure the proper distribution of the active ingredient, and, if possible, to cover the taste of the drug. The quantity employed should be noted in the copy in the prescription-book. If the ingredients are bulky they should be triturated in a glass or glazed mortar until thoroughly mixed. When small quantities only are being dealt with, the best method is to mix them on a piece of smooth paper by means of a spatula, which also prevents any loss taking place in the process of mixing.

In dividing, each powder must be weighed out separately, and the division not made by guessing the quantity with the eye. Powders containing volatile or deliquescent salts should first be folded in white paper, then enclosed in tinfoil or waxed paper. One or two powders only are usually dispensed in small envelopes, larger numbers being sent out in boxes. The utmost neatness ought to be observed in folding powders, each being made exactly the same in size, symmetrical in shape, and every care used to prevent soiling the paper in any way.

Powders ordered in bulk, and not to be divided into separate papers, are usually dispensed in wide-mouthed bottles. The student will find the powder-folder a useful implement in helping him to fold powders uniform in length.

Cachets.—This convenient method of administering dry and nauseous medicines has been for some time in use on the Continent, and has now gained favour with practitioners in this country. The cachet consists of two bowl-shaped discs with flat edges, composed of wafer-paper, which, when placed together, form a kind of envelope. When used, the drug must be reduced to a fine powder and placed in the receptacle ; the edges of the other half are moistened, and then placed on top of that containing the powder, the rims being pressed together to seal it. In this manner butyl-chloral hydrate, quinine, and similar unpalatable drugs, may, after dipping the cachet in water, be easily swallowed by the most fastidious patients without unpleasant taste.

There are various makes of cachets now on the market, and in choosing them it is well to bear in mind that a perfect cachet should be convenient in shape, elastic, tasteless, readily soluble, and easily digested.

The main points to be observed in filling them are (1) the selection of cachets of the most suitable size to contain the required dose, (2) the protection of the edges whilst filling, and (3) the observance of due care in moistening the edges before closing.

Cachets are manufactured in various sizes to hold from about 1½ to 24 grains of a light substance like quinine.

There are also several machines made for damping, filling, and sealing, which may be selected according to the make of the cachet used.

Capsules.—Another tasteless form of exhibiting nauseous remedies is the capsule, which has recently increased in popularity. The flexible gelatine capsules now used are especially suitable for administering liquids, and are made to hold from 5 to 30 minims. The capsule is usually oval or egg-shaped in form, and composed of gelatine, with an aperture at one end, by means of which the liquid may be inserted and then sealed. It is made by dipping a metallic mould the size required into a hot solution of gelatin, inserting the other end of the mould into a stand, and allowing it to remain until dry. The base of the gelatin coat is then cut round with a knife, forming the aperture ; the capsule is slipped off the mould, and is ready for filling. The bulb of the mould should be greased before being immersed in the solution. Capsules may be filled with the aid of a pipette, small syringe, or by a special apparatus designed for the purpose, and sealed by applying a touch of gelatin solution with a camel-hair brush over the aperture until completely covered, then allowing to remain until perfectly dry. They may be polished by gently rubbing with an oiled cloth. The gelatin solution may be made by dissolving gelatin 6 parts, gum acacia 1 part, sugar 1 part, in water 5 parts. The most disagreeable medicines are rendered tasteless when administered in this way, it being specially useful for exhibiting such drugs as liquid extract of cascara sagrada, terebene, etc. The American gelatin capsules are well adapted for giving powders or a semi-liquid mass in this form. They are hard, cylindrical in shape, and rounded at the ends. They are made of thin but firm gelatin, with a cap or top which may be removed to insert the drug, and then replaced. The capsule may be sealed, when filled, by passing a camel-hair brush charged with gelatin solution round the joint. They are made in various sizes to hold from $\frac{1}{4}$ to 12 grains.

CHAPTER VI

Medicated and compressed tablets—Pastils.

Medicated and Compressed Tablets.—The compressed tablet has now become an established medicinal agent in pharmacy, and is certainly an elegant and convenient method of exhibiting certain drugs. The tablets may consist of a single chemical or drug, or a combination of active remedies compressed into a small disc. By varying the degrees of pressure employed in the process of manufacture they may be made to dissolve quickly or slowly in the mouth. Several hand machines are now on the market for manufacturing tablets, some having been brought to a great state of perfection with automatic and other improvements.

A good deal of the art of tablet making lies in preparing the material for compression. There are some drugs, but they are few, that require very little preliminary treatment before being compressed. The majority require the admixture of some binding substance to make them cohere before they are ready for the machine.

The material for compressing should not be in the form of fine powder, but, if possible, in a granular condition, or a powder of the coarseness of ammonium chloride compresses best. Should the material be in a state of fine powder it is necessary to granulate it. This is done by slightly moistening it with weak gum water (powdered gum arabic 1 part, water 35 parts) or other medium, then thoroughly triturating in a mortar until a uniform mixture results. Rub through a No. 20 sieve with a bone or wooden spatula, and dry the mass thoroughly. After drying, pass again through the sieve, breaking up all lumps, so that the finished product may be similar in appearance to fine granulated sugar. For powders of a hygroscopic nature the addition of a small quantity of powdered gum acacia is also necessary. The other adhesives generally employed are powdered sugar, powdered starch, and diluted glucose, but the latter only when it is wished to make the tablets very hard and to disintegrate slowly. As a general rule, 5 per cent. of powdered acacia

and 10 per cent. of sugar added to the material will give all the adhesiveness required. The nature of the adhesive added answers to the excipient necessary to a pill mass, and the dispenser will soon learn from experience and from his knowledge of the composition of the substance used the best medium to employ.

In making small quantities of tablets, such as one or two dozen for dispensing, all that is necessary is to first damp the material with the weak gum water or spirit, or when requisite add a small quantity of powdered starch or soap, pass through a sieve, and it is ready for the machine.

In some cases it is necessary to add some substance to the material as a lubricant, to prevent the powder from adhering to the dies and punches. At the same time it is well to note that the liquid used in damping, so long as it is not a solvent to the substance to be compressed, will act as a protection against adhesion to the dies to a certain degree.

The substances generally employed as lubricants are powdered boric acid French chalk, talc, hydrocarbon oil (odourless), or a solution of white vaselin in ether (2 per cent.). The liquid lubricator should be sprayed on the material previously spread out on paper, then well stirred, dried, and passed through a sieve. When the powdered lubricants are used, they should first be dusted over the dry granulated material, then the whole placed in a wide-mouthed bottle, and well shaken together. Not more than 2 or 3 per cent. of French chalk or boric acid should be used. The latter should always be employed when the tablet is to be dissolved in water, as it gives a clear solution.

In the choice of a lubricant, the dispenser must be guided by his knowledge of the composition and solubility of the material used in different menstrua. In making up compounds it is well to first reduce all the ingredients to a fine powder, then granulate them afterwards. In many cases simply damping with alcohol will granulate the material sufficiently, while in others, a small quantity of starch powder added before damping is all that is necessary.

The medicated tablet with a chocolate base is a form of administration that seems likely to become a favourite

one with medical men. They may be made in a very short time, and with less trouble than pills. Either chocolate or cacao butter may be used as a base, with the addition of powdered gum and a flavouring agent. By this means cocain, morphine, trinitin, aloin, and other active remedies in great variety may be exhibited in a pleasant and palatable form. The following formula may be taken as an example, the active drug being altered as required:

Cocain Tablets with Chocolate.

Cocain hydrochlor.	grs. ii.
Pulv. tragacanth	grs. xxiv.
Chocolate (sweetened)	ʒi.
Ess. vanillæ	♏ x.
Aquæ	♏ xxv.

Mix and divide into 24 tablets, each to contain $\frac{1}{12}$ grain of cocain.

Proceed by triturating the cocain with the powdered tragacanth, then reduce the chocolate to powder, and thoroughly mix altogether; next add the flavouring essence, and, finally, beat into a soft mass with the water. The mass may now be treated as if it was to be made into pills, being rolled out in the ordinary way on the machine, but without using powder. When rolled the proper length, instead of cutting into pills, flatten the pipe by pressure, and place it at once over the cutter with slight pressure to accurately mark the divisions; then cut into square tablets with a sharp knife, and set aside on a plate to dry. If the flavour of chocolate is objected to, the same proportion of cacao butter may be used instead, with the addition of a few grains of saccharin to sweeten it; 1 or 2 grains will be found sufficient for this quantity. The tablets made with cacao butter may be dusted with powdered arrowroot, but those made with chocolate should be dispensed without.

Pastils.—The pastils of the Throat Hospital Pharmacopœia, suggested by Dr. Whistler, form an agreeable lozenge, and are easily prepared. They are regarded as being specially suitable for cases of inflammation of the tongue or palate. The base is composed of glycogelatin, and is recommended to be kept prepared in

stock, so that the pastils when ordered may be made fresh. The base is prepared as follows :

℞ Refined gelatin .. .. .. ℥i.
Glycerin by weight .. .. .. ℥ii.ss.
Solution of carmine in ammonia q.s. to colour.
Orange flower water .. .. .. ℥ii.ss.

Soak the gelatin in the water for two hours, then heat in a water-bath until dissolved ; add the glycerin, and stir well together. Let the mixture cool, and when nearly cold add the carmine solution. Mix till uniformly coloured, and place on one side to set. After medicating as required, it should be poured into a flat, oiled tray to about half an inch in depth, and when solidified may be cut into the requisite number of pastils. The following formula will serve to illustrate the process :

Pastillus Bismuthi et Morphinæ (**T.H.P.**).

℞ Bismuth carb. .. .. grs. iii.
Morph. acet. .. .. grs. $\frac{1}{10}$.
Glycerin .. .. ♏iii.

Rub together, and add the mixture to

Glyco-gelatin (melted in a water-bath) grs. xviii.
Mix, and set aside to cool.

Pastils of acids boric, carbolic and iodoform, etc., are prepared in a similar manner, and they may also be made with a variety of drugs.

CHAPTER VII

Gargles—Inhalations—Enemas—Hypodermic injections.

Gargles.—The gargle is the name given to a liquid medicine employed for local application to the throat, and usually consists of salts in solution or combined with glycerin and astringent preparations. The methods of preparation are the same as those used in compounding mixtures. Honey is frequently used in gargles. It should be placed in a mortar, rubbed down with the water, and

strained through muslin. The following formula is sometimes met with :

℞ Alum. sulph. .. .. ʒii.
Tr. myrrh .. .. ʒvi.
Aquæ .. .. ad ℥x.
Misce.

The alum may be placed in a mortar and rubbed down with the water until dissolved, the tincture of myrrh being diffused through the solution, and the whole strained into the bottle. The resin is soon thrown out of solution on standing. Chlorate of potassium is often prescribed in gargles, and the aid of a mortar is usually necessary to properly dissolve it. Carbolic acid will form a clear solution with water if first mixed with a small quantity of glycerin. Gargles should be dispensed in ordinary mixture bottles with a distinctive label to that used for mixtures, and with instructions that the liquid should not be swallowed.

Inhalations.—Inhalations usually consist of light oils or other volatile bodies, or spirituous preparations, etc., a certain quantity of which is directed to be placed in a suitable apparatus and inhaled in the form of vapour. They are, as a rule, dispensed in glass-stoppered bottles. When prescribed in diluted form with water, the admixture of a little magnesia is sometimes ordered, as in the following prescription :

℞ Thymol .. .. ʒss.
Spt. chlorof. .. .. ʒiii.
Tr. benzoin comp. .. .. ʒiii.
Magnes. calc. .. .. grs. x.
Aquæ .. .. ad ℥ii.
Misce.

The thymol should be dissolved in the tincture and spirit, then mix the magnesia with part of the water, gradually adding the thymol solution, and make up with water, well shaking the whole. This should have a 'shake the bottle' label affixed.

Enemas and Hypodermic Injections.—The preparation of enemas is not a matter of much difficulty. The amount of fluid administered in this way varies from 2 to 30 ounces, usually in the form of gruel, solution of soap,

or castor oil, etc., mixed with water. The preparation of hypodermic injections require both care and accuracy, and distilled water that has been sterilized by boiling should always be used. They generally consist of solutions of active, soluble, and potent glucosides and alkaloids. Aconitine is dissolved by the smallest possible quantity of very dilute sulphuric acid. It is necessary to add 1 per cent. of pure carbolic acid to inject. ergotinæ in order to keep it. The inject. physostigmatis is prepared by rubbing down the extract with rectified spirit until smooth, and adding 10 grains of gum acacia to ½ ounce of water. Iodide of sodium is used as a solvent in making the inject. hydrargyri iodidi. In every case hypodermic injections should be freshly prepared if possible; when kept, they should be preserved in well-stoppered bottles, away from the light.

CHAPTER VIII

Liniments and embrocations—Lotions—Pigments—Oleates—Ointments—Salve and plaster mulls—Steatines.

Liniments and Embrocations.—A liquid application to be rubbed over the surface of the body is called a liniment or embrocation. In consistence the liniment is necessarily thicker than the lotion, and may be composed of oils, soaps, or spirituous preparations. The liniments of the British Pharmacopœia are frequently prescribed, and the methods used in preparing them are well-known. Liniments prescribed in pharmacy are usually an admixture of two or more of these, the preparation of which causes no special difficulty. The following formula is one frequently met with:

℞ Acid. acetic. fort. .. .. ℥i.
Spt. terebinth .. .. ℥i.
Ovi vitelli .. .. i.
Aq. cinnam. .. .. ad ℥vi.
Misce.

In preparing this embrocation the turpentine should first be emulsified in the usual manner with the yolk of

egg, the emulsion being thinned down with some of the water and stirred constantly; finally, the acid may be added and the whole made up to the required quantity, a thick creamy emulsion being the result. Liniments composed of spirit and oils should be dispensed with a 'shake the bottle' label. Extracts should be rubbed down with a little hot water. The following is best prepared with the aid of a warm mortar:

℞ Lin. potass. iodid. c. sapon. .. .. ℥i.
Lin. camp. .. .. ℥iii.
Misce.

The lin. pot. iodid. should be well stirred for a short time, and the camphor liniment then added gradually with constant stirring until the whole is thoroughly incorporated. Liniments should invariably be dispensed in coloured bottles, with a coloured and distinctive label, and this rule must never be departed from.

Lotions.—The lotion is the term given to a liquid application or wash for external use to various parts of the body. That used for application to the eye is termed a collyrium. The preparation of the average lotion presents no special difficulty to the dispenser. In some combinations chemical reaction takes place, such being the intention of the prescriber. The lotio hydrarg. nig. of the Pharmacopœia is an instance of this, when on shaking up the calomel with lime water mercurous oxide is formed. Lead in the form of acetate and subacetate in solution is an ingredient frequently met with in lotions. For diluting the latter, distilled water must always be used, otherwise an opaque solution will result. The addition of opium preparations to a lead solution produces a copious precipitate, but by adding a small quantity of glycerin to the lead first, the precipitate is prevented. The following formula may sometimes be met with:

℞ Plumbi acet. .. .. ʒss.
Zinci. sulph. .. .. grs. xv.
Aq. rosæ .. .. ad ℥iv.
Misce.

An insoluble precipitate of sulphate of lead is the result, but it should not be filtered out in this case unless so ordered.

A similar reaction takes place on mixing the following lotion:

℞ Alum sulph... .. .. ʒiii.
Plumbi acet. .. .. ʒiv.
Aq. destill. .. .. ad ℥viii.

This is usually dispensed without straining.

Another instance:

℞ Liq. plumbi .. .. ʒiii.
Acid. carbolic. .. .. ʒiii.
Acid. hydrocyan. dil. .. .. .. ʒii.
Aquæ .. .. ad ℥viii.

Misce.

An insoluble precipitate results when the above ingredients are mixed together, but the lotion may be much improved in appearance if the carbolic acid, before being added, be first mixed with an equal quantity of glycerin. Solid extracts like opium, belladonna, etc., should be rubbed down in a mortar with a small quantity of hot water and strained into the bottle. Oxide of zinc and other insoluble chemicals must always be finely levigated in a mortar, then rubbed down with the liquid menstruum, and dispensed with a 'shake the bottle' label. Milk is occasionally ordered with solution of subacetate of lead, usually in the proportion of 1 part of the latter to 8 parts of the former. The solution should be added to the milk in small quantities at a time, and the whole well shaken. Boric acid is a common ingredient in lotions. It is well to remember it is soluble 1 in 25 parts of cold water, and will dissolve on brisk agitation without the aid of a mortar. Lotions must always be dispensed in coloured bottles, those known as actinic green, round or octagonal, being especially suitable for the purpose. The labels should be distinctive in colour and character to those employed for medicines for internal use.

Pigments.—The pigment, or paint, is the term applied to a liquid application that is directed to be applied by means of a soft brush. The base usually consists of a solvent, such as spirit or glycerin. The latter especially is a valuable agent, as it forms an excellent solvent for a large number of salts, as well as being a most suitable medium for exhibiting them. The class of preparations known as glycerins are prepared with glycerin as a base.

The glycerin of lead, now an official preparation, is an improved form of Goulard's extract. In forming some of the glycerins decomposition takes place. The glycerinum iodi contains 20 grains of iodine to the ounce, and the strength of glycerinum belladonna 1 to 1. In making the latter the extract should be placed in a warm mortar, and rubbed down perfectly smooth with the smallest possible quantity of hot water before adding the glycerin. Chloral camphor, the liquid body formed on rubbing chloral hydrate and camphor together, is sometimes used as a pigment. In preparing it, equal parts of the two substances should be placed in a warm mortar, well rubbed together, and then allowed to stand for a short time until a clear liquid results. The product will mix with alcohol, ether, and oils, but not with water or glycerin. When morphine or other alkaloids are ordered to be dissolved in the liquid, they should be rubbed down with it in a mortar. Menthol and chloral hydrate, and thymol and chloral hydrate, when rubbed together in equal proportions, also become liquefied. Pigments should be dispensed in wide-mouthed bottles.

Oleates.—The class of remedies for external application known as oleates are formed by combining oleic acid with metallic oxides. The acid acts as a solvent, the result being a solution of oleates in an excess of oleic acid. The oleates have the advantage of being readily absorbed by the skin. The oleate of mercury is perhaps most frequently met with in dispensing, and is usually kept prepared of various strengths—viz., 5, 10, and 20 per cent. It is made by gradually adding yellow oxide of mercury to oleic acid in a mortar, and stirring constantly until the oxide is all dissolved. The 5 per cent. solution remains liquid, but those containing over 10 per cent. are of a semi-solid nature. When no special strength is particularized by the prescriber, the 10 per cent. is usually dispensed. Alkaloids are soluble in oleic acid, but not their salts; morphine and other alkaloids may thus be dissolved in oleate of mercury when so ordered. Oleic acid will dissolve $\frac{1}{10}$ its weight of morphine. The oleate of morphine is made 1 grain to the drachm, and oleate of atropine (1 in 40) is prepared by dissolving the alkaloid, with the aid of gentle heat in the acid over a

water-bath. Quinine is dissolved by oleic acid (1 in 4) and may so be mixed with cod-liver oil or other oils. The oleate of zinc is made by heating together 1 part of zinc oxide with 8 parts of oleic acid until they are combined. The so-called metallic oleates are formed by the double decomposition of a soluble metallic salt and Castile soap, and occur in the form of fine powder, and generally used in skin diseases, etc.

Ointments.—An ointment is a semi-solid preparation, usually employed to smear over the surface of the body, the base of which consists of a fatty substance. Those met with in dispensing are generally prepared by the mixing of two or more fatty substances, or by the incorporation of some oil, chemical or vegetable body in the form of powder, with a fatty base. The official ointments are frequently ordered. The bases generally in use are benzoated lard, soft paraffin or vaselin, a mixture of hard and soft paraffin, lanolin, and a combination of wax and oil. As a general rule, the simple mixture of two or more ointments may be made on a suitable slab with a spatula, but when a powdered substance is to be added, a mortar must be used to insure the powder being finely levigated and free from grittiness, a most essential point in preparing an ointment. When dealing with a large quantity of powder, it should first be finely levigated, and then rubbed down with a few drops of oil or of the melted base to the consistence of a stiff paste before being mixed. Crystalline substances, such as potassium iodide, require to be rubbed down with a little water and dissolved, to insure smoothness, while with others a few drops of rectified spirit are necessary, as in the case of iodide of sulphur. The alkaloids aconitine and atropine should be dissolved with spirit in this manner before being combined with a base to form an ointment.

Sometimes heat is required, and the base must be melted to insure thorough incorporation of the solid body, as in the case of the ointment of boric acid and others. Therefore in the preparation of ointments the student must be guided by the nature of the ingredients he has to combine as to the proper course to take. When rectified spirit is ordered to be mixed with lard it is well to use a mortar, and add the spirit a few drops at a time, incorporating

each portion before adding another, until the whole is thoroughly combined. Glycerin may easily be mixed with most fatty bodies if the mortar used be slightly warmed, but it is apt to separate out after awhile. Extracts of belladonna and henbane should first be rubbed down to a smooth paste with a few drops of hot water, and resinous extracts with a small quantity of spirit.

When preparing an ointment in which thymol is an ingredient, it is necessary to reduce it first to powder, and then heat it with the melted base until dissolved. Undissolved particles produce great irritation when applied to the skin. When making iodoform ointment, the base should be melted and allowed to become fairly cool before being added to the iodoform; then the whole should be well stirred until cold. For melting the base, a water-bath should always be used, and a high temperature must be avoided. Ointments prepared with a base, composed of hard and soft paraffin, should be stirred constantly while liquid until they are cool, otherwise they will be granular and lumpy when set. The following formula illustrates a case in which the use of a mortar as well as heat is required :

℞	Ext. opii	ʒii.
	Ext. belladonna	ʒvi.
	Ung. hydrarg.	ʒii.
	Lanolin	℥ii.

Misce. Fiat ungt.

To prepare this ointment the extracts should first be placed in a mortar and carefully rubbed to a smooth paste with a little hot water. The mercurial ointment and lanolin meanwhile may be heated gently over a water-bath until dissolved, then added gradually to the extracts and stirred well until cold. A white ointment will sometimes become coloured owing to a reaction taking place between the ingredients, thus an ointment containing resorcin, ammoniated mercury, and white vaselin turns blue on keeping. Care must be taken to avoid using steel spatulas with ointments containing any body that will act on the metal, such as ung. hydrarg. nitrat. An ointment when properly made must be free from lumps or gritty matter, and should be perfectly smooth and bland throughout. Ointments are dispensed in

covered pots of earthenware or glass, those known as 'opal' having a very neat appearance. The surface of the ointment should be covered with waxed paper, white being usually preferable to the coloured varieties. Ointments that are semi-liquid should be dispensed in wide-mouthed bottles.

Salve and Plaster mulls.—Salve and plaster mulls were introduced by Unna. The former consists of a basework of mull or undressed muslin, impregnated on one or both sides with an ointment consisting of lard, lanolin, vaselin, or other fat, and kept in position by a bandage of mull. Plaster mulls consist of mull covered on one side with gutta-percha tissue, the medicament being evenly spread on the latter.

The mass base is usually pure rubber or oleate of aluminium, which is used in just sufficient quantity to bring the active medicament to an adhesive consistence at a body temperature.

They are prepared containing a definite quantity of active medicament spread over a given area, generally 1 metre × 20 centimetres ; thus in a 50-gramme mull, 50 grammes of the active ingredients are spread over this space by the aid of a minimum quantity of medicine.

The following are some of the formulæ for salve mulls :

Acid. boraci., 10 grammes ; emplast. plumbi and acid. carbol., 5 grammes ; ichthyol, 10 grammes ; zinci oxidi, 10 grammes ; zinci oxidi and ichthyol, 10 grammes and 2 grammes ; zinci oxidi and hydrarg. ox., rub 10 grammes and 5 grammes.

Formulæ for plaster mulls : acid. salicylic., 10 grammes or 25 grammes ; acid. salicylic and creosote, 10 grammes and 20 grammes, up to 40 grammes and 60 grammes ; acid. salicylic. and ext. cannab. ind., 20 grammes and 5 grammes ; belladonæ extract., 10 grammes ; chrysarobin, 2 grammes; hydrargyri, 20 grammes ; hydrargyri and acid. carbol., 20 grammes and 7·5 grammes ; hydrargyri, acid. carbol., hydrarg. perchlor. and zinci oxidi, 20 grammes, 2 grammes and 10 grammes of each to make one mull ; hydrargyri and zinci oxidi, of each 20 grammes ; hydrargyri ammon. 10 grammes ; iodoformi, 10 grammes ; resorcin, 15 grammes ; zinci oxidi, 10 grammes; zinci oxidi and ichthyol, 10 grammes and 5 grammes.

Steatines.—In preparing these a large piece of wet parchment-paper is laid upon the smooth surface of a table and wiped dry with a cloth. A piece of gauze is laid on this paper, and on this the nearly cold ointment is painted evenly with a brush, a uniform smooth surface being finally obtained by means of a warm spatula. Boric steatine, 10 per cent.: Benzoated suet, 70: Benzoated lard, 20; powdered boric acid, 10. Carbolic steatine, 10 per cent.: Benzoated suet, 90; carbolic acid, 10. Sublimate steatine, 0·2 per cent.: Benzoated suet, 900; benzoated lard, 50; sublimate, 2; alcohol 90 per cent., 50. Sublimate steatine, 1 per cent.: Benzoated suet, 85; benzoated lard, 5; sublimate, 1; alcohol 90 per cent., 9. Mercury and carbolic steatine: Benzoated suet, 35; mercurial ointment, 50; carbolic acid, 5. Ichthyol steatine, 10 per cent.: Benzoated suet, 80; benzoated lard, 10; ichthyol, 10. Iodoform steatine, 10 per cent.: Benzoated suet, 85; benzoated lard 10; iodoform, 5.

CHAPTER IX

Plasters and Blisters

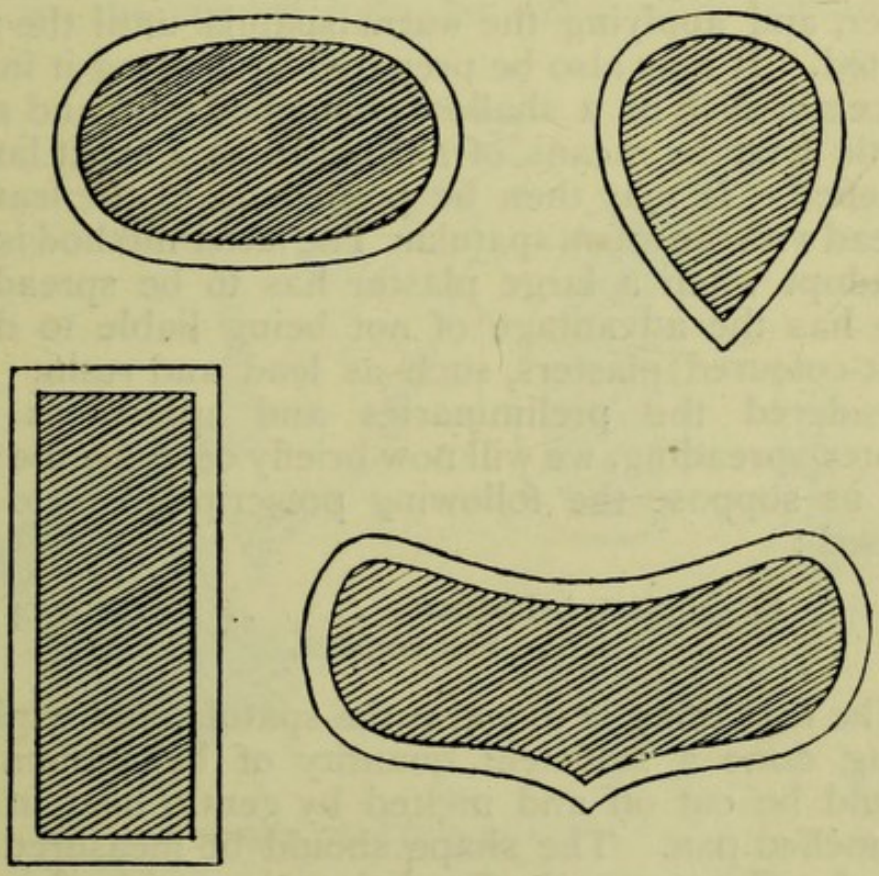
Plasters.—The preparation of a plaster is largely a matter of manipulative skill, which can only be acquired by practice and experience. To spread a really good plaster is not by any means an easy task, and only few become adepts. The whole art is to thinly cover or spread a piece of leather or other base with a compound of wax, resin, and other ingredients, while in a fluid condition, by means of a warm plaster-iron or spatula. The process seems simple enough, but it is one which the student will find is not so easy in practice.

Unfortunately, there is a tendency nowadays to use machine-made plasters, and the art of plaster-spreading by hand, is in danger of becoming extinct, except in those pharmacies where they are ordered to be made according to prescription. The student, however, who has his heart in his work should resolve to become proficient in every

branch of his craft, and should take a pride in being able to spread a plaster beyond reproach, and in turning it out in a workmanlike manner. It may, perhaps, be well to consider, first of all, the appliances requisite in plaster-spreading. The plasters generally in use are those of the British Pharmacopœia, where the process of preparation is fully described. The majority are conveniently kept in rolls of 1 inch in diameter, weighing about half a pound. The plaster of cantharides is the only one not spread by heat. This will be referred to later on under the head of blisters. Belladonna, opium, and soap plasters want but little heat in melting, and lead and resin plasters require care. The base on which the plaster is to be spread next claims attention. That most generally used and easiest to work upon is the prepared white leather, known as plaster-skin. Chamois leather, swans'-down, brown holland, and calico, etc., are also employed. The method of spreading the plaster on each base is much the same, the chief object being to spread evenly, using as little heat as possible in the process. The plaster is always spread on the rough side when operating on leather, but on swans'-down the smooth side is used. When using chamois leather care must be exercised to prevent wrinkling. On calico and all thin materials the plaster should be spread very thin, when nearly cool, or else it will penetrate through.

In a prescription the shape and size of the plaster is usually indicated by the prescriber. When the shape is not mentioned the dispenser may judge from the part to which it is to be applied. Plasters to be applied to the chest are generally made heart-shaped, and those for the side and back, oblong or saddle-shaped. Plasters for the breast are made circular in shape, and spread on thin skin or chamois leather. They are usually made about 6 or 7 inches in diameter, having a small piece about the size of a shilling cut out of the centre. The plaster shape must be cut out of a piece of stiff paper the exact size ordered, and affixed to the leather. This is done by moistening one side of the paper all round, and carefully pressing it to the leather. This is usually sufficient to cause it to adhere, and anwers well for a small plaster. For larger plasters, the paper shape should be moistened

with a little thin paste or thin mucilage and water. Care should be taken to press the inner edges of the shape close to the leather, in order that the plaster may not run underneath. Thin metal shapes of zinc are sometimes used, but are of advantage only when a large number of plasters have to be spread. The spatulas used for spreading are made of various shapes. The old-fashioned kind is made of iron, and consists of a blade, with a curved iron shank and a wooden handle. In



PLASTER SHAPES.

others the under edges of the blade are bevelled off, and the whole slightly curved, or the blade may be perfectly flat. Another variety is the gas spatula, which is hollow throughout, the upper part of the blade being perforated with small holes, so that when connected to the gas by means of a rubber tube, and lighted, the heat generated soon warms the metal. The heat of the spatula may thus be regulated, and will be constant during the process, which is a decided advantage when

a large surface has to be covered. The ordinary spatula may be heated by placing it in a stove or over a Bunsen burner. The blade should be carefully cleaned by rubbing it on a piece of rag before using. With experience the student will soon learn the proper degree of heat to employ. If the spatula be too hot it will spoil the leather and cause it to shrivel up, as well as discolouring the plaster.

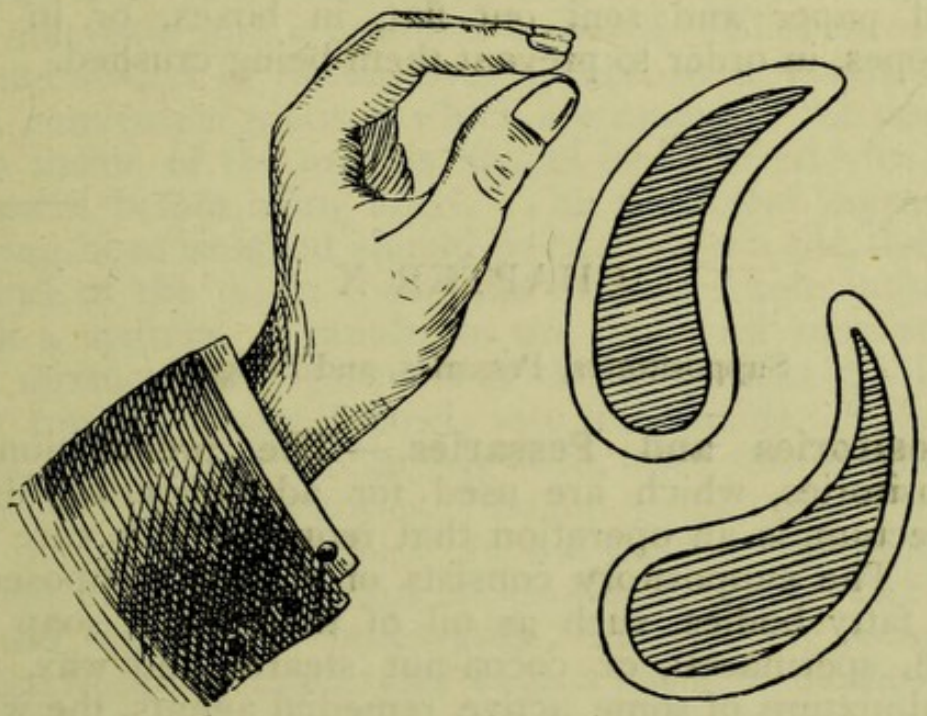
The plaster may be melted by cutting off the quantity required and placing it on a piece of cardboard or brown paper, and applying the warm spatula until the whole is melted. It may also be prepared by placing it in a small porcelain dish or a shallow enamelled pan, and applying gentle heat by means of a Bunsen or a spirit lamp until liquefied. It may then be poured on to the leather and spread with the warm spatula. The latter method is the best to adopt when a large plaster has to be spread, and it also has the advantage of not being liable to discolour light-coloured plasters, such as lead and resin. Having considered the preliminaries and appliances used in plaster-spreading, we will now briefly describe the process. Let us suppose the following prescription is to be dispensed :

℞ Emplast. belladonnæ .. .. .. 8×4
Fiat emplast.

The first thing is to warm the spatula, and while this is being done a sufficient quantity of belladonna plaster should be cut off and melted by gentle heat in a small enamelled pan. The shape should be measured and cut out of stiff paper and affixed to a piece of leather slightly larger, a margin of about 1 inch or more being allowed all round. Care must be taken to see the paper adheres close to the skin at the inner edges. Several folds of paper should be placed between the leather and counter, to form a soft base to work upon. The plaster having been melted and the spatula heated to the right temperature, proceed by pouring the former on to the leather. Holding the spatula at a slight angle, begin to spread with rapid, but careful long strokes, first covering the centre and then working around the margins until the whole of the leather is evenly covered. As quickly as possible detach the paper

shape, which should come away easily, leaving the margin of the plaster clean, straight, and sharp. It may then be set aside in a cool place to dry. In a well-made plaster the surface should be even and smooth, and the edges perfectly clean and straight.

Blisters.—In spreading emplast. cantharidis, or blistering plaster, the thumb is used in place of a spatula. Blisters are generally spread on adhesive plaster, allowing a margin of about ¾ inch all round, according to size. They are made of various shapes—circular, square, and oblong, or the special form for application behind the



SOME BLISTER SHAPES.

ear. The student very often gets confused between the shape for the right ear and that for the left. He need never be in doubt if he fixes the following in his mind. Bend the forefinger of the right hand and allow it to touch the top of the thumb, and, taking the shape of the hollow formed in the centre, he will have a fair idea of the shape of a blister for behind the right ear. If he does the same with the left hand, he will have the shape for the left ear. Blister shapes are cut out of paper in the same manner as those for plasters. The paper will adhere to the adhesive plaster if the edge

of the latter be slightly warmed. A sufficient quantity of the emplast. cantharid. having been cut off from the roll, it should be well worked with the fingers, slightly warming if necessary, until it is quite plastic and soft, about the consistency of putty. Place it in the centre of the adhesive plaster, then using the side of the thumb, spread it from left to right until the whole is evenly covered. The shape may then be removed and the margins trimmed, the edges being cut straight with a thin spatula if necessary. The surface of the blister may be smoothed, if necessary, by smearing a little olive oil over it.

Plasters and blisters should be neatly covered with waxed paper and sent out flat, in boxes, or in stiff envelopes, in order to prevent them being crushed.

CHAPTER X

Suppositories, Pessaries, and Bougies.

Suppositories and Pessaries. — The preparation of suppositories, which are used for administering drugs per rectum, is an operation that requires both care and skill. The suppository consists of a base composed of solid fatty bodies, such as oil of theobroma, soap and starch, spermaceti, or cocoa-nut stearin and wax, with the admixture of some active remedial agents, the whole being moulded or pressed into the form of a small cone. The old method of preparation in the cold, was by mixing the ingredients with soap and starch-powder in a mortar until of a suitable consistence, then dividing the mass into separate portions and pressing each into a mould.

Oil of theobroma, the basis most generally used, melts at temperatures between 86° and 95° F., so requires very little heat to liquefy. The moulds used are made of metal, nickel-plated. either divided down the centre or horizontally through the middle, the parts being held together by a screw. The former pattern answers best. Convenient and handy moulds for making a few suppositories may be made with tinfoil in the following manner : Get a

small cone, with a shank or handle attached, turned out of a piece of hard wood the exact size and shape of a suppository. To make the mould, roll a piece of tinfoil tightly round the cone, twisting it well at the apex. Pass a knife round the tinfoil at the base of the cone, and insert the whole into a shallow box that has been filled with powdered whiting or magnes. sulph., and gently withdraw the wood cone, leaving the tinfoil mould standing upright and ready for use.

In proceeding to make suppositories, the first thing necessary is to melt the base, using as little heat as possible. The quantity required should be weighed and heated in a small evaporating dish over a water-bath for a few moments until it becomes liquefied. Oil of theobroma should always be melted over a water-bath, several small and convenient kinds of which are made for the purpose. The inside of the moulds should be smeared with soap-liniment before being filled. The medicinal ingredients having been weighed should be placed on a tile, then add a little of the oil to them, and mix the whole intimately with a spatula. Transfer to the dish and keep stirring the mixture until it arrives at the stage that it will only just run, then pour it slowly into the moulds. When the oil appears to be thoroughly hard, open the moulds and remove the suppositories. To aid solidification immerse the mould in cold water. In hot weather ice should be added to the water to aid the cooling process. The tinfoil mould requires no preparation, the foil being simply unrolled from the suppository when it has set. Suppositories are made of the uniform weight of 15 grains each, and pessaries from 60 to 75 grains each, inclusive of ingredients. When weighing the oil of theobroma, it is always advisable to allow a few grains margin over the exact amount ordered.

Several machines are now on the market for preparing suppositories in the cold by compression. The mass for this method is prepared as follows: Crush the theobroma oil or other basis in a mortar, then add the other ingredients and work the whole together like a pill-mass with the aid of a few drops of oil. When the mass is of the proper consistency, divide it into suitable pieces and it is ready for pressing into the moulds.

Agar has been recommended as a basis for suppositories, for which it is claimed they are easier to introduce and more sterile than those made with any other basis. The agar basis is prepared as follows :

Agar, being acid, it is first neutralized with sodium bicarbonate, 1 gramme of the latter to 10 grammes of the former. One part of neutralized agar powder is poured into a small bottle with the quantity of medicament intended to be used for a certain number of suppositories; then 29 parts of water are weighed and added, and the whole shaken up. The stopper of the bottle is well tied down, and the bottle placed in boiling water for five to ten minutes. Square pieces of paraffined paper (about 4 centimetres) are rolled into pointed paper bags, the points turned over, and the bags fixed in a suitable frame on a scale pan. The respective quantities of the hot agar mass are then weighed carefully into the paper bags, and the suppositories are preserved for use in the bags. It is best to make the agar as required. If it is desired to make a 0·1 gramme potassium iodide suppository, 1 gramme of neutral agar and 1 gramme of the iodide are placed in a flask with 29 grammes of water. The whole is then shaken up to dissolve the iodide and heated in a water-bath. When fluid, the mass is poured out into the moulds.

Tannin suppositories are prepared without heat; 1 part of tannin is mixed with 2 parts of agar powder and massed with 7 parts of water. The mass is then rolled out and divided.

The author has devised and found the following basis a useful one that may be employed in place of theobroma oil.

Cocoa-nut stearin	℥iv.
White wax	grs. 340.

Melt together with gentle heat over a water-bath. The product has a melting-point of about 98° F. It sets more rapidly than theobroma oil at a temperature of 64° F.

Difficulty in mixing extracts with oil of theobroma is sometimes experienced in making suppositories. When belladonna is ordered, the alcoholic extract may be used with advantage, as it may be easily mixed with the oil. Extract of conium should be rubbed down on a tile to

the consistence of a smooth, thin paste with a few drops of hot water and the aid of a warm spatula knife, then the oil thoroughly incorporated with it, a small quantity at a time, until the whole is well mixed. The same method should be used with other extracts. Iodoform, should be rubbed to a fine powder and mixed with the oil on a tile. It should on no account be heated in it. Potassium bromide, tannic acid, and crystalline substances must be reduced to fine powder and mixed with the oil in the same manner, or they will sink to the bottom of the mould when poured in. Heavy ingredients, like lead iodide or zinc oxide, should be rubbed to a smooth paste with the oil, and not poured into the moulds until just before setting. Care must be taken not to make the oil too hot, and never to attempt to pour it into the moulds until it is of a thick, creamy consistence, and the solid ingredients well suspended, otherwise, they will form a hard mass at the apex of the suppository. Heat must not be used in making a suppository of chloral. The crystals should be crushed and worked together with the oil in a mortar until well mixed, then pressed into the moulds. Hollow cones, composed of oil of theobroma into which the medicinal agent may be introduced, are sometimes used. Pessaries are made in the same manner as suppositories.

Glyco-gelatin is sometimes used as a basis for suppositories and pessaries, which, when not medicated, are popularly known as glycerin suppositories. The basis may be made as follows :

Fine gelatin	ʒvi.
Glycerin	℥i.ss.
Water	ʒx.

Mix, and dissolve by gentle heat over a water-bath. The moulds should be greased or painted with lin. saponis. This base may be medicated as desired, but tannin, and astringent drugs containing it, should be avoided.

Suppositories, with gelatin base, are usually made to weigh 20 grains each.

Bougies.—Medicated bougies may be made in metal or tinfoil moulds in the same manner as suppositories

The turned wood model should be about 2½ inches in length, by ¼ inch in width at the base, gradually tapering to the apex. The taper end of a No. 9 bougie forms a good mould. They are usually made to weigh 20 grains each, with a base of oil of theobroma, and should be allowed to become perfectly hard before being removed from the moulds, as they are very liable to break.

Nasal bougies are prepared with a glyco-gelatin base, and are introduced into one of the nasal passages for treatment of chronic affections of the nares.

They are made tapering in shape, the usual length being 8 centimetres.

The basis is prepared as follows (T.H.P.) :

Gelatin, refined	℥v.
Glycerin	℥vi.
Water	℥vi.

Soak the gelatin in the water for twelve hours, with occasional stirring ; add the glycerin, dissolve in a water-bath, and evaporate to produce 15 ounces by weight of the glyco-gelatin. They may be medicated with acid. carbolic. bismuth, iodoform, morphine, etc., or made according to the formulæ of the Throat Hospital pharmacopœia.

CHAPTER XI

Explosive Compounds.

Explosive Compounds. — Occasionally the dispenser may find ordered in prescriptions certain drugs which, when brought in contact, form explosive compounds of a dangerous nature, and in the mixing of which the greatest care is necessary. It behoves him, therefore, to act with special caution when handling or dispensing such mixtures. In many cases the prescriber may be ignorant of the danger of combining certain ingredients, and, unless the dispenser be on his guard, an accident may result.

Care should be exercised in mixing all chlorates, and in triturating them with other chemical substances. Potassium chlorate forms an explosive compound when brought directly in contact with creosote. With silver oxide, also, creosote forms a dangerous combination. In both cases, if the ingredients are first mixed with some inert powder before being brought in contact, the danger may be avoided, and they may with care be dispensed together. Potassium chlorate, when rubbed with tannin, dry, forms an explosive mixture. Potassium bichromate and chromic acid form dangerous compounds with other bodies, and care should be observed when bringing the latter in contact with glycerin. Potassium permanganate is liable to cause an explosion when mixed with any rapidly deoxidizing agent. The dangerous explosive iodide of nitrogen is formed by combining iodine and ammonia, and caution should be used in mixing salts of these bodies. Spirit of turpentine, when brought in contact with strong sulphuric acid, bursts into flame. Hypochlorite of sulphur is sometimes liable to explode on tapping the stopper of the bottle it is kept in. Iodine and charcoal also form a dangerous mixture. Trinitrin (nitroglycerin) now employed in making the official tablets, is usually kept in 1 per cent. solution, and may be handled in safety in that form and strength. Syrups kept for a length of time in tightly corked bottles are liable to explode, owing to fermentation taking place and liberation of CO_2.

The following prescriptions form dangerous explosive compounds, and should not be dispensed :

℞ Calcis hypophosph. .. .. .. ʒss.
Potass chlorat. .. .. ʒss.
Misce. Fiat pulv.

℞ Acid. chromic. .. .. ʒss.
Glycerin .. .. ʒiv.
Misce.

℞ Iodol. .. .. grs. v.
Hydrarg. oxid. flav. .. .. .. grs. ii.
Vaselin .. .. grs. x.
Misce. Fiat ung.

On rubbing the iodol. with the oxide of mercury a violent explosion results.

Potassium chlorate or nitrate should not be triturated with sulphur or compound liquorice powder (which contains sulphur), antimonious sulphide, sugar, or charcoal.

Liquid ammonia, tincture of iodine, and collodion form a dangerous mixture.

Iodine reacts powerfully on some volatile oils, such as turpentine and oil of lemon.

The greatest care should be exercised in mixing erythol tetranitrate.

The following solution was the cause of a serious accident owing to an explosion.

℞	Potass. permangan.	ʒx.
	Alcohol	ʒx.
	Aquæ destill.	ʒxv.

Creosote must never be mixed directly with potassium chlorate, silver nitrate or oxide.

CHAPTER XII

Finishing and Wrapping.

Finishing and Wrapping.—In the completing, wrapping, and other little requisites necessary to give a medicine bottle a neat appearance, the dispenser has an opportunity of showing good taste, and he will find it a matter which merits attention. The appearance of the medicine bottle, which usually stands in a prominent position in the sick room, is often an object for criticism and remark on the the part of the patient and the medical man. Careful attention to what may seem to some trivial matters are always worth the trouble, and add to the credit of the dispenser.

All bottles used should be well shaped and moulded. With regard to choice in the tint of the glass, the white flint certainly have the most elegant appearance,

pale-green tint. perhaps, coming next. For lotions and liniments, the actinic green bottles, round or octagonal, are very suitable. The shape of mixture bottles is purely a matter of taste, the ordinary flat being generally used. The oval has the advantage of taking any shaped label, but it does not wrap up as neatly as the flat. The direct square, and perfect flat, are also convenient shapes for dispensing bottles, and wrap up well. Always use good corks, which should not be too tightly inserted, and test them before sending out. Nothing looks worse, and is more annoying to the patient, than a cork which breaks the first time it is taken out of the bottle. A neat seal, or circular red label placed on top of the cork, greatly improves its appearance. The cork seal should not be too elaborate, the name of the pharmacist alone is quite sufficient, and all that is really necessary. To make a good and bright impression, melt the wax by holding it for a moment in the blue part of the gas flame, which prevents it from becoming discoloured. The styles of labels used for dispensing bottles are many and varied, and in the choice of design there is room for the display of taste. A label to look well should be printed from an engraved plate on good white paper, the size being in proportion to the bottle to which it is to be affixed. The old-fashioned, elaborately designed label, with its coat-of-arms and flourishes, is gradually being superseded by a plainer style, in which the blank space for filling in the directions occupies the principal portion. Too much printed matter, coloured ink, and tinted papers should be avoided for medicines for internal use, all that is really necessary being the name of the dispenser, his qualification and address. If the directions are not printed, the writing should be small, neat, and, most important of all, distinct. The words should be regularly spaced, and not too many crowded in a line. The white irregular margin of the label should always be trimmed with a pair of scissors. It may then be affixed to the bottle, care being taken not to soil it with the fingers in so doing. A new label must never be pasted over an old one. It is customary in some pharmacies to cap the cork with tinfoil or a pleated paper cap, which gives a very neat finish to the bottle. The paper used for wrapping dispensing bottles should be

glazed, and of good quality, white being generally used. Bright colours should be avoided, but a pale primrose, green, or blue tinted paper, forms a very effective wrapping. There are several styles of wrapping for dispensing bottles in vogue, in which the student will do well to perfect himself by careful and painstaking practice. A slovenly wrapped bottle is an eyesore to the neat dispenser. There are three essential points necessary to observe: First, that the paper is the proper size; second, that the pleat or fold should come near the centre of

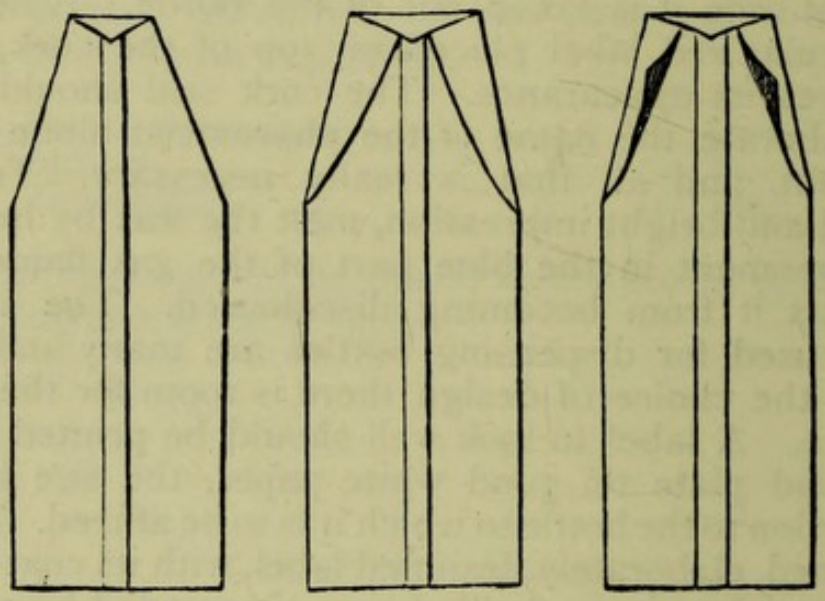


FIG. 1. FIG. 2. FIG. 3.

the bottle; third, that the paper is drawn tight, and handled firmly.

In style shown in Fig. 1, the paper is pressed on to the cork on either side above the shoulders of the bottle, the front being turned in, and the back folded on it, and sealed. In Fig. 2, the paper above the shoulders is pressed in by the first and second fingers on either side of the neck, and secured by folding in the remaining side portions and back, forming two flat pleats. In Fig. 3, the front part is at once pressed on to the cork, and both sides folded over it, two projecting pleats being formed by the fingers.

When dispensing pills, a small piece of pink wool, placed in the box—should they be silvered or coated—

greatly adds to their appearance. In wrapping pill boxes, ointment pots, etc., the dispenser should aim at being as neat as possible in every detail, and he may rest assured he will find it worth the trouble and time bestowed.

It should be the aim of the student to strive and perfect himself in the process of every operation he may be called upon to perform, and look upon his work, as the craftsman did of old, 'not as a toil but a pleasure.'

APPENDIX

POULTICES, AND THEIR PREPARATION

ALTHOUGH the preparation of poultices does not exactly come within the range of the duties of the pharmacist, he may occasionally be asked for directions how to make them. Most people can stir a little hot water and linseed meal together, but that does not necessarily constitute a proper poultice, and as much often depends on this valuable aid to medical treatment, it is worth while to give the matter attention.

The poultice is applied for its warmth and moisture, which relaxes the tissues, allays inflammation, and limits its spread. It soothes and relieves pain, and lessens the tension on inflamed parts ; thus the proper degree of heat is an important factor in its preparation.

The media generally in use for poulticing are ground linseed, bread, oatmeal, bran, starch, yeast, potatoes, and carrots. The linseed and bread perhaps retain the heat the longest. Poultices should be made large in size, and always applied as hot as can be borne. They should not be kept on too long, and never allowed to become cold and hard. Where continuous poulticing is necessary they should be changed about every hour, or less, the old one not being removed until the new one has been prepared, and is ready for application, to prevent the warm surface of the skin becoming cool, and risk of cold. The poultice should be spread on a piece of soft linen cut out the required size, allowing about two inches margin to turn in. It should not be spread too thick, three-quarters

of an inch, or an inch at the outside, is quite sufficient. Being covered with a layer of cotton-wool helps the poultice to retain its heat. It may be kept in position by pieces of tape or light bandaging.

The following methods of preparing poultices are recommended by Dr. Ringer :

Linseed Poultice.

Pour sufficient boiling water into a heated bowl, and into the bowl the meal must be quickly sprinkled with one hand, while with the other the mixture is constantly stirred with a knife or spatula, till sufficient meal has been added to make a thin and smooth dough. The whole process should be carried out as rapidly as possible. By adding the meal to the water the ingredients are easily and thoroughly blended without becoming lumpy. The poultice should be spread evenly on the warm linen to within about two inches of the edge, which may then be turned in to prevent it escaping. The proportions recommended are half a pint of boiling water to a quarter of a pound of linseed meal. The linseed used should be freshly ground, and that from which no oil has been extracted. It should be a rich, pale yellowish colour and fairly free from husk. Laudanum is often added to the linseed poultice to alleviate pain, especially when the skin is broken. One or two teaspoonfuls sprinkled over the surface of the poultice is usually sufficient.

Mustard Poultice.

The mustard should first be mixed with a little warm water, then added to the mixture of linseed meal and boiling water, and the whole stirred together.

Equal parts of mustard and linseed may be used, or one part of the former to three of the latter, if it is not required so severe.

Bread Poultice.

The bread poultice may be prepared by cutting bread in thick slices, placing it in a basin, pouring boiling water over it, and allowing the whole to stand by the fire for five minutes; then pour off the water, replacing it with fresh boiling water, and repeat this process. When thoroughly soaked, pour off the excess of water, and press the bread, beat up with a fork, and make into a poultice. Another process is to cut the bread into slices and pour boiling water over it, place the whole by the fire covered over, and allow it to simmer for a short time, then strain off the excess of water. It is then ready for spreading.

Oatmeal poultices are made in the same manner as the linseed meal. Starch poultices retain their heat for a considerable time. The starch should first be mixed with a little cold water, and then sufficient boiling water added to make it into a proper consistence to spread into a poultice.

Yeast Poultice.

This poultice is made by mixing 6 ounces of yeast with the same quantity of water at 100° F., and stirring in 14 ounces of flour. Place the mass before the fire until it rises, when it is ready to apply.

Another method is to smear the warmed yeast over the surface of a bread poultice. Powdered charcoal mixed with linseed meal and bread is sometimes used as a poultice. The potato and carrot poultices are made by boiling the vegetables till soft, and then mashing them up until they are reduced to a pulp by means of a potato masher. They may then be placed on linen or in a bag in the ordinary way.

REGULATIONS FOR KEEPING, DISPENSING, AND SELLING POISONS.

Under Section 1 of the 1868 Act, the Pharmaceutical Society of Great Britain is empowered to make regulations as to the keeping, dispensing, and selling of poisons. Such regulations were approved by the Privy Council on January 31, 1899, and are in the following terms :

Regulation 1.—That in the keeping of poisons each bottle, vessel, box, or package containing a poison be labelled with the name of the article, and also with some distinctive mark indicating that it contains poison.

Regulation 2.—Also that in the keeping of poisons each poison be kept on *one or other* of the following systems, viz. :

(*a*) In a bottle or vessel tied over, capped, locked, or otherwise secured in a manner different from that in which bottles or vessels containing ordinary articles are secured in the same warehouse, shop, or dispensary ; or

(*b*) In a bottle or vessel rendered distinguishable by touch from the bottles or vessels in which ordinary articles are kept in the same warehouse, shop, or dispensary ; or

(*c*) In a bottle, vessel, box, or package kept in a room or cupboard set apart for dangerous articles.

Regulation 3.—That in the dispensing and selling of poisons all liniments, embrocations, and lotions containing poisons be sent out in bottles rendered distinguishable by touch from ordinary medicine-bottles, and that there also be affixed to each such bottle (in addition to the name of the article, and to any particular instructions for its use) a label giving notice that the contents of the bottle are not to be taken internally.

These regulations do not extend to, or interfere with, the business of any legally qualified apothecary or medical practitioner, or any member of the Royal College of Veterinary Surgeons. Nor do they apply to limited companies, but the terms of the section clearly show that any person employed by companies to sell, dispense, or compound poisons must conform to the regulations.

LATIN TERMS USED IN PRESCRIPTIONS, WITH THEIR ENGLISH MEANINGS.

Acidum	= An acid.
Adde, addendus	= Add, to be added
Admove	= Apply.
Alias	= Another.
Alter	= Any.
Alternis horis	= Every other hour.
Ana, aa	= Of each ingredient.
Ante	= Before.
Aqua bulliens	= Boiling water.
Aqua fervens	= Hot water.
Aqua fontana	= Spring water.
Articulus	= A joint.
Auris	= The ear.
Balneum maris	= A warm bath.
Balneum vaporis	= A vapour bath.
Bibe	= Drink.
Bis in dies	= Twice a day.
Brachium	= The arm.
Capiat	= Let the patient take.
Cephalagia	= Headache.
Cibus	= Meals, food.
Cochlear	= Spoon.
Cochleare amplum	= A tablespoonful.
Cochleare magnum	= A tablespoonful.
Cochleare medium	= A dessertspoonful.
Cochleare modicum	= A dessertspoonful.
Cochleare parvum	= A small or tea spoonful.
Cochleare theæ	= A teaspoonful.
Cochleatina	= By spoonfuls.
Cœnam	= Supper.
Cola	= Strain.
Compositus	= Compound.
Continuentur remedia	= Let the medicine be continued.
Coque	= Boil.

Cortex	= A bark.
Coryza	= Cold in the head.
Coxa	= The hip.
Crastino	= To-morrow.
Crastino mane sumendus	= To be taken to-morrow morning.
Crastino nocte	= To-morrow night.
Crastino vespere	= To-morrow evening.
Cubitus	= The elbow.
Cujus	= Of which.
Cum	= With.
Cyatho theæ	= In a cup of tea.
Cyathus vinarius	= A wineglassful.
Decoctum	= A decoction.
Decubitûs hora	= At bedtime.
Dejectiones alvi	= Liquid stool.
Detur	= Let (it be given).
Dextrum latus	= The right side.
Diebus alternis	= Every other day.
Dilue	= Dilute.
Dimidius	= One half.
Donec	= Until.
Donec alvus dejiciatur	= Until the bowels have been moved.
Donec somnus obrepat	= Until sleep comes on.
Dolore lateris urgente	= Pain in the side.
Dosis	= Dose.
Ejusdem	= Of the same.
Electuarium	= An electuary.
Enema	= An injection.
Ex	= In.
Exhibeatur	= Let it be exhibited.
Extende super alutam mollem	= Spread upon soft leather.
Extractum	= An extract.
Femoribus internis	= To the inner part of the thighs.
Fiat fiant	= Let it be made.
Fiat haustus	= Let a draught be made.
Fiat secundum artem	= Let it be made according to art.
Fluidus	= Liquid.

Frons	= The forehead.
Gargarissma	= A gargle.
Gena	= The cheek.
Granum	= A grain.
Gutta	= A drop.
Guttur	= The neck.
Hora decubitus	= At bedtime.
Hora somni	= At bedtime.
Horis consuetis	= At the accustomed hours.
Incisus	= Being cut.
Indies	= Daily, or from day to day.
Infusum	= An infusion.
Initio	= At first.
In pulmento	= In gruel.
Jam	= At once.
Jentaculum	= Breakfast.
Lagena obturata	= A stoppered bottle.
Liquoris	= A solution.
Mane nocteque	= Night and morning.
Mane primo	= Early in the morning.
Massa pilularum	= A pill mass.
Media nocte	= Midnight.
Meridies	= Noon.
Mica panis	= Breadcrumb.
Minimum	= A minim.
Misce	= Mix.
Mistura	= A mixture.
Mitte	= Send.
More dicto	= In the manner directed.
More solito	= In the usual way.
Nasus	= The nose.
Nullus	= None.
Occulus	= The eye.
Omni hora	= Every hour.
Omni bihoris	= Every two hours.
Omni mane	= Every morning.
Omni nocte	= Every night.
Omni quadrante horæ	= Every quarter of an hour.
Ovi vitellus	= Yolk of an egg.
Parte sexta hora	= Every ten minutes.
Partem affectam	= The part affected.
Partem dolentem	= The part in pain.

Partes æquales	= Equal parts.
Pectus	= The breast.
Pharmacopœia Britannica	= British Pharmacopœia.
Phialâ agitatâ	= Shake the bottle.
Pilula	= A pill.
Poculum	= A cup.
Pomeridie	= Evening.
Post	= After.
Post aurem	= Behind the ear.
Post cibum	= After meals.
Post prandium	= After dinner.
Pro re nata	= If occasion requires.
Pulvis	= Powder, a powder.
Quantum sufficiat	= As much as sufficient.
Regio hepates	= The region of the liver.
Regio umbilici	= The umbilical region.
Sabinde	= Now and then.
Scatula	= A box.
Semel, septemane, hebdomada	= Once a week.
Semi	= Half.
Semi hora	= Half an hour.
Sero nocte	= Late at night.
Sesquihora	= An hour and a half.
Sesuncia	= An ounce and a half.
Si	= If.
Si opus sit	= If required.
Signatura	= Label.
Solus	= Alone.
Statim	= Immediately.
Sternum	= The chest.
Stet	= Let it stand.
Sumat	= Let him take.
Sumatur sumendus	= To be taken.
Syrupus	= A syrup.
Tabella	= A tablet.
Tere simul	= Rub together.
Tertium vicem	= Three times.
Tinctura	= A tincture.
Totus	= The whole.
Trihorio	= Every third hour.
Tritura	= Triturate.

Trochisci	= Lozenge.
Tussi urgente	= When the cough is troublesome.
Vespertina	= Evening.

The *cardinal* numbers are: *Unus*, one; *duo*, two; *tres*, three; *quatuor*, four; *quinque*, five; *sex*, six; *septem*, seven; *octo*, eight; *novem*, nine; *decem*, ten; *undecim*, eleven; *duodecim*, twelve, etc.

To express the fractional part of a number, an *ordinal* is used: as *primus*, first; *secundus*, second; *tertiis*, third.

Numeral adverbs: *Semel*, once; *bis*, twice; *ter*, thrice, or three times; *quater*, four times; *quintus*, five times, etc

TABLE OF SOLUBILITIES.

	In Water at 60° F.	In Alcohol, 90 per Cent.
Acetanilid	1 in 200	1 in 4
Acid, arsenious	1 „ 100	1 „ 140
„ benzoic	1 „ 400	1 „ $2\frac{3}{4}$
„ boric	1 „ 30	1 „ 18
„ citric	10 „ 6	10 „ 15
„ oxalic	1 „ 8	1 „ 6
„ tartaric	10 „ 8	1 „ 8
„ gallic	1 „ 100	1 „ 5
„ salicylic	1 „ 500	1 „ 3
„ tannic	1 „ 1	5 „ 3
Alumen	1 „ 10	Insoluble.
Ammon. carb.	1 „ 4	Slightly.
„ benzoat. ...	1 „ 6	1 in 30
„ bromid. ...	1 „ $1\frac{1}{2}$	1 „ 13
„ chlorid. ...	1 „ 3	1 „ 55
„ phosph. ...	1 „ 4	Insoluble.
Antipyrine	1 „ 1	Readily.
Antim. tart.	1 „ 17	Slightly.
Atropine	1 „ 300	1 in 8
Butyl-chloral hydrate ...	1 „ 50	1 „ 1
Chloralamid	1 „ 10	Readily.
Caffeine	1 „ 80	„
Camphor	1 „ 700	„
Chloroform	1 „ 100	„
Codeine	1 „ 80	„
Ether (·720)	1 „ 9	„
Ferri tart.	1 „ 4	Sparingly.
„ sulph.	1 „ 2	Insoluble.
Hydrarg. perchlorid. ...	1 „ 16	1 in 3
Lithia citrat.	1 „ $2\frac{1}{2}$	—
„ carb.	1 „ 70	Insoluble.
Magnes. sulph.	1 „ 1	—

TABLE OF SOLUBILITIES—*continued.*

	In Water at 60° F.	In Alcohol, 90 per Cent.
Morph. hydrochlor. ...	1 in 24	1 in 50
„ acet.	1 „ 6	1 „ 100
„ tartras	1 „ 11	Insoluble.
Pilocarpine nit.	1 „ 9	Slightly.
Phenacetin	Slightly.	1 in 20
Plumbi acet.	1 in 3	1 „ 30
Potass. bicarb.	1 „ 3	Insoluble.
„ bichromate ...	1 „ 10	—
„ bromid.	1 „ 2	1 in 109
„ chlorat.	1 „ 16	—
„ citrat.	10 „ 6	Insoluble.
„ iodid.	4 „ 3	1 in 11
„ nitras	1 „ 4	—
„ permangan. ...	1 „ 20	Decomposed.
Quinine hydrochlor. ...	1 „ 35	1 in 3
Saccharin...	1 „ 400	1 „ 30
Sacch. lact.	1 „ 7	Insoluble.
Salicin	1 „ 28	1 in 60
Sodii arsenate	1 „ 6	Slightly.
„ benzoas	1 „ 2	1 in 25
„ bicarb.	1 „ 11	—
„ bibor	1 „ 22	—
„ hypophosph. ...	1 „ 1	1 in 30
„ phosph.	1 „ 6	—
„ salicyl.	1 „ 1	1 in 6
„ sulph.	1 „ 3	—
„ sulphocarb. ...	1 „ 6	1 in 150
„ tart.	1 „ 2	Insoluble.
Strychnine hydrochlor....	1 „ 35	1 in 60
Sulphonal	1 „ 450	1 „ 50
Thalline sulph.	1 „ 7	1 „ 100
Urethane...	1 „ 1	—
Zinc acet....	1 „ 2	1 in 40
„ sulph.	10 „ 7	Insoluble.
„ sulphocarb. ...	1 „ 2	1 in 2½

INDEX

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