A guide to pharmacy and dispensing for nurses and women desirous of qualifying as dispensers / by C.J.S. Thompson.

PHARMACY & DISPENSING

HOW TO QUALIFY AS A DISPENSER

C. J. S. THOMPSON

The Burdett Series

A GUIDE TO PHARMACY AND DISPENSING FOR NURSES

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FOR NURSES AND WOMEN DESIROUS OF QUALIFYING AS DISPENSERS

BY

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AUTHOR OF "PRACTICAL DISPENSING FOR PHARMACEUTICAL AND MEDICAL STUDENTS," "A MANUAL OF PERSONAL HYGIENE," "THE CHEMIST'S COMPENDIUM," "A COMPENDIUM OF THE PHARMACOPŒIAS" ETC., ETC.

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FOREWORD.

THE success which has attended the many previous editions of this little book proves it to have served a useful purpose.

The present edition has been completely revised in accordance with the British Pharmacopœia of 1914, and a chapter has been added indicating the course of study necessary for those who are desirous of qualifying as pharmacists.

The description of the various processes in Pharmacy and methods of dispensing are described in as simple language as possible, and the book must not be considered in any way as a complete treatise on the subject.

Thanks are due to Prof. Greenish, Dean of the School of Pharmacy of the British Pharmaceutical Society, for kindly revising the proofs of the recent additions.

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A GUIDE TO PHARMACY AND DISPENSING.

CHAPTER I.

HOW TO QUALIFY IN PHARMACY — TRAINING — CHOICE OF A SCHOOL — EXAMINATION AND REGISTRATION.

AMONG the varied careers that have opened out for women in recent years, Pharmacy is one in which she has already found a place. There seems little doubt that in the future there will be even greater scope for those who are ready to undertake a proper and thorough training and become qualified in the art of Pharmacy and Dispensing.

To the nurse who, in the daily exercise of her calling, is not only called upon to handle, but to administer drugs and remedial agents, Pharmacy is an attractive subject. It offers a wide field to women with ambition and intelligence, and the qualities of accuracy and reliability which its practice demands are well within her powers. As a guide to those who seriously desire to take up Pharmacy and Dispensing as a

calling, the following particulars of the requisite course to take will be found of service.

The first step in training is to pass an approved preliminary examination and to become registered as an apprentice or student of Pharmacy, the registration fee for which is two guineas.

The certificates which are accepted for registration must include English, Arithmetic, Algebra, and Geometry, and two optional subjects are also included, one of which should be Latin, but a modern foreign language or book-keeping would be accepted. The list of certificates authorised may be obtained from the Registrar of the Pharmaceutical Society of Great Britain, 17 Bloomsbury Square. They include the Junior or Senior Local Examinations, Higher Local Examinations, and Responsions of the Universities of Oxford and Cambridge, the Matriculation Examination of the Universities of London, Manchester, Leeds, Liverpool, and Sheffield ; also the Junior or Senior Examination of the College of Preceptors, and those of many other bodies. This having been done, the student must for three years take practical instruction, and be engaged in the translation and dispensing of prescriptions. This may be accomplished by becoming apprenticed to a registered chemist, or may be obtained in a hospital or dispensary where prescriptions are dispensed, providing the

necessary certificate is signed by a registered chemist, a pharmaceutical chemist, or a registered medical practitioner.

During this important period, the student should make every endeavour to acquire all the knowledge possible of the theoretical as well as the practical side of Pharmacy, Chemistry, Physics, and Botany.

On attaining the age of twenty, preparation should be made for taking a college course in order to enter for the Minor Examination, the passing of which carries with it registration as a chemist and druggist, and a legal right to dispense medicine, to keep open shop, and vend poisons.

The Council of the Pharmaceutical Society, the body empowered under the Pharmacy Acts to carry out the examinations and registration, recommends that all students before presenting themselves for the Minor Examination should take a systematic course of instruction which should last for a period of at least six months, and include at least sixty lectures in Chemistry, eighteen hours' work per week in practical Chemistry, forty-five lectures and demonstrations in Botany, and twenty-five lectures and demonstrations in Materia Medica.

For this purpose it is necessary to enter a School or College of Pharmacy or other institution providing the necessary courses attached to some

University. In the provinces such schools and institutions are to be found in Birmingham, Bradford, Bristol, Bath, Edinburgh, Glasgow, Huddersfield, Leeds, Liverpool, Manchester, Nottingham, Plymouth, Sheffield, and other large centres. To those residing in London the School of Pharmacy of the Pharmaceutical Society of Great Britain, 17 Bloomsbury Square, W.C., offers the best and most thorough training. Full particulars of the course for the Minor Examination can be obtained from the Dean of the School. The course begins in October, and continues until the end of June, the fees to student-associates being £30. Having completed the courses of lectures and practical instruction and attained the age of twenty-one years, the student can enter for the Minor Examination, which is conducted by the Board of Examiners for England and Wales in London, and by a similar Board for Scotland in Edinburgh. The examinations, which are both oral and practical, are held four times annually, and the fee of ten guineas is payable to the Registrar of the Society on or before the fifteenth day of the month prior to the examination. The subjects, of which full details are given in the official pamphlet to be obtained from the Registrar, include Botany, Chemistry and Physics, Materia Medica, Pharmacy, Pharmaceutical Latin, and Prescriptions.

The examination lasts two days, and if passed, the diploma as a registered chemist and druggist or pharmacist is granted, which entitles the holder to practice Pharmacy, *i.e.* to keep open shop for the sale of scheduled poisons in Great Britain.

Several scholarships, full particulars of which can be obtained from the Registrar and the Dean, are tenable in the Pharmaceutical Society's School and are available to student-associates.

As a guide to the student the following books are recommended for use in preparation for the Minor Examination :—

For Chemistry and Physics: Newth's *Inorganic Chemistry* (Longmans, Green & Co.); Smith's *Introduction to Inorganic Chemistry* (Bell & Sons); Perkin and Kipping's *Organic Chemistry* (W. & R. Chambers); Gregory and Hadley's *Class Book of Physics*, Parts I, II, and III (Macmillan & Co.); Perkin's *Qualitative Chemical Analysis : Inorganic and Organic* (Longmans, Green & Co.); Hampshire's *Volumetric Analysis* (J. & A. Churchill).

For Botany: Johnson's *Text-book of Botany* (Allman). For Latin Prescription Reading, Bennett's *Medical and Pharmaceutical Latin for Students* (Churchill), and Ince's *Latin Grammar* will be found useful.

For Pharmacy and Dispensing, the British Pharmacopœia, last edition, 1914, is indispens-

able; Lucas's *Practical Pharmacy* (Churchill), and Thompson's *Aids to Practical Dispensing for Students* (Balliere, Tindal & Cox).

For Electricity and Magnetism: S. Thompson's *Elementary Lessons in Electricity and Magnetism* (Macmillan & Co.) will be found of assistance.

For Materia Medica: Greenish's or Southall's works on the subject are most suitable.

A further examination for the title of Pharmaceutical Chemist is open, on the payment of a fee of three guineas, to all those who have passed the Minor. This examination extends over three days, and is called the Major. A more extended knowledge of the subjects included in the Minor is necessary. The candidate is also examined on Heat, Light, Electricity, Magnetism, Taxomomy, Analysis: Gravometric and Gasometric, the examination of drugs by the microscope to detect adulterants, and alkaloidal assays.

In Ireland the law is somewhat different, and particulars for registration under the Pharmacy Act should be obtained from the Registrar of the Pharmaceutical Society of Ireland, 67 Lower Mount Street, Dublin.

The Society of Apothecaries of London grants certificates which entitle the holders to act as assistants to apothecaries (registered medical practitioners), but it should be fully understood

that these certificates do not carry with them the right to keep open shop for the sale or dispensing of poisons, but holders can act as dispensers to the National Insurance Act, provided their work is supervised by a registered chemist and druggist. The examination is held at the Society's Hall four times annually, and is practical and oral, the fee being five guineas. Candidates must be at least nineteen years of age, and a certificate of sound general education must be produced, together with one signed by an apothecary's assistant holding a public appointment, a registered chemist and druggist, or a registered medical practitioner, showing that special instruction in practical Pharmacy has been taken for six months. The subjects included in the examinations are the compounding and dispensing of Medicines, Chemistry, Materia Medica, Pharmacy and Prescription Reading.

A similar certificate is granted by the Apothecaries' Hall of Ireland on passing their examination, but this is only of use in that country.

CHAPTER II.

THE BRITISH PHARMACOPŒIA AND ITS PREPARATIONS.

THE British Pharmacopœia, which is issued by the General Medical Council, under the authority of the Medical Act, is a list or collection of medicines, simple and compound, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed for the guidance of those engaged in the practice of Medicine and Pharmacy. This work fixes the standards for the preparation of the various forms of medicinal agents, and other remedies used in the treatment of disease. The Pharmacopœia also lays down standards of purity for the drugs used so that the preparations employed may be of uniform strength. Medicines included in the British Pharmacopœia are termed "official," but there are of course a large number of remedial agents in general use which are classed as "unofficial" remedies. A careful study of this work therefore is of the greatest importance to the student of Pharmacy, who must be familiar with its processes, and

know the proportion of the active ingredients in the chief preparations, the doses of the same, and the drugs included.

The student should learn the English and Latin names of the drugs and preparations of the Pharmacopœia, which are arranged alphabetically in that work, and further take note of their chief character and doses.

The preparations and the methods of administering medicines included in the Pharmacopœia are as follows :—

The first group are the VINEGARS.

The VINEGARS are preparations in which diluted acetic acid is employed as a medium to extract the properties of certain drugs such as squills.

The WATERS of the Pharmacopœia chiefly consist of aqueous solutions of the volatile principles of drugs. Dill, anise, orange flower, caraway, cinnamon, fennel, cherry-laurel, peppermint, spearmint, and rose waters, are prepared by distillation, and camphor and chloroform waters as directed in the formulæ.

CONFECTIONS form the next group, and are preparations of solid medicaments made into the form of a thick paste by the addition of sugar or honey.

The DECOCTIONS are solutions prepared by boiling drugs with water. With one exception,

the simple drug after being prepared is boiled for ten minutes or longer with a certain proportion of water and then strained.

PLASTERS are solid tenacious compounds employed for local application. They are usually composed of some active drug with a basis of beeswax, resin, soap, and oil. Prepared for use they are melted and spread on leather or other media for application to various parts of the body.

The EXTRACTS of the Pharmacopœia are solid or liquid preparations. Some are prepared from the drug in a dry state by the action of cold or boiling distilled water, by means of which all the soluble matter is dissolved, the fluid being then evaporated to a dry or semi-dry consistence. With others the active principles are extracted by means of alcohol or ether, these solutions being similarly evaporated. The liquid extracts are prepared by analogous processes.

The GLYCERINS are preparations in which glycerin is used as a solvent.

INFUSIONS are prepared by allowing a certain quantity of a vegetable drug to infuse in hot or cold water as specified for periods varying from fifteen minutes to one hour, and straining off the liquid.

HYPODERMIC INJECTIONS consist of solutions in distilled water, sometimes with the addition of

a preservative. They are used for subcutaneous injection.

DISCS OF GELATIN medicated with various alkaloids used in ophthalmic cases are also included in the Pharmacopœia.

LINIMENTS are fluids for external application, and are sometimes of an oily or soapy nature in the form of an embrocation, or they are prepared with alcohol to be rubbed on or otherwise applied to the body.

SOLUTIONS consist of solutions in water of inorganic substances such as that of arsenious acid or mercuric chloride. There are also solutions of certain definite organic bodies, such as morphine, strychnine, etc. The solutions of arsenic, atropine, morphine, and strychnine salts are made of uniform strength, and contain one grain in 110 minims.

The MIXTURES included in the Pharmacopœia mainly consist of insoluble bodies suspended in water by means of gum and sugar.

PILLS, simple and compound, consist of drugs reduced to powder, combined with some soft substance called the excipient, such as syrup of glucose, hard soap, in order to form them into a suitable mass for making into pills.

The POWDERS are prepared by simply mixing various powdered drugs together.

SPIRITS are solutions of volatile oils or other bodies in alcohol. The aromatic spirit of ammonia, and the spirit of nitrous ether are prepared by distillation.

JUICES consist of the expressed juice of plants to which one-third of the volume of alcohol is added as a preservative.

SUPPOSITORIES are a form of local application. They are of conical shape, administered per rectum, the basis being (with the exception of glycerin suppositories) oil of theobroma.

SYRUPS are preparations in which sugar dissolved in water forms the medium for administering some drug or other body generally used as flavouring agents.

TINCTURES are fluid preparations in which the active principle of the drug has been dissolved in alcohol or other suitable solvent.

OINTMENTS are soft or semi-liquid applications employed for external use by smearing over the surface of the body or for application on lint. The basis consists of some fatty matter such as lard, soft paraffin, or mixtures of wax and oil.

The WINES are preparations in which sherry or orange wine is used as a solvent of the drug instead of alcohol. The wines of antimony, colchicum, iron, ipecacuanha are prepared with sherry, while those of iron, citrate, and quinine are prepared with orange wine.

The LOZENGES of the Pharmacopœia contain certain medicinal substances mixed with a fruit basis consisting either of gum tragacanth, sugar, and black-currant paste, a simple basis of sugar and gum acacia, or a tolu basis, consisting of sugar, gum acacia, and tincture of balsam of tolu. The sugar basis is sometimes flavoured with oil of rose. The ingredients are mixed and formed into a mass which is divided or cut into lozenges, round or oval in shape, and then dried.

CHAPTER III.

OPERATIONS AND PROCESSES EMPLOYED IN PHARMACY.

HAVING glanced at the principal preparations included in the British Pharmacopœia, it will be useful to the student to know in brief outline the operations in Pharmacy of which a practical knowledge is necessary.

First let us consider those operations requiring the use of HEAT.

EVAPORATION and the methods of carrying it out are very important, especially in the preparations of the various kinds of Extracts.

Evaporation may be carried out by water, steam, and sand-baths or by distillation, ordinary, fractional, steam, and destructive, all of which must be learnt by practical experience in the laboratory. In connection with these operations the influence of surface, temperature, and pressure upon the rate of evaporation must be considered.

DISTILLATION and the use and principles on which the various kinds of apparatus are employed, such as the retort and receiver, still and

worm, and Liebeg's condenser must be studied and understood.

SUBLIMATION and its objects and applications in pharmacy must be noted, especially in connection with the official products of sublimation, such as benzoic acid and flour of sulphur, together with CALCINATION and FUSION.

DESICCATION is another process of which a knowledge is necessary. The temperature most suitable for drying particular drugs, loss in drying vegetable drugs, and in the forms of drying ovens, and the principles on which they are constructed must be studied and understood.

The DISINTEGRATION of solid substances is an important consideration in pharmacy, and the methods employed in cutting, bruising, and pulverisation, and the implements used in these operations must be acquired by practice. A knowledge of the various methods employed for controlling the degree of comminution, sieves and sifting, trituration, levigation, elutriation, and granulation, including the methods used for producing certain chemicals either as fine powders like Grey powder, small crystals like potassium bromide, and scales, such as the citrate of iron and quinine, must be learnt.

The nature of SOLUTION, the solvent power of the various menstrua employed and the influences of temperature, state of division of the substance

to be dissolved, the time necessary, and the position of the substance in the menstruum, are all necessary features in pharmaceutical operations.

INFUSION, DIGESTION, DECOCTION, and LIXIVIATION and the principles on which the successful performance of these processes depend, must all be studied.

The student must also be familiar with the forms and materials for PERCOLATORS and PERCOLATION, and the various kinds of apparatus employed for this purpose.

PERCOLATION is a process largely used in the preparation of tinctures and liquid extracts, and is carried out as follows: the solid materials are moistened with a certain quantity of the liquid, and set aside for four hours in a well-closed vessel. They are then packed in a percolator, and sufficient of the liquid added to saturate the material and leave a layer on the top. This is allowed to macerate for twenty-four hours. Then the liquid is allowed to percolate slowly through until it measures about three-fourths of the volume required for the finished tincture. The materials called the marc are then pressed and the liquid recovered is mixed with that which has percolated, and it is then made up to the required volume as ordered.

MACERATION is carried out by placing the

solid material with the whole of the liquid to be used in a closed vessel, shaking it occasionally for seven days. It is then strained, the materials or marc pressed, and the liquids obtained mixed together. It may be allowed to stand to clarify or filtered if necessary.

FILTRATION, its objects and the various methods and media used in filtering, next claim attention, together with the means of expediting the same.

DIALYSIS and the construction and use of the Dialyser and its application in pharmacy must be understood.

Finally EXPRESSION and the different kinds of apparatus used for this purpose, such as the screw and hydraulic, demand attention, also the methods of expressing the juices from plants, and the recovery of the residual liquids from tincture marcs and other materials must be studied.

A good general knowledge of the processes involved in making the official preparations of the British Pharmacopœia is absolutely necessary, and the proportions of the active ingredients, especially those of a more powerful nature, such as aconite, arsenic, belladonna, chloral hydrate, digitalis, mercury, nux vomica, opium, and the official alkaloids, should be committed to memory.

CHAPTER IV.

THE ART OF DISPENSING—THE PRESCRIPTION—WEIGHING AND MEASURING.

THE art of dispensing consists in the compounding of medical prescriptions in a proper and scientific manner. In order to become a competent and proficient dispenser, practical instruction and considerable experience are absolutely necessary; therefore, from the outset, it must not be expected that an art which is by no means easy to acquire, can be mastered from a simple description of its various operations.

Dispensing presents no special difficulties which a woman, by study, practice, and careful attention, should not be able to overcome. Delicate manipulation, accuracy, and care are three very essential points in dealing with minute quantities such as grains and minims, and carefulness in every detail should be cultivated from the beginning. Besides the accomplishment of technical and manipulative difficulties which can only be surmounted by experience, a knowledge of the structure and chemical composition of drugs and other medicinal agents,

and the sciences of chemistry and botany which bear on the art, is necessary. A familiarity with the physical appearance of the drugs and chemicals used in medicine, with their preparations and their doses, is also of importance.

The position of the dispenser, on whose accuracy human life often depends, is one of great responsibility, and the compounding of medicine demands both scrupulous care and undivided attention. These important principles should ever be borne in mind.

When dispensing, the whole attention must be concentrated on the operation in hand, and not relaxed until it is completed. Once allow it to be distracted by conversation or otherwise, it is very easy to make an error which may have fatal results. The greatest care should be exercised over the smallest details, as, for instance, in draining the last drop of liquid from a measure, or in removing every particle of a pill mass from the mortar in which it has been made, and in noting that the measure or implement is perfectly clean before being used.

The strictest accuracy is also necessary in weighing and measuring, where exactitude is of the utmost importance. Equal caution must also be observed in checking the doses ordered in prescriptions, and in the quantities used, also in writing the direction on the label.

Neatness is essential in every operation of

dispensing, from the wrapping of a bottle or powder, to the rounding of a pill. The direction on the label should not only be written neatly, but distinctly, to prevent any possibility of error.

The practice of the rules mentioned should be made habitual from the beginning, as when once a slovenly and careless method of work is acquired, it is rarely got rid of afterwards. It should be firmly resolved to use every precaution that will help to render a mistake a practical impossibility. One such error is sufficient to destroy confidence, and the unreliable dispenser can never be trusted.

THE PRESCRIPTION.

The prescription is the medium of communication between the prescriber and the dispenser, wherein the former gives the ingredients and instructions for preparing and administering the medicinal agents to be dispensed. The word is derived from *præ*, "before," and *scribo*, "I write".

In most countries Latin is used in writing medical prescriptions, for which purpose it has many advantages. In the first place, it is a universal language among medical practitioners and pharmacists, therefore a prescription written in Latin can be dispensed in almost any civilised

country. Secondly, it is considered by prescribers not always advisable for the patient to be aware of the exact nature of the medicine he is taking. Therefore, to translate and read a prescription some knowledge of Latin is absolutely necessary. A careful study of a suitable text-book on medical and pharmaceutical Latin should be commenced early.

The Latin names of the various drugs and their preparations should be committed to memory.

In a prescription the words are greatly abbreviated, often to an extent that becomes confusing to the student, but with experience and practice this difficulty will soon be overcome. Thus tinctura is usually written as T. or Tr., extractum as E. or Ext., and liquidum as L. or Liq.

In the direction for administration also, the words used are usually abbreviated, often to a single letter, but the terms generally employed are not very numerous, and may be learnt in a short time with a little careful study.

The prescription may be divided into four parts. (1) The heading. This usually begins with the name of the patient. Beneath it in the left-hand corner, we have the symbol ℞., which represents the word "Recipe," signifying "Take thou". This symbol is said to have originated in the ancient invocation to Jupiter, with which the early physicians commenced their prescrip-

tions. (2) The names of ingredients prescribed, each occupying one line, followed by the symbol denoting the weight or measure to be used. (3) The instructions to the dispenser as to the form in which the medicine is to be made, as, for example, the mixture, the application, the pills, the powders, etc. (4) The directions for administration, the whole of which is to be translated and written in English on the label. Below, in the right-hand corner, the initials or signature of the prescriber are usually placed, followed by the date on which the prescription was written. Always read a prescription through carefully before beginning to dispense it.

The abbreviated manner in which some prescribers write the names of the ingredients in their prescriptions is often a source of difficulty to the student, especially when there is a similitude between the names of drugs. In such cases the dose ordered may serve as a guide to the dispenser, but where there is room for doubt the prescriber should be communicated with if possible. The following may be taken as examples of doubtful curtailment of words: *Ext. col.* might mean extract of colocynth or extract of colchicum, two very different preparations. *Hydr. chlor.* might be taken to mean calomel or corrosive sublimate, a mistake which would lead to very serious results, the latter being a very powerful poison. *Potass. sulph.*

might be read as potassium sulphate or sulphurated potash, and many other instances of a similar nature might be enumerated, against which the dispenser must be on guard.

As science has advanced, many changes in chemical nomenclature have been made, with the result that certain chemical and other bodies are known by various names or synonyms. For instance, perchloride of mercury is also known as bi-chloride of mercury, corrosive sublimate, and mercuric chloride. Persulphate of mercury is also sometimes termed sulphate of mercury, and mercuric sulphate, and sulphurated antimony is also known as oxy-sulphuret of antimony, golden sulphuret of antimony, and precipitated sulphuret of antimony. The dispenser should make a note of such synonyms until thoroughly acquainted with them.

In dispensing, as in the Pharmacopœia, the rule that all liquids are to be measured and solids weighed is strictly adhered to. In Great Britain, apothecaries' weights and measures are usually employed in dispensing, although in the last edition of the British Pharmacopœia the metrical weights and measures are used throughout. A working knowledge of the metrical system is now indispensable in pharmacy. Liquid measure is represented in the Pharmacopœia by the millilitre, the recognised abbreviation for which is 'mil.'. A mil. approximately

equals 16 minims. In continental countries and in the United States the metrical system is universally employed. In Germany and France it is customary to weigh both solids and liquids in dispensing.

The weight or measured quantity of each ingredient in a prescription is expressed by the symbol or contraction which follows it; thus m. represents the minim, followed by the number in Roman numerals; gtt. signifies drops, gr. for grain, ℈ the scruple, ʒ the drachm, fluid or solid, ℥ the ounce, fluid or solid, ss. following any of these symbols signifies half, for instance, ʒss. represents ½ drachm and ℥iss. 1½ ounces. The symbol O represents 1 pint or 20 fluid ounces, and C 1 gallon.

In weighing a powdered substance, a small quantity should first be placed in the scale pan and added to gradually by means of a palette knife, until the exact amount is reached to balance the scale. The same care should be exercised in measuring liquids. The measure should be raised to the level of the eye, and the fluid gently poured into it until the desired graduated mark is reached. Then it should be compared with the mark on the other side, taking care that the measure is held perfectly level.

Occasionally a prescription is met with in which a small fraction of a grain of some potent drug is ordered in one pill or powder.

As the ordinary dispensing scales are not used for weighing less than 1 grain, the difficulty can be overcome by weighing 1 grain of the potent drug and mixing it intimately with 100 grains of sugar of milk, when the subdivision of $\frac{1}{10}$, $\frac{1}{20}$, and $\frac{1}{30}$ or any fraction of a grain is rendered easy by weighing the necessary quantity containing the equivalent to the fraction required.

CHAPTER V.

IMPLEMENTS AND APPARATUS EMPLOYED IN DISPENSING.

THE dispensing counter or bench for compounding medicines should be furnished with a water tap and basin, a Bunsen burner, shelves above for bottles, jars, and measures, and drawers below the counter to hold other necessary requisites.

It will be well, perhaps, at this point to give a short description of the implements used in dispensing. To commence with, a good pair of apothecaries' scales, with glass pans, are of the greatest importance to the dispenser. They must be perfectly accurate and should turn to half a grain, and care should be taken to keep them scrupulously clean. The pans should be cleaned with a dry cloth each time after they have been used. Grain weights from $^1/_2$ to 6, and apothecaries' weights from $^1/_2$ scruple to 4 drachms, should be kept in a box close to the scales. When using the scales they should be held with the left hand, the pans being allowed just to touch the counter, in order to steady

them. The weight must be placed in the left, and the article to be weighed in the right pan, a small quantity being put in at first, and then added to gradually. Between such addition raise the scales about an inch, in order to see if the correct balance has been reached, and add more, or reduce the quantity accordingly.

The pestle and mortar are the appliances used for powdering, pounding, and triturating. They may be of metal, wedgwood or composition, and glass. The metal mortar is used for breaking up roots, barks, and other hard bodies, the wedgwood and glass being chiefly used for mixing or triturating purposes.

The measures employed in dispensing are of glass, and vary in capacity from 1 drachm to 20 ounces. The drachm measure is graduated in minims, the 1 and 2 ounce graduated in drachms, and the 10 and 20 ounce usually in ounces. When measuring a liquid the bottle containing it should be held in the right hand, the measure being in the left. The stopper of the bottle may be removed with the disengaged fingers of the left hand, and, on the measure being raised to the level of the eyes, gently pour the liquid into it until the desired graduated mark is reached. Carefulness in measuring is most important, and it should never be hurriedly performed.

On removing a bottle from a shelf do not get into the habit of giving it a vigorous shake, or, when measuring, of pouring out 2 ounces instead of 2 drachms, and then having to pour the overplus back into the bottle.

When drops are ordered, the liquid should be dropped from the neck of the bottle. If it be a stoppered one, slightly loosen the stopper, and, supporting it against the inside of the neck with the forefinger, allow the liquid to escape drop by drop. The rim around the neck of the bottle should first be moistened. The drop is often confused with the minim. The former is by no means an accurate method of measuring a liquid, and is now happily falling out of use. The drop may vary in size according to the consistency of the liquid, the shape of the bottle from which it is dropped, and the amount of liquid in it at the time. Therefore it must be remembered that drops and minims are not synonymous terms. Funnels of varied size, made of earthenware or glass, etc., are used in pharmacy for filtering or straining. In dispensing, the smaller sizes of from 2 to 4 ounces in capacity are generally used. The filtering medium usually employed is unsized paper known as "filtering paper," and may be bought in packets, ready cut into circular form, or in sheets. The paper should be simply folded into the form of a cone or plaited concertina fashion, then placed in the

funnel and the liquid carefully poured down the side of the filter to prevent the paper breaking. For straining a liquid, to remove any foreign substance or dirt that may have got into it, the medium used must depend upon the consistency of the liquid. For instance, for thick syrupy fluids, flannel or fine muslin may be used; for thin watery solutions, absorbent wool or tow is best, it being simply necessary to place the medium in the neck of the funnel and run the liquid through it. When it is necessary to filter a large quantity of liquid containing heavy solid matter, it is a good plan to use two thicknesses of paper, or place a second small filter paper arranged as a cap to strengthen the cone and prevent breakage. The folded filter paper should be somewhat smaller than the funnel in which it is placed, as a projecting, badly cut, or torn filter, wastes the liquid both by absorption and evaporation. The paper itself should never be quite filled with liquid, but a margin of about an inch left at the top. When filtering liquids that rapidly evaporate on exposure to the air, such as alcohol, the top of the funnel should be covered.

The pill machine is the appliance used for rolling and cutting a mass into pills. It consists of two parts, one of which rests on the counter, while the other is used with the hands. The latter consists of a flat piece of wood about

three or four inches wide with a handle at each end. One side is used as a roller, while the other, to which a brass plate with hemispherical grooves running across in parallel lines is attached, is employed as the cutter. The larger and stationary part of the machine also consists of two portions, one being flat for rolling, and the other fitted with a corresponding grooved brass plate which exactly coincides with those in the other part.

The operation of rolling and cutting a mass into pills is carried out in the following manner. The mass having been worked to a proper and plastic consistence, it is rolled out on the flat part of the machine by pressure with the upper part, into a pipe or long cylinder of the required length. It is then placed across the metal grooves, the cutter placed over it, and then by slight pressure and a sharp rolling movement, the pipe is cut and formed into pills. The pills are rounded or finished by being placed under a perfectly smooth disc of hard wood, having a rim to prevent them escaping, and being rapidly revolved on the flat part of the pill board. The ordinary pill machines are made to cut from twelve to twenty-four pills of from 1 to 5 grains in weight.

The plaster spatula used for spreading plasters consists of an oblong iron blade about four inches in length, which is attached to a curved shank

having a wooden handle. The under edges of the blade are bevelled and the whole sometimes slightly curved. Another form of spatula is heated with gas. It is made hollow throughout and connected with the gas pipe by means of a rubber tube. The upper part of the blade is perforated with small holes, through which the gas passes, and on being ignited soon warms the metal and keeps it at a suitable heat.

Suppository and pessary moulds are usually made of gun metal and nickel-plated. They vary in size, and are constructed to make six, twelve, or twenty-four cones. They divide down the centre into two sections, which are held together by means of a screw.

Palette knives and spatulas for mixing ointments, etc., are made of metal, bone, and vulcanite, and may be had stiff or pliable.

A few small porcelain dishes, an iron tripod stand, glass stirring rods, glass flasks and beakers, all go to make up the practical necessities of the dispensing counter.

CHAPTER VI.

MEDICINES FOR INTERNAL USE—MIXTURES.

THE methods employed for the administration of drugs may be divided into two classes, *viz.*: (1) Those for internal use, (2) those for external application. The former includes mixtures, draughts, drops, emulsions, pills, powders, cachets, capsules, and tablets. The latter consists of liniments, lotions, ointments, pastes, plasters, and blisters. Suppositories and pessaries are administered per rectum.

On receiving a prescription to compound, the dispenser's first duty is to read it through carefully, then to consider the best method of preparing it. If intended for internal use, the dose of each ingredient should be noted and the frequency of its administration. If any of the ingredients ordered are likely to be incompatible when brought together, precautions must be taken to prevent such reaction as far as possible. The course of preparation adopted should be that which will best preserve the properties of the drugs used, and at the same time carry out the intentions of the prescriber.

MIXTURES.

The mixture is the name given to a liquid medicine for administration by the mouth, consisting of more than one dose. The dose may range from 1 drachm to 2 ounces, according to the directions of the prescriber. The quantities prescribed vary from 1 ounce upwards. The mixtures usually ordered are of 2, 3, 4, 6, 8, 10, or 12 ounces. They may consist of solid substances suspended or dissolved in water or in a watery vehicle, consisting of an infusion or decoction combined with other preparations, or they may take the form of a simple mixture of tinctures, spirits, and syrups, diluted with water.

When dispensing a prescription it is not necessary to mix the ingredients in the order in which they are written. Where solid bodies are ordered they should be dealt with first, and, if soluble, they should be at once dissolved in a portion of the water or other liquid with which the mixture is to be made up. This may usually be done by placing them together in a bottle and shaking well till dissolved. When a mixture is simply composed of liquids the tinctures or other preparations should first be mixed together, and water then added to make up the quantity ordered. If, as we have previously stated, any of the ingredients are likely to pro-

duce a chemical reaction when mixed together, and such is evidently not the intention of the prescriber, endeavour must be made to prevent it as far as possible. Thus, if an acid be brought into contact with an alkaline body, we shall have a reaction that will probably burst the bottle. Such antagonistic bodies should be well diluted before being mixed together. Hydrocyanic acid and other volatile liquids, when ordered, should always be added to the mixture last of all, and the bottle corked immediately afterwards.

When making a mixture some dispensers prefer to mix the various ingredients in a glass measure of suitable capacity, and when completed, transfer the whole to the bottle, but in most cases the best plan is to mix the various articles in the bottle, then after adding the water, transfer the whole to a measure to confirm that the quantity is correct.

When insoluble bodies such as the carbonates of bismuth or magnesia are included in a mixture, they should be placed in a mortar and well triturated with a portion of the water till thoroughly diffused throughout the liquid. Mucilage is usually added to mixtures containing insoluble powders in order to suspend them. To all bottles containing mixtures in which there is any insoluble matter, a "shake the bottle" label should be affixed. Some drugs, such as butyl-chloral hydrate, codeine, are much more

soluble in spirit than water. When drugs of this kind are met with in a mixture, advantage should be taken of any tincture or spirit included in the prescription to act as a solvent before adding the water.

In some cases, as, for instance, when bulky crystals such as sulphate or phosphate of soda or sulphate of magnesia in quantity are prescribed, which take a long time to dissolve in the cold, hot water may be used.

To illustrate the compounding of a prescription for a mixture, we will describe exactly how the following should be dispensed :—

℞ Potass. Bicarb., ℥ii.
Potass. Bromid., ℥i.
Tinct. Calumb., ℥ss.
Spt. Chlorof., i.
Syr. Aurant., ℥i.
Aquæ ad ℥viii.
Misce. Fiat mist.

In this prescription we have two solid and three liquid bodies to be made into a mixture with water as the vehicle. It will be well to note here, that when the word "aquæ" is followed by "ad" or "adde," sufficient water is to be added to the other ingredients to make up the mixture to the given quantity. When no directions are given "to add," the exact quantity of water ordered is to be used. To proceed with the mixture, an eight-ounce bottle should be half-

filled with water, and the bromide of potassium and bicarbonate of potassium having been carefully weighed and placed on a piece of paper, may then be introduced into the bottle. As both these salts are readily soluble in water, if the bottle be shaken briskly for a minute or two, solution will soon be effected. This being done, measure the requisite quantities of tincture of calumba, spirit of chloroform, and syrup of orange, and add to the solution in the bottle. Shake again to mix well, and add sufficient water to fill the bottle. Before corking see that the mixture measures exactly eight ounces by transferring it to a glass measure; also examine it carefully for the presence of any foreign matter or dirt that may have found its way in. If such be present, strain the liquid back into the bottle through a little fine tow or absorbent wool, then cork, shake well for a few minutes, and the mixture is ready for labelling.

But it must not be supposed that every mixture is as easy to prepare as the one we have just described, and we will now consider some of the difficulties the dispenser is likely to meet with, and the best methods of dealing with them. First as to solubility. The student will find it a good plan to commit to memory the solubility of the ordinary solid substances used in medicine. If the quantity of a solid ordered in a mixture is more than the water will dissolve,

the undissolved portion should not be strained out, but directions to shake the bottle should be affixed. Hot water will be found to aid solution in many cases. Thus gallic acid is soluble only 1 in 100 of cold water, and in boiling water 1 in 3, but it rapidly re-crystallises out on cooling. This drug should be rubbed down in a mortar as fine as possible, cold water being added gradually. When ordered together with potassium citrate it dissolves readily. The frothing caused on shaking up citrate of iron and quinine will speedily subside on the addition of a few drops of alcohol. It is necessary when dispensing the potassio-tartrate or the pyrophosphate of iron to rub them down in a mortar with hot water to effect solution. Tincture perchloride of iron and mucilage of acacia when mixed together form an unmanageable jelly, but if the tincture be well diluted with water before the mucilage is added, this can be prevented. Tinctures containing resinous matter, such as guaiacum and Indian hemp, on dilution with water, will precipitate their resin. This may be avoided if the tincture be first triturated with a small quantity of mucilage of tragacanth or acacia and the water added gradually.

CHAPTER VII.

DISPENSING DIFFICULTIES—INCOMPATIBLE MIXTURES.

OF the many difficulties that may present themselves from time to time to the dispenser we can only mention a few, but they will serve to illustrate the fact that, with a little forethought and skill, an unsightly appearance in many compounds may be avoided.

The preparations of iron are a fruitful source of trouble. They are incompatible with alkalies and their carbonates, and also turn black or darken all vegetable astringents that contain tannic acid. In preparing a mixture of solutions of dialysed iron and arsenic, with glycerin and water, care must be taken not to add the solution of arsenic until the iron has been well diluted with water, otherwise a precipitate will be formed. When powdered gum tragacanth is met with in a mixture, advantage should be taken of any alcoholic liquids ordered in the prescription to mix them with the gum before adding the water, when by vigorous shaking a mucilage can easily be formed. Quinine is incompatible with all alkalies, their carbonates, and iodides. When

mixed with vegetable infusions containing tannic acid, a precipitate of tannate of quinine is thrown down. Salts of quinine is readily soluble in acids, tincture perchloride of iron, and aromatic spirit of ammonia, but is precipitated from the latter on the addition of water.

In the following prescription the whole of the menthol (if the tincture of iodine be added to it and the glycerin) will collect and form a cake on the top of the liquid :—

℞ Tr. Iodi., ʒv.
Menthol, ʒiss.
Glycerin, ℥i.
Aquam, ad. ℥iv.

This may be prevented if prepared in the following manner: Dissolve the iodine and potassium iodide (composing the tincture) in the water, then powder the menthol and rub it up with the glycerin, adding the rectified spirit of the tincture last of all.

In the following mixture decomposition takes place owing to the action of the spirit of nitrous ether on iodide of potassium :—

℞ Potass. Iodid., ʒiss.
Tr. Digital., m. xxx.
Spt. Æther Nitros, ʒvi.
Syr. Simpl. ℥i.
Aq. ad. ℥viii.
Misce.

This may be prevented by neutralising the spirit

of nitrous ether with a little bicarbonate of potash before adding it to the mixture.

Quinine sulphate and salicylate of soda when ordered together in a mixture are a frequent source of difficulty, as instanced in the following :—

℞ Quinæ. Sulph., grs. xii.
Acid. Hydrobrom., Dil., ʒiss.
Sodii Salicylas, ℈ ii.
Syr. Simpl., ʒvi.
Aquæ, ad. ℥vi.
Misce.

In preparing this mixture the quinine sulphate should first be dissolved in the hydrobromic acid and diluted with three ounces of water and the syrup. Then dissolve the sodium salicylate in the remainder of the water, and add slowly to the previous solution, shaking gently between each addition.

The following prescription cannot be properly dispensed as written, owing to the sodium bicarbonate causing the precipitation of the cocaine :—

℞ Sol. Cocainæ Hydrochlor., 2 per cent.
Sodii Bicarb., ʒss.
Glycer. Boracis, ʒi.
Ac. Carbol., m. v.
Aquæ, ℥i.
Misce.

If ten grains of sodium chloride be used in place

of the sodium bicarbonate the reaction is prevented.

In the next example a double reaction takes place, resulting in the formation of insoluble calcium sulphate and iron hypophosphite. This cannot be avoided.

℞ Potass. Chlorat., ℥ss.
Calci. Hypophosph., ℥ss.
Magnes. Sulph., ℥i.
Ferri. Sulph., grs. xii.
Liq. Strych., ṃ. xii.
Aquæ, ℥vi.
Misce.

In incompatible mixtures of this class the dispenser must endeavour to prepare them in as presentable a condition as possible.

Perchloride of mercury is incompatible with mucilage of acacia, albumen, and gelatine, forming insoluble masses. With iodide of potassium, a precipitate of iodide of mercury is thrown down, which must always be carefully avoided in dispensing. It should never be brought into contact with metals, especially in the presence of moisture, and the student must beware of using a damp palette knife with this salt. When dispensing the perchloride with mucilage, the former must always be well diluted with water before adding the latter, or an unmanageable mass will be produced. The subjoined prescription illustrates a mixture of this kind ;—

℞ Hydrarg. perchlor., grs. iv.
Mucil. Acacia, ℥iv.
Spt. Chlorof., ℥ii.
Liq. Potass., ℥i.
Aquæ, ad. ℨiii.
Misce.

When dispensing this, the perchloride of mercury should first be dissolved in an ounce of the water, and the mucilage then be added. Dilute the solution of potash with the remainder of the water, mix the solutions and finally add the spirit of chloroform.

It will be well to bear in mind the following list of incompatible substances. The vegetable alkaloids are nearly all precipitated by tannic acid. Acacia mucilage is incompatible with alcohol, sulphuric acid, borax, perchloride of mercury, persalts of iron, and subacetate of lead renders it gelatinous; acid gallic with spirit of nitrous ether, and metallic salts; acid hydrochloric with salts of silver and lead, tartarated antimony, and alkalies; acid nitric with alcohol, alkalies, oxides, sulphate of iron, acetate of lead, and carbonates; acid tannic with mineral acids, alkalies, salts of antimony, lead, and silver, persalts of iron, vegetable alkaloids, and gelatine; ammonia carbonate with acids and acidulous salts; tartarated antimony with gallic and tannic acids, the alkalies, lead salts, and astringent infusions; antipyrine with hydrocyanic acid,

tannic acid, butyl-chloral hydrate, chloral hydrate in strong solutions, astringent infusions, nitrites in solution, and astringent tinctures, sodium salicylate, when mixed with spirit of nitrous ether, turns green in colour; bismuth subnitrate with potash, soda, and ammonia, and their carbonates; cinchona preparations with ammonia, antipyrine, metallic salts, and gelatine; digitalis preparations with sulphate of iron, tincture of perchloride of iron, preparations of cinchona and acetate of lead; iron and ammonia citrate with mineral acids, vegetable astringents, and fixed alkalies; iron and quinine citrate with alkalies and their carbonates, tannic acid, and vegetable astringents; iron perchloride with alkalies and their carbonates, magnesia and its carbonate, vegetable astringents blacken it, and all vegetable infusions are darkened in colour with the exception of quassia and calumba; mercury perchloride with alkalies and their carbonates, tartarated antimony, nitrate of silver, acetate of lead, albumen, iodide of potassium, soap, and decoction of cinchona; mercury subchloride (calomel) with alkalies and their carbonates, sulphides, hydrocyanic acid, bitter almonds, lime water, iodide of potassium, iodine, nitric acid, salts of iron, lead, copper, nitrate of silver, and soap. Soap should never be used as an excipient for pills containing calomel. Magnesium

sulphate with alkaline carbonates, and acetate of lead; morphine hydrochlorate with alkalies, astringent infusions and decoctions; opium preparations with alkaline carbonates, salts of lead, iron, copper, and zinc, solution of arsenic, and vegetable astringents; subacetate of lead solution with hard water, mineral acids and their salts, vegetable acids, iodide of potass, all astringents, preparations of opium, and albuminous liquids; potassium iodide with bismuth subnitrate, spirit of nitrous ether, decoction of liquorice, preparations containing starch or acid, and vegetable alkaloids; potassium permanganate decomposes when mixed with organic bodies; quinine with all alkalies and their carbonates, astringent infusions, salicylic acid and its salts; infusion of roses with alkalies and borax turns green in colour; spirit of nitrous ether with antipyrine, iodide of potassium, tincture of guaiacum, sulphate of iron, gallic and tannic acids.

CHAPTER VIII.

DRAUGHTS—DROPS—EMULSIONS.

THE draught is the name applied to a liquid medicine, the whole of which is to be taken for a dose. During the early part of the last century the draught was the most popular method of administering medicine in liquid form, it being customary with medical practitioners to prescribe each dose in a separate bottle. When two doses are dispensed in one bottle a strip of paper should be affixed, showing an accurate division of the liquid. Draughts may vary in quantity from ½ to 2 ounces. They are prepared in a similar manner to mixtures, *viz.*, first dissolving the solids in the liquid menstruum, then adding the fluids; or, if the solid substances are insoluble in water, they should be stirred in a mortar with a little mucilage in order to suspend them, then placed in the bottle and labelled with directions to shake.

Drops for internal use is the term applied to a medicine in concentrated form, the dose of which is ordered to be taken in drops, diluted with water by the patient. It may be in the

form of a tincture, or simply a mixture of tinctures, and rarely gives the dispenser trouble.

Drops are also frequently ordered for application to the eyes or ears. The former require considerable care in preparation, especially when minute quantities of alkaloids are ordered. When the quantity is too small to be weighed in the ordinary dispensing scales, a solution of definite strength should be made, from which an exact equivalent of the weight may be measured off. Solutions containing nitrate of silver and eserine should be sent out in coloured glass bottles to prevent the action of the light on the drug, and distilled water must always be used. Drops should be dispensed in glass-stoppered bottles, and the stopper capped with skin or parchment paper.

EMULSIONS.

An emulsion is the name given to a mixture of an oil, fat, or resin, with water, it being rendered more or less permanent by the aid of another body such as a gum or an alkali, which medium is called the emulsifying agent. Milk may be taken as an example of an almost perfect natural emulsion.

If we half-fill a bottle with olive oil, then add an equal quantity of water, and shake them together vigorously for a few minutes, the oil

for a time will appear to have mixed with the water, forming an opaque mixture; allow it to stand for a short period and it will soon separate into two distinct liquids again. But if a small quantity of liquid ammonia be mixed with the oil before the water, and then the latter added gradually, and the bottle well shaken, a milky liquid will result, which will not readily separate on standing. In this case the ammonia acts as the emulsifying agent or medium, in breaking up the oil globules and so rendering them miscible with water. A perfect emulsion should be of a creamy consistence, exhibit no oil globules, and not separate on standing. Some oils emulsify with one agent better than another. One will form a better emulsion with mucilage than with an alkali; for another, yolk of egg will be found the best medium; therefore the dispenser must note from practical experience the right agent to employ in order to get the best result.

In making an emulsion a great deal depends on manipulative skill, and the manner in which the operation is conducted. While some oils simply require to be shaken up in a bottle with the emulsifying agent, others need careful trituration or stirring in a mortar.

The former method is usually adopted when alkalies, such as solutions of potash or lime, or tinctures of quillaia or senaga, are employed as emulsifying agents. As an example of this class

we may take the following process, which should be adopted for emulsifying balsam of copaiba.

The bottle should first be half-filled with water, then 2 or 3 drachms of solution of potash added. The copaiba should then be poured in, without being allowed to touch the neck or sides of the bottle; shake the liquids together vigorously until they assume a creamy consistence. The remainder of the water may then be added in small quantities at a time, the bottle being well shaken after each addition. Copaiba may also be emulsified with acacia mucilage In this case the mucilage and copaiba are mixed well together in a mortar and the water then added gradually.

Cod-liver oil may be emulsified with tincture of quillaia and lime-water in a similar manner. One drachm of the tincture is sufficient to emulsify 2 ounces of oil. Fill the bottle half full of water, to which add the tincture, and mix. Then pour in an ounce of the oil and shake well until the oil globules are broken up; add another portion and repeat the agitation, and so on until all the oil is emulsified.

Cod-liver oil forms an excellent emulsion also with powdered gum acacia if carried out in the following manner: Place 6 drachms of finely powdered gum acacia in a mortar, and add to it, while stirring constantly, 3 ounces of cod-

liver oil, which has been previously flavoured with a suitable essential oil, such as almonds or cinnamon. Ten drachms of water may next be added, the mixture being stirred quickly but lightly until it has a creamy appearance. The remainder of the water may now be added gradually, and any other liquid it is required to mix with it, the whole to form a product measuring 6 ounces.

A good emulsion of cod-liver oil may also be made with mucilage of Irish moss. Resinous bodies are usually emulsified with powdered gum acacia.

When mucilage, powdered gum acacia, tragacanth, Irish moss mucilage, or yolk of egg are used as emulsifying media, trituration in a mortar is necessary. With this method the pestle requires skilful handling. The motion should be quick, light, and regular, care being exercised to stir in one direction only, and not to reverse it during the process. It is well to remember that in most cases the body to be emulsified must be added to the agent in small quantities at a time, each portion being thoroughly mixed before the next is added.

Castor oil may be emulsified with gum acacia in the following way: To one part of the powdered gum in a mortar, add gradually two parts of castor oil, and triturate well with the pestle

until thoroughly mixed, then add all at once 2 ounces of water, and again triturate till the oil is completely emulsified. Flavouring may now be added, and more water if required.

Sweet oil of almonds may be emulsified with solution of potash or ammonia. Spermaceti, or other solid fats, with yolk of egg. Balsam of Peru and tincture of benzoin, with yolk of egg. Oil of male fern with mucilage, powdered acacia, or tincture of quillaia.

The admixture of glycerin or spirit is usually fatal to the formation of a good emulsion.

Turpentine may be emulsified with yolk of egg or soap. To prepare the yolk, the egg-shell should be fractured about the centre by means of a sharp blow with a knife. Allow all the albumen to escape, then place the yolk in a mortar, break, and stir it well, and add the turpentine to it in small quantities, stirring constantly until they are thoroughly incorporated.

When soap is used as the emulsifying agent, it should be placed in a mortar, and the turpentine added to it gradually, in small quantities, with rapid trituration.

Each of the methods we have mentioned should be tried and practised by the student repeatedly, until the art of making a good emulsion is acquired.

CHAPTER IX.

PILLS AND THEIR EXCIPIENTS.

PILLS are a common method of administering drugs in solid form, and are very largely prescribed by medical practitioners, especially when they wish to give medicinal agents which cannot readily be given in solution. They are made of various sizes, generally weighing from 1 to 5 grains. The ingredients prescribed in pills vary greatly, and beside the pill masses of the pharmacopœia, various combinations of extracts, gum-resins, alkaloids, and other active principles are met with in prescriptions.

The first step necessary in compounding pills is to work the ingredients ordered into a plastic mass of suitable consistence, an operation which is sometimes attended with difficulty. This having been accomplished satisfactorily, the second stage is purely a mechanical one, and simply consists in rolling and cutting the mass and forming it into pills with the aid of the pill machine. To make a pill mass it is first necessary to bind the ingredients together, and the

medium which is usually added for this purpose is called the excipient.

In the choice of this *excipient*, in the majority of cases, lies the solution of the difficulties met with in the art of pill-making. Occasionally pills are ordered to be made simply of soft extracts, as in the following instance :—

℞ Ext. Colocynth Comp., gr. ii.
Ext. Hyoscyam., gr. i.
Ext. Taraxaci, gr. i.
Misce fiat pil. i.

In this case it is necessary to add some inert powder, such as powdered marshmallow root, in order to form the extracts into a firm and suitable mass. So *dry* as well as *liquid excipients* are necessary in pill-making, their use depending entirely on the nature of the ingredients ordered.

The procedure usually adopted in preparing a pill mass is to place the dry ingredients in the mortar first, and powder them as finely as possible. This is especially essential when a crystalline substance such as sulphate of iron is being dealt with. Then carefully add sufficient of the excipient to make a mass, which should be adhesive enough to form a firm pill and just sufficiently soft to roll. In massing the ingredients the pestle should be used with a lever-like motion, in order to induce thorough incorporation. It is necessary that the dispenser should have a knowledge of the composition of

the ingredients used, in order to know the best excipient to employ. Thus, if none of the substances ordered contain a gum or other adhesive body, it is well the excipient should do so. On the other hand, should the ingredients be of a gummy or resinous nature, a liquid excipient may be used to bind the particles of powder into a solid mass. Care must be exercised not to use too much excipient, and so make the mass soft. The right amount can soon be judged with practice. When a very small quantity of an alkaloid such as strychnine or other powerful poison is ordered, it should be placed in the mortar and triturated with a little sugar of milk, in order to ensure perfect distribution throughout the mass. When essential oils are prescribed, they should be placed in the mortar last, and thoroughly well triturated with the other ingredients before massing. When the prescriber orders a certain excipient to be used, the dispenser should always employ it, except when he finds it is absolutely necessary to use another. If the prescriber leaves the size of the pill to the discretion of the dispenser, as shown in the following prescription: ℞. Hydrarg. Subchlor. gr. $\frac{1}{6}$, fiat pil. i., it should be made as small as possible with the aid of sugar of milk, liquorice, or althæa powder, and each pill when finished should not weigh more than 1 grain. Always make a note in the prescription-

book of the excipient employed and the weight to which the pills have been made up. To make the process as clear as possible to the student, we will describe how the following prescription, which is a very common one, should be made :—

℞ Ext. Aloes, gr. ii.
Podophyl. Resin, gr. $\frac{1}{6}$.
Euonymin, gr. i.
Pulv. Zingib., gr. ss.
Misce fiat pil. i.
Mitte xii.

In this case all the ingredients in the prescription are of a dry nature. The extract of aloes should first be reduced to fine powder, then the other ingredients added, and the whole thoroughly mixed. Compound decoction of aloes forms an excellent excipient when any preparation containing aloes is included among the ingredients; so in this instance, four or five drops of decoction of aloes placed in the mortar and well worked with the pestle will form an excellent mass. The mass, when finished, should present a perfectly homogeneous appearance throughout. Every particle should be scraped from the mortar and pestle. If crumbly or gritty it will not roll, and should be replaced in the mortar and worked up again with a little more of the excipient. It should be worked for a few moments between the fingers after being

taken from the mortar to see it is sufficiently plastic, then placed on the board of the pill machine, which has been previously dusted over with a small quantity of powdered French chalk or magnesia to prevent sticking. With the flat side of the cutter, roll it out into a pipe of the required length, then place on the grooves and quickly cut into the number of pills ordered. A smooth surface and finish may be imparted by giving them a few rapid turns on the board under the pill finisher. They should be allowed to stand a short time to dry, after which they may be finished off by shaking them up with a small quantity of French chalk, lycopodium or magnesia; or they may be silvered, varnished, coated with gelatine, French chalk or sugar, as desired.

EXCIPIENTS.

The nature of the excipient used in pill-making necessarily depends on the composition of the drugs it is desired to mass. For bulky powders, such as ipecacuanha, jalap, and rhubarb, etc., simple syrup or treacle are good media. For resinous drugs, equal parts of spirit and acacia mucilage may be used, or when aloes is included, the compound decoction forms an excellent mass. Where moisture is necessary the mucilage of tragacanth or acacia will be found

useful. For dry powders that require the addition of an adhesive body to bind them, the confection of roses, or glycerin of tragacanth answers best. The latter is a most useful all-round excipient, and very generally employed. It should be the consistence of a stiff jelly, and is made as follows: Take of powdered gum tragacanth, 1 drachm; glycerin, 4 ounces; water, 1½ drachms; rub them together in a mortar, then heat over a water bath for ten minutes, and allow to cool and set.

Among other useful excipients is powdered soap, which is employed for massing powdered opium, and with liquorice powder for making creosote pills. Bread-crumb (which should be a day old), for massing calomel, and balsam of Peru, etc. Honey, for dry powders, and manna, for nitrate of silver, calomel, etc. Confection of roses, for woody powders, but it must not be used with sulphate of iron or tannic acid. Kaolin ointment, for permanganate of potassium and nitrate of silver. Powdered gum acacia, tragacanth, liquorice or marshmallow powder, may be added to soft extracts to render the mass a suitable consistence.

There are certain drugs which present special difficulties to the dispenser and which need special excipients, as, for instance, carbolic acid, creosote, and phosphorus. These drugs require

experience and careful manipulation to form into a good pill mass, and a great deal also depends on the method employed.

Liquids such as essential oils are best massed with curd soap and some dry inert powder in order to give firmness.

Usually ½ grain of soap and about 3 grains of liquorice or marshmallow in powder will be sufficient to mass 1 minim of oil.

CHAPTER X.

A FEW DIFFICULTIES IN PILL-MAKING—FINISHING AND SILVERING—PEARL COATING, KERATIN COATING, GELATINE COATING AND VARNISHING.

CHLORIDE of ammonium is a difficult salt to work into a pill mass, but with the aid of a small quantity of soluble cream of tartar a good result can be obtained. Benzoic acid can be massed with Canada balsam, 1 to every 4 grains of the acid, or with glycerin, using 1 drop to 5 grains. Antipyrine with glycerin of tragacanth, or powdered gum and water. Nitrate of bismuth forms a good pill with soluble cream of tartar, or powdered gum tragacanth, and a few drops of water. Balsam of Peru with bread-crumb or bees-wax. Calomel may be made into a firm pill with the aid of confection of roses or manna and compound tragacanth powder. Calcined magnesia should not be used for rolling a mass containing calomel. In massing camphor, it should first be reduced to very fine powder with the aid of a few drops of spirit, then worked up with glycerin of tragacanth and powdered soap. Chloral hydrate must also be reduced to a very fine powder, when it may

be massed with syrup and powdered tragacanth, or Canada balsam, $^1/_2$ gr. to each 5 grs. of chloral, and made into pills. Ergotine, which is usually semi-liquid, should be very carefully evaporated over a water bath, and brought to a proper consistence by the addition of powdered gum acacia. Thin extracts may require the addition of compound tragacanth powder or gum acacia to form a firm mass. Grey powder may be made into a satisfactory pill with confection of roses, care being exercised not to work it too hard, or the mercury will separate, and be found at the bottom of the mortar. Bromide and iodide of potassium, after being reduced to a fine powder, form a good mass with liquorice powder, tragacanth and a few drops of water, or with confection of roses. Permanganate of potassium decomposes when mixed with organic substances; therefore, after reducing to powder, it must be massed with kaolin or resin ointment. An excellent quinine pill can be made by adding 1 grain of tartaric acid to every 10 grains of quinine and a drop of water.

Of the liquids that are likely to give the dispenser trouble, we will first consider creosote. Most dispensers have their favourite method of forming this drug into a pill mass, but the success of the result depends largely on the manipulation. An excellent method of making a firm mass is to well mix 1 part of creosote

with 5 parts of liquorice powder and 1 part of powdered soap; another, with powdered liquorice and glycerin of tragacanth. A good pill may also be formed with calcium phosphate and hard soap as excipients. The student should practise all these methods until a good result is obtained.

Carbolic acid may be massed by incorporating 2 parts, with powdered marshmallow 3 parts, and glycerin $^1/_4$. A firm pill may also be formed with liquorice and soap in the following proportions: Carbolic acid, 1 part; powdered soap, 1 part; liquorice powder, 5 parts. Balsam of copaiba should be mixed with calcined magnesia or slaked lime and allowed to stand for some hours, when it may be massed with the aid of a small quantity of bees-wax.

Essential oils require the addition of calcined magnesia and powdered soap, or calcium phosphate and soap, to form a workable mass.

Croton oil can be made into a firm pill with bread-crumb, magnesia and soap, or powdered liquorice and glycerin of tragacanth.

Tar should be massed with lycopodium, and oil of turpentine with calcined magnesia and white wax.

Phosphorus is a somewhat difficult substance to form into a satisfactory pill, and the student must be wary in handling it. In the first place a solvent is necessary, and in the second the

solution must be incorporated with a suitable base. Bisulphide of carbon is one of the best solvents for phosphorus, but chloroform and theobroma oil answer the purpose well.

Phosphorus pills should be coated or varnished soon after being made, and kept in a dark place in well-closed amber-coloured bottles.

FINISHING AND COATING.

Of the various methods of finishing and coating pills used in pharmacy, silvering is the process most frequently employed.

The pills to be silvered should be kept free from powder and have a smooth surface. They should first be shaken up in a willow box or covered pot, with a drop or two of mucilage, until they have received a thin coating of the gum; then turn them into a clean glazed covered pot in which a sheet or two of silver leaf has been placed and rotate them rapidly for a few minutes. The superfluous silver may then be blown off and the pills placed into another clean pot, in which they should again be rapidly rotated for a few minutes. The process for varnishing pills is very simple; all that is necessary is to place them in a covered pot, with a small quantity of the varnish, and shake them for a few moments until they are evenly coated, then turn them out on a flat plate to dry. A good varnish can be

made by dissolving one part of gum sandarach in one part of absolute alcohol.

To give pills a pearl coating is an operation that requires some dexterity, and is not by any means an easy one; but with practice good results may soon be obtained.

The following is a simple method: Moisten the pills by shaking them up in a pot with just sufficient of a mixture of mucilage of acacia, 1 drachm; syrup, 1 drachm; water, 5 drachms; spirit, 1 drachm; then turn them into a round-bottomed covered pot about half filled with the following powder: Powdered French chalk, 6 drachms; and rice starch, 2 drachms. Rotate the covered pot rapidly and evenly until the pills have received a white coating, then transfer them to a clean pot without any powder, and rotate again until they are polished. Pills to be coated must be well rounded, hard, and free from powder.

Keratin coating is used for pills that are intended to pass through the stomach and into the small intestine before being dissolved. Keratin is prepared in alkaline and also in acid solution, the alkaline being employed for alkaline medicines, and the acid for those that are acid. Keratin is prepared by digesting the parings of horn with a liquid consisting of pepsin, 1 part; hydrochloric acid, 1 part; and water, 11 parts, so long as anything is removed. The residue is then

dissolved in ammonia by prolonged maceration for several weeks, and the solution evaporated.

The alkaline solution is made by dissolving 7 parts of this dried keratin in 100 parts of a mixture of equal volume of ammonia and alcohol, the acid solution of the same strength in acetic acid. A fatty excipient should be used for the pill mass, and no dusting powder, the pills being dipped in melted cocoa butter before coating. Coating is carried out by shaking the pills up in a covered pot with the solution, the process being repeated several times.

Pills may be coated with gelatine by placing each on the point of a fine needle, dipping them separately into a warm solution of gelatine, then placing the other end of the needle in a pincushion, and allowing them to dry and become hard. The gelatine solution for coating should be made as follows: Dissolve 2 parts of gelatine in 8 parts of water over a water bath, and strain through muslin.

CHAPTER XI.

POWDERS — GARGLES — CACHETS — CAPSULES— TABLETS—ENEMAS—HYPODERMIC INJECTIONS— PASTILLES.

POWDERS are another method of dispensing medicine in a dry form. For internal administration, if small in bulk, they are usually directed to be taken dry, by being placed on the tongue, or dissolved or stirred in a little water. They may consist of a single drug or a mixture of several, each dose being divided and wrapped separately in paper. In the latter case, the ingredients after being weighed, must be placed in a mortar, reduced to fine powder, and well mixed together. The requisite number of pieces of paper having been spread out on the counter, the total amount for each powder must be weighed separately, and then neatly folded in the usual manner. The quantities should never be guessed. Glazed white paper of good quality should always be used for wrapping powders, and the utmost neatness observed in folding, so that each may be exactly similar in shape and size. Drugs of a volatile nature should be folded in tinfoil or waxed paper, and enclosed in white paper afterwards.

Powders may also be ordered for external use, such as for dusting on the skin or for insufflation. In such cases they should be finely sifted after mixing and dispensed in wide-mouthed bottles or in suitable boxes.

GARGLES.

The gargle is the term applied to a liquid medicine used as an application for affections of the mouth, palate, and fauces. Gargles are usually composed of salts in solution, combined with certain astringent preparations, or glycerin. They rarely present any difficulty to the dispenser, and are prepared in a similar manner to mixtures. Chlorate of potassium is very frequently met with as an ingredient in gargles. In dissolving it, the use of the mortar is necessary. Any portion undissolved must also be placed in the bottle, which should be labelled with directions to shake.

The following gargle is frequently prescribed with the object of exhibiting chlorine in solution, the gas being liberated by the action of the hydrochloric acid on chlorate of potassium.

℞ Potass. Chlorat., ℥i.
Acid Hydrochloric, m. xvi.
Glycerin pur., ℥i.
Aquæ ad. ℥viii.
Misce ; fiat gargar.

In dispensing this prescription, the chlorate of potassium should be placed in the bottle first, and the hydrochloric acid added to it. Cork the bottle loosely, and allow the gas to evolve. When the bottle is apparently full of the yellowish gas, add about four ounces of water and shake well for some time, then add the glycerin, and after further shaking for several minutes, make up to the required quantity with water.

CACHETS.

The method of administering insoluble and unpalatable drugs in an envelope composed of thin wafer paper called a cachet, has been largely employed on the continent, and France in particular, for a considerable time. Within recent years this mode of administration has become very popular in our own country. The cachets in general use consist of two circular bowl-shaped discs with flat edges. The drug to be enclosed should be reduced to fine powder, and then packed into the bowl part of one of the discs. The edges of another disc, having been slightly moistened, are placed over that containing the powder, and the edges or rims pressed together. Several handy machines are made, by means of which a dozen or more cachets can be filled and sealed with very little trouble. In this form the most nauseous drugs

may be easily swallowed by the most fastidious patient.

CAPSULES.

The capsule is another method of administering both solid and liquid medicines which has become very popular with prescribers. For liquid medicines, flexible capsules of gelatine are made to hold from 5 to 30 minims. They are usually egg-shaped in form, with an aperture at one end, by means of which they are filled with the aid of a pipette, or small syringe. They are sealed by passing a camel-hair brush charged with a solution of gelatine over the aperture, then allowing it to become hard. They should afterwards be polished by gently rubbing with an oiled cloth. By this method, terebene, eucalyptus oil, creosote, cascara sagrada, cod-liver oil, and castor oil can be readily swallowed without tasting the drug. Flexible capsules are now also largely used for administering the ingredients contained in Blaud's pill, with various combinations. For administering solids, cylindrical capsules are made of thin but firm gelatine, with a cap, or top, which may be removed to insert the drug. After filling, the cap is replaced and the joint sealed with a solution of gelatine.

TABLETS.

This method of administering drugs in a compressed form is now very largely used. Tablets are generally manufactured on a large scale. They may be composed of a single drug or a combination of several, mixed with some inert adhesive powder and compressed into small lenticular discs. There are several varieties of hand machine in use, which are fitted with steel dies, for making 1, 3, 5, and 10 grain tablets. The plunger used as a compressor is worked by a lever. The powdered drug is compressed between two concave surfaces, and so formed into a tablet. The three main points in tablet-making are: First, to carefully regulate the pressure; second, to ensure proper cohesion of the particles of substance under compression; and, third, to prevent adhesion of those particles to any part of the machine. The material to be compressed should not be too finely pulverised, but be reduced to a granular powder. It may be prepared by simply damping with ether or alcohol, or by rubbing up with a little powdered soap and afterwards passing through a sieve. In other cases, powdered gum acacia, starch, or sugar, are mixed with the drug.

ENEMAS.

The preparation of enemas in most cases comes more within the province of the nurse

than the dispenser. The amount of fluid administered by this method varies from 2 to 30 ounces for adults. The manner of preparing the ordinary enemas of gruel, soap, olive and castor oils, we need not describe. The pharmacopœia formerly included five medicated enemas, *viz.*, aloes, asafœtida, sulphate of magnesia, opium and turpentine. The enema of aloes is composed of aloes, carbonate of potash, and mucilage of starch, and is simply made by rubbing the solids together in a mortar and mixing with the mucilage. Enema of asafœtida is prepared by rubbing 30 grains of asafœtida in a mortar, with 4 ounces of water, added gradually, so as to form an emulsion. Enema of sulphate of magnesia is made by dissolving 1 ounce of sulphate of magnesia in 15 fluid ounces of mucilage of starch, then adding 1 fluid ounce of olive oil, and mixing well together. Enema of opium is simply made by adding ½ fluid drachm of tincture of opium to 2 fluid ounces of mucilage of starch, and mixing. Enema of turpentine is prepared by shaking together 1 fluid ounce of oil of turpentine with 15 fluid ounces of mucilage of starch.

HYPODERMIC INJECTIONS.

The preparation of solutions for hypodermic injection requires great care and accuracy. They

should always be freshly prepared when possible, or if kept, they must be preserved in well-stoppered bottles away from the light. Distilled water should always be used. In most cases they are simple solutions of the active agent in water, but sometimes a preservative or solvent medium must be added. One per cent. of pure carbolic acid is usually added to the injection of ergotine, while the injection of physostigmine is prepared by rubbing down the extract with rectified spirit, then adding powdered gum acacia and water.

PASTILLES.

Medicated pastilles with a glyco-gelatin basis may be prepared as follows:—

Soak one ounce of good gelatine in water for two hours, then dissolve it over a water bath; add two and a half ounces of glycerin and mix, then add a few drops of solution of carmine to colour, and allow to cool.

This basis may be medicated according to prescription. The necessary quantity of the mass should be weighed, and after melting it, the drug may be incorporated with it. The liquid should then be poured into a shallow tray and allowed to set. It may then be cut into as many squares as necessary for the proper division of the dose of the active ingredient.

CHAPTER XII.

LOTIONS—LINIMENTS—PIGMENTS AND OLEATES—OINTMENTS.

A LOTION is a liquid preparation used for external application to various parts of the body. An eye lotion is usually termed a collyrium.

Solution of subacetate of lead is a very frequent ingredient in lotions, and when diluting it distilled water should be used, otherwise the solution will turn opaque. It is often prescribed with tincture of opium, and a heavy precipitate results on mixing the two liquids; but this may be prevented if a small quantity of glycerin be mixed with the lead solution before adding the tincture.

Acetate of lead is sometimes ordered in combination with alum or sulphate of zinc, with the result that a copious precipitate of sulphate of lead is thrown down. Such precipitates should not be strained out unless specially ordered. Solid extracts, when met with in lotions, should be placed in a mortar and rubbed down with hot water until dissolved, then strained.

Insoluble bodies, such as oxide of zinc, should be reduced to very fine powder and

well diffused throughout the liquid menstruum. Lotions should always be dispensed in coloured bottles and bear distinctive labels, to prevent them being mistaken for medicines intended for internal use.

LINIMENTS.

The liniment or embrocation is the name given to a liquid application to be rubbed over the surface of the body.

Liniments generally consist of a mixture of oils, soaps, or spirituous preparations, simple or compound. The liniments met with in dispensing are usually those of the pharmacopœia, or a mixture of the same, as in the following instance:—

℞ Lin. Belladonna, ℥i.
Lin. Chloroform Co., ℥iv.
Lin. Saponis, ℥iv.
Misce fiat linimentum.

A liniment of this kind presents no difficulty in preparation, the ingredients being simply mixed together in a bottle.

Liniments are sometimes prescribed in the form of an emulsion or soap, as for example:—

℞ Lin. Camph., ℥iiss.
Liq. Ammon., ℥ii.
Tr. opii, ℥ii.
Misce.

When dispensing, the camphor liniment should be placed in the bottle first, and shaken well with the solution of ammonia until a creamy emulsion is formed. Then the tincture of opium may be added, and the bottle well shaken until the whole is thoroughly mixed.

The following liniment is frequently met with :

℞ Spt. Terebinth., ℥ii.
Acid. Acetic fort., ℥i.
Ovi Vitel., i.
Aquam, ℥iii.
Misce.

Place the yolk of egg in a mortar and add the turpentine in small quantities, stirring well between each addition, until it is thoroughly emulsified. Next add the acetic acid, and finally the water, then transfer to the bottle and shake well. The liniment of potassium iodide with soap is an example of a liniment with a soap base. It is made by dissolving curd soap in fine shavings in glycerin and water, over a water bath. The iodide of potassium is placed in a mortar and powdered, and the soap solution gradually added to it, the whole being well stirred until cold. Oil of lemon is finally added.

Liniments must always be dispensed in coloured bottles bearing a distinctive label, and marked "for external use only".

PIGMENTS AND OLEATES.

An application that is directed to be applied by means of a brush is usually termed a pigment or paint. Spirit or glycerin generally forms the basis of these applications, with some active agent in solution.

The glycerins of acids, carbolic, gallic, and tannic, also of alum, may be taken as examples of preparations of this class, all of which are easily prepared. Glycerin of belladonna, which is very often prescribed, may be prepared by placing 1 ounce of extract of belladonna in a warm mortar and rubbing it down to a smooth paste with 1 drachm of hot water, then adding sufficient glycerin to produce 2 ounces.

There are certain solid bodies which, when rubbed together, become liquid, as, for instance, chloral hydrate and camphor, chloral hydrate and menthol, also chloral hydrate and thymol. A warm mortar aids the process. These compounds are frequently employed as pigments. Oleates are formed by the combination of oleic acid, and with most metallic oxides. The acid acts as a solvent, the result being a solution of oleate in an excess of oleic acid.

Oleostearates occur in the form of fine powder, and are made by the double decomposition of a soluble metallic salt, as, for instance, sulphate of zinc and castile or curd soap. The oleostearates

contain no free oleic acid, and are often prescribed for dusting purposes in certain skin diseases. Oleates are very readily absorbed by the skin, and are used for applying mercury, bismuth, copper, lead, and zinc. Oleate of mercury is prepared of varied strengths. It is made by gradually adding 1 part of yellow oxide of mercury to 19 of oleic acid, in a mortar, and stirring constantly until the oxide is dissolved. A solution of 5 per cent. remains liquid when finished, but if over 10 per cent., it assumes a semi-solid consistency. Alkaloids, such as morphine and quinine, are soluble in oleic acid, but their salts are not.

OINTMENTS.

An ointment may be described as a semi-solid application, the basis of which consists of a fatty body, such as lard, soft paraffin, lanoline, or combination of wax and oil, etc.

Ointments are prepared by simply mixing the ingredients on a suitable glazed slab with a flexible spatula, or rubbing them together in a mortar. In some cases it is advisable to melt the base over a water bath and add it while liquid to the drug, the whole being well stirred until cool. The latter method is generally adopted when a solid substance has to be dealt with. The latter must first be reduced to fine powder in a mortar, and rendered quite free from

grittiness. Should the powder be bulky, it may be rubbed into a smooth paste with a little almond oil before adding the base to it. When the active ingredient is an alkaloid, and there is only a small quantity of it, a solvent is generally used, in order to ensure its thorough distribution throughout the base. Thus, in the case of ointment of atropine, which contains atropine, oleic acid and lard, the atropine is dissolved in the oleic acid with gentle heat, then the lard added, and the whole mixed thoroughly. In this, and similar cases, the base, of course, should not be melted.

When dispensing ointments, the student must be guided by the nature of the ingredients ordered as to the best means of combining them. Thymol should be heated in the melted base until dissolved, as undissolved particles are apt to produce irritation when applied to the skin. Iodoform, on the other hand, should not be heated, but incorporated with the base while it is cooling. When mixing glycerin with fats, the mortar used should be slightly warmed, and soft extracts should be rubbed down to a smooth paste with a few drops of hot water before the base is added.

An ointment, when finished, should be bland and smooth throughout, and quite free from lumps and grittiness.

CHAPTER XIII.

SUPPOSITORIES—PESSARIES—BOUGIES—PLASTERS AND BLISTERS.

SUPPOSITORIES are used for the administration of drugs *per rectum*, and consist of some active medicinal agent mixed with a solid base, that melts about the temperature of the body, such as oil of theobroma, stearine, or soap and starch. They are moulded or formed into the shape of a small cone. The moulds generally used are made of metal, and can be divided into two parts, which are held together by a screw.

In making suppositories, the chief art lies in properly incorporating the medicinal ingredients with the base, and transferring the mixture at the right time to the moulds.

Oil of theobroma, the base most frequently used, is a concrete oil that melts at a temperature between 86 degrees and 95 degrees Fahr.

To illustrate the process of making suppositories, we will describe how the following prescription should be prepared :—

℞ Pulv. Opii, gr. i.
Ext. Belladon. Alcohol., gr. ii.
Ol Theobrom. q.s. ; ft. supposit, mitte vi.

First weigh sufficient of the theobroma oil to make six suppositories (each of which should weigh 15 grains), and melt it in a small porcelain dish with gentle heat over a water bath. While this is being done, prepare the moulds by brushing them over with soap liniment, and leaving them moist, which prevents the suppository adhering. Next weigh the powdered opium and extract of belladonna, and placing them on a slab, rub them down to a thin paste with a little of the melted oil by means of a soft spatula. When thoroughly mixed, place in the dish with the remainder of the melted oil, and stir the whole thoroughly until it assumes a creamy consistence and will only just pour ; then, still stirring, rapidly transfer to the moulds, and allow to stand in a cool place till set.

Another method of mixing when the active ingredients are in the form of powder, is to melt the base in a wide-mouthed bottle and add the other ingredients ; cork, and shake well till incorporated, then pour into the moulds.

The ordinary extracts of the pharmacopœia not prepared with alcohol, may be easily mixed with the base if first rubbed down on a slab with a few drops of boiling water. Substances of a crystalline nature, such as bromide of potassium,

chloral hydrate, or tannic acid, must be reduced to a fine powder before being mixed with the base. Iodoform should not be heated but mixed on a slab, after the base has been melted. Heat must also be avoided when chloral hydrate is used. Iodide of lead, oxide of zinc, and other heavy ingredients should be rubbed to a smooth paste with a little of the melted oil on a slab, and not transferred to the moulds until just before setting, as they are apt to settle into a hard mass at the apex of the cone.

Glyco-gelatine is largely used as a basis for suppositories, which when not medicated are popularly known as "glycerin suppositories". The base may be prepared as follows: Take of fine gelatine, ʒvi.; glycerin, ʒiss.; water, ʒx. Moisten the gelatine first with a little water, then add the glycerin and the remainder of the water, and heat over a water bath until dissolved. The moulds should be oiled or brushed over with soap liniment.

PESSARIES AND BOUGIES.

Pessaries are prepared in the same manner as suppositories. They are usually made to weigh 60 or 75 grains each, and prepared in moulds of suitable capacity.

Medicated bougies are made to weigh 20 grains each, and should be about two and a half inches in length, gradually tapering to a point.

Nasal bougies are usually prepared with a glyco-gelatine base, and are introduced into one of the nasal passages for treatment of chronic affections of the nasus. They should be about three inches long, and a quarter of an inch in diameter at the base, the whole gradually tapering towards the apex.

PLASTERS AND BLISTERS.

The spreading of a plaster is an operation that requires a considerable amount of practice and skill. It consists in melting, and evenly spreading by means of a warm spatula, a medicated compound with a basis of wax and resin, etc., over a given space of thin leather or other material suitable for the purpose. The plasters met with in dispensing are chiefly those of the pharmacopœia. They are usually kept in convenient rolls, weighing about half a pound.

For melting, a very gentle heat is required, which may be applied by means of the warm spatula, or a sufficiency of the plaster may be cut off the roll and melted in a small pan. As little heat as possible should be used throughout the process. The material on which plasters are generally spread is the prepared white skin known as "plaster skin". Chamois leather, swansdown, brown holland, calico, etc., are also

used for the purpose. Plasters for application to the chest are made heart-shaped, and those for the side or back, oblong or reniform. Those for application to the breast should be made circular.

In order to follow out the process in detail, we will take the following prescription as an example:—

℞ Emplast. Plumbi, 10 × 6.
Fiat emplast.

The plaster spatula or iron must first be heated. If the ordinary iron is used, it may be heated over a Bunsen burner, or by being placed in the fire for a few minutes. While this is being done, cut out the exact pattern of the plaster from a piece of fairly stout paper, leaving a margin of about an inch in depth around the shape. A piece of leather may now be cut, at least an inch and a half each way larger than the dimensions given for the plaster, and several folds of paper placed between it and the bench to form a soft bed to work upon. The paper shape must next be affixed carefully to the leather by means of some weak gum or soft soap, the inner edge being closely pressed to prevent the plaster getting underneath. The plaster having been melted as described above, take the spatula, and with long strokes carefully spread it evenly over the surface of the leather, working from left to

right. After allowing it to cool for a few minutes, strip off the paper shape, which should leave a clean sharp edge.

A blister is usually spread on adhesive plaster or thin leather, the shape being cut out of paper, as that for a plaster. Cantharides or blistering plaster being of a soft nature, the spatula is not necessary, and a sufficient quantity being cut off the roll, it is well worked between the fingers until it is quite plastic and soft. It is then placed on the base to which the shape has been affixed, and spread with the side of the thumb, first around the margins, and then over the centre, until the whole is evenly covered. The surface may be rendered smooth by applying a little olive oil with the thumb if necessary. The shape may now be removed and the margin trimmed. A blister should have a margin of from three-quarters of an inch to an inch, according to size. They are made of various shapes, according to the directions of the prescriber.

APPENDIX.

LATIN TERMS USED IN PRESCRIPTIONS, WITH THEIR ENGLISH MEANINGS.

Acidum	= An acid.
Adde, addendus	= Add, to be added.
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.
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 teaspoonful.
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 morning.
Cubitus	= The elbow.
Cujus	= Of which.
Cum	= With.
Cyatho theæ	= In a cup of tea.
Cyathus, cyathus vinarius	= A wineglassful.
Decoctum	= A decoction.
Dejectiones alvi	= Liquid stool.
Detur	= Let (it be given).
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.
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 bed time.
Hora somni	= At bed time.
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	= Bread crumb.
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.
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.
Sabinde	= Now and then.
Scatula	= A box.
Semel, septemane, hebdomada	= Once a week.
Semi	= Half.
Semi hora	= Half an hour.
Sesquihora	= An hour and a half.
Sesuncia	= An ounce and a half.
Sero nocte	= Late at night.

Si	= If.
Si opus sit	= If required.
Signatura	= Label.
Solus	= Alone.
Statim	= Immediately.
Stet	= Let it stand.
Sumat	= Let him take.
Sumatur sumendus	= To be taken.
Syrupus	= A syrup.
Tabella	= A tablet.
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., etc.

To express the fractional part or 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.

IMPERIAL WEIGHTS AND MEASURES.

Imperial Measures of Length.

1 Inch - - -	=	25·3999 Millimetres.
1 Foot (12 in.) - -	=	304·7997 Millimetres. 0·3047997 Metre.
1 Yard (3 ft.) - -	=	914·3992 Millimetres. 0·9143992 Metre.
1 Mile (1760 yds.) -	=	1,609,342·5920 Millimetres. 1·6093426 Kilom.

Conversion of Imperial to Metric Units.

Inches ÷ 0·0394 = Millimetres.	Inches × 0·2539 = Decimetres.
Inches × 25·3999 = Millimetres.	Inches ÷ 39·3701 = Metres.
Inches ÷ 0·3937 = Centimetres.	Inches × 0·0254 = Metres.
Inches × 2·5399 = Centimetres.	Miles ÷ 0·6214 = Kilometres.
Inches ÷ 3·9370 = Decimetres.	Miles × 1·6093 = Kilometres.

Imperial Weights or Measures of Mass.

1 Grain - - - - - -	=	0·0648 Gramme. 64·7989 Milligrammes.
1 Scruple (20 grains) - -	=	1·2959 Grammes.
1 Drachm (60 grains) - -	=	3·8879 Grammes.
1 Troy or Apothecaries' Ounce (480 grains) - - -	=	31·1035 Grammes.
1 Avoirdupois Ounce (437·5 gr.)	=	28·3495 Grammes.
1 Pound (7,000 grains) - -	=	453·5924 Grammes. 0·4536 Kilogramme.

Conversion of Imperial to Metric Units.

Grains ÷ 15·4324 = Gms.	Ounces (Troy) × 31·1035 = Gms.
Grains × 0·0648 = Gms.	Ounces (Av.) ÷ 0·0353 = Gms.
Scruples (Ap.) × 1·2959 = Gms.	Ounces (Av.) × 28·3459 = Gms.
Drachms (Ap.) × 3·8879 = Gms.	Pounds (Av.) ÷ 2·2046 = Kilo.
Ounces (Troy) ÷ 0·0311 = Gms.	Pounds (Av.) × 0·4536 = Kilo.

Imperial Measures of Capacity.

1 Minim (0·9114583 grains of water) = 0·0592 Millilitre.
1 Fluid Drachm (60 m. or 54·6875 gr.) = 3·5515 Millilitres.
1 Fluid Ounce (8 fl. dr. or 437·5 grains) = { 28·4123 Millilitres. / 0·0284 Litre.
1 Pint (20 fl. oz. or 8750 grains) - = { 568·2454 Millilitres. / 0·5682 Litre.
1 Gallon (8 pints or 70,000 grains) = { 4545·9631 Millilitres. / 4·5459 Litres.

APPROXIMATE WEIGHTS.

Imperial to Metric.

$\frac{1}{100}$	grain	= 0·00065	Gm.	4	grains	= 0·26	Gm.
$\frac{1}{64}$	,,	= 0·001	,,	5	,,	= 0·32	,,
$\frac{1}{60}$	,,	= 0·0013	,,	6	,,	= 0·4	,,
$\frac{1}{40}$	,,	= 0·0016	,,	7	,,	= 0·46	,,
$\frac{1}{32}$	,,	= 0·002	,,	8	,,	= 0·52	,,
$\frac{1}{30}$	,,	= 0·0022	,,	9	,,	= 0·6	,,
$\frac{1}{25}$	,,	= 0·0026	,,	10	,,	= 0·65	,,
$\frac{1}{20}$	,,	= 0·0032	,,	12	,,	= 0·6	,,
$\frac{1}{16}$	,,	= 0·004	,,	15	,,	= 1·0	,,
$\frac{1}{12}$	,,	= 0·0054	,,	20	,,	= 1·3	,,
$\frac{1}{10}$	,,	= 0·0065	,,	24	,,	= 1·5	,,
$\frac{1}{8}$	,,	= 0·008	,,	30	,,	= 2·0	,,
$\frac{1}{6}$	,,	= 0·01	,,	40	,,	= 2·6	,,
$\frac{1}{5}$	,,	= 0·013	,,	60	,,	= 4·0	,,
$\frac{1}{4}$	,,	= 0·016	,,	90	,,	= 6·0	,,
$\frac{1}{3}$	,,	= 0·02	,,	120	,,	= 8·0	,,
$\frac{1}{2}$	,,	= 0·032	,,	$\frac{1}{2}$	ounce (av.)	= 15·0	,,
$\frac{3}{4}$	,,	= 0·05	,,	1	,, ,,	= 30·0	,,
1	,,	= 0·065	,,	(*or nearer* 28·35)			,,
$1\frac{1}{2}$	grains	= 0·1	,,	1 pound		= 453·59	,,
2	,,	= 0·13	,,				
3	,,	= 0·2	,,				

Metric to Imperial.

1 kilogramme - - -	= 2 lb. $3\frac{1}{4}$ oz.	
500 Gm. - - - -	= 1 ,, $1\frac{6}{8}$	,,
100 ,, - - - -	= $3\frac{1}{2}$ oz.	
25 ,, - - - -	= $\frac{7}{8}$	,,
10 ,, - - - -	= $\frac{1}{3}$	,,
1 ,, - - - -	= 15·43 grains.	
$\frac{1}{2}$,, or 500 milligrammes	= 7·7	,,