Silver Nitrate and *Lead Acetate* and *Subacetate*, though incompatible with almost everything, may be combined with *Opium*, the latter forming therewith a compound which though insoluble is therapeutically active as an astringent and anodyne lotion. *Silver Nitrate* with *Creosote* forms an explosive compound.

Tannic and Gallic Acids, and substances containing them (as the astringent bitters), precipitate albumin, alkaloids and most soluble metallic salts. They may be prescribed with the proto-salts of Iron, but not with its per-salts. *Calumba* is the best vegetable tonic to use with ferric salts, as it contains neither tannic nor gallic acid. *Tannic Acid* precipitates gelatin.

Iodine and the soluble *Iodides* are incompatible with the alkaloids and substances containing them, also with most metallic salts.

Alkalies neutralize free acids, and precipitate the alkaloids and the soluble non-alkaline metallic salts. *Oxides of the Alkalies* decompose salts of the metals proper and salts of the alkaloids, precipitating their bases; but the base may be soluble in an excess of the alkali.

Resinous Tinctures or *Fluidextracts*, (*e. g.*, Tinct. Cannabis Indicæ), when combined with aqueous solutions should always have Acacia or some other emulsifying agent added, to prevent the separation of the resin, which otherwise will be deposited on the sides of the bottle or will float on top of the mixture.

Tincture of Digitalis should not be mixed with aqueous or syrupy solutions for in such cases precipitation or decomposition of the active principles may occur. This tincture is injured by admixture and is best administered on sugar or dropped on a piece of bread.

EXTEMPORANEOUS PHARMACY.

This is the most important division of Pharmacy, embracing as it does the preparation and dispensing of those medicines which are designed for immediate use and are compounded on the prescriptions of physicians. Hence it comprises the chief portion of the daily work of the pharmacist, and can be learned only at the dispensing counter under the personal supervision of a competent master. In the following pages are given the most important of the general directions pertaining to this subject, with the object, so far as the limits of the book will admit, of enabling the young medical practitioner to familiarize himself with the compounding and dispensing of drugs. The drug-store of the present day has degenerated so much from its legitimate business that ere long physicians will be compelled in self defense to dispense their own medicines, thereby protecting themselves and their patients from the patent-medicine vending, the counter-prescribing, and the many other nefarious methods which

have degraded the pharmacist from his old professional position to that of a mere trader in drugs and nostrums. The first outfit of every young doctor should include a few pharmaceutical instruments and a small stock of drugs. By the daily handling of these, the tools of his profession, he will insensibly become familiar with the technique of the art, and even if he does not continue to dispense his medicines in after years he will never regret possessing the practical knowledge which such a course will give him.

Compounding means the mixing or preparing of the drugs ordered in a prescription, and comprises all the operations of official pharmacy together with many other manipulations which will be described in their appropriate places.

Dispensing is the operation of putting up and issuing the drugs ordered in a prescription, and may apply to the already compounded preparations of official pharmacy as well as to those prepared extemporaneously

Filling a Prescription means a combination of operations which requires great care, undivided attention, and a special practical apprenticeship at the dispensing desk. In the following discussion of extemporaneous preparations such hints are incorporated as are particularly applicable to the compounding of each article under consideration; and they may be prefaced by a few general suggestions which will serve to point out the most approved method of dealing with this important part of the druggist's work.

The prescription should first be slowly read over in a critical spirit, but no word or action of unfavorable criticism should reach the ears or eyes of the messenger. To shrug the shoulders when scanning the items, to laugh or even smile at the phraseology, to question the person offering it as to whom it is for, or for what complaint it is given, are instances of such flagrant treason to the prescriber as would justify the most complete professional ostracism of the offender. The compounder has no business whatever with the propriety of the prescription for its purpose. It might have been given as a *placebo* for reasons eminently wise and judicious; or if not so constituted it has at least been ordered by one who is in possession of facts about which the druggist knows nothing, even if by education and experience the latter were competent to judge in the matter, which he seldom is. His criticism should be directed only to the dosage and the pharmaceutical compatibility of the ingredients. Even in the latter case he must remember that incompatibles are often prescribed with the view of forming another agent by the chemical reaction produced. If he thinks that there is any mistake, or that the quantities ordered are in any degree poisonous, it is his duty to make an excuse for delay to the messenger and at once communicate with the physician. This course, in these days of telephones, is nearly always practicable.

After reading the prescription, it is well to first number it and then write the label. This gives time for the label to dry, and avoids the use of blotting

paper, which often mars the writing and renders the directions all but illegible.

A clearly defined method should then be decided on by which to compound the prescription. Directions for such plans of procedure will be found in the succeeding pages under the titles of the various preparations. Next, the ingredients should be carefully weighed or measured out, each one being checked off so as to avoid the danger of its being duplicated. In many cases the excipient is not specified, its choice being left to the druggist; but in all such a note should be made on the prescription to show the article used, in order that in the event of a renewal being ordered there may be no perceptible difference. No alteration or addition should be made which would in any degree affect the medicinal action of the prescription or interfere with the intention of the prescriber.

The labelling of the package and the numbering and filing of the prescription are matters of mechanical detail which are best learned at the counter. Various devices for simplifying these operations are in vogue and may be seen in any well-appointed drug-store. Poisonous articles sold by druggists should always be labelled *Poison*, and the transaction entered in a book usually required by law to be kept for that purpose; but in the case of prescriptions the word "Poison" should not appear on the package or label unless so directed by the prescriber.

Stock Solutions of the salts most frequently prescribed are kept in many establishments for convenience in dispensing. Those most generally used are the following:—

Alum,— ℥ijss in a quart of distilled water. Of this solution each fluidounce represents ℥ss of the salt.

Potassium Bicarbonate,— ℥j in f℥iv of distilled water; of which ℥ss contains ℥j of the salt.

Potassium Chlorate,—1 in 24 of distilled water, will not crystallize as the temperature changes.

Potassium Bromide,—1 in 6 of distilled water, makes a very convenient solution for dispensing purposes, each ℥ containing 10 grains of the salt.

Hydrated Chloral,—1 in 1 of distilled water, of which each minim contains one grain of Hydrated Chloral; or 1 in 6 of distilled water, of which each ℥ contains 10 grains.

Morphine Sulphate,—gr. xvj in ℥j of distilled water, with a grain of Salicylic Acid or 3 drops of Phenol to prevent change. Of this solution, known as Magendie's, each minim contains gr. $\frac{1}{30}$ of the salt, and ♏x contain gr. $\frac{1}{3}$. A safer solution, as it requires less mental calculation, is one of one-half the above strength, viz.—gr. viij in ℥j, of which each fluidrachm contains gr. j of Morphine Sulphate.

Phenol,— ℥j in f℥iv of glycerin, makes a convenient solution which will mix with water in all proportions. ♏ivss represents gr. j of Phenol.

Tannic Acid,— ℥j in f℥iv of glycerin, dissolved by the aid of a gentle heat. ♏ivss represent gr ½ of Tannic Acid

Rules for the Pharmaceutical Student. The following rules are quoted from the *Chemist's and Druggist's Diary*, and are well worth remembering by the student:—

Read a prescription through rapidly and in a manner suggesting no suspicion or doubt.
Write directions invariably before dispensing. Avoid thus the use of blotting-paper; a good dispenser uses almost none.

If a mixture contains readily soluble ingredients, never use a mortar
Avoid effecting solution by heat, for fear of recrystallization.
With syrups and also ingredients not water, arrange in dispensing to rinse out the measure and leave it clean; a skilled dispenser shows very little traces of his work.
Carefully clean and put away weights and scales after each operation.
Hold the scales firmly by the left hand, never lift them high above the counter and judge of the weight as much by the indicator as by the position of the scale.
Select glass pans for scales, preferably of heavy make, and discard flimsy brass material, which corrodes speedily and becomes inaccurate.
Learn to judge of the quantity to be weighed with tolerable accuracy; train the eye as well as the hand.
If in doubt, always begin with that about which you have no doubt.
Be rapid in manipulation. Finish wrapping, tying, or sealing quickly. Slowly dispensing is bad dispensing, and arises either from deficient practice or want of knowledge.
Never hesitate when in doubt to ask advice from a fear of compromising your own dignity.

OFFICIAL PHARMACY.

Official Operations are those processes which are directed in the pharmacopœia to be used in the preparation of medicines. Many of them are processes which are common to both chemistry and pharmacy, as precipitation and crystallization,—while others are peculiar to pharmacy, as percolation and trituration. The most important of the pharmaceutical operations are briefly described below; for full details of the various apparatus used the student is referred to the more exhaustive treatises on Pharmacy.

PHARMACEUTICAL OPERATIONS.

Carbonization is the heating of organic substances without exposure to the air until the volatile constituents are driven off, and the residue assumes the characteristic appearance of carbon.

Clarification is the separation from liquids of solid matter which prevents their being transparent, without using filters or strainers. It may be effected by heat (as in the case of Mel Depuratum), by adding a lighter liquid, by adding albumin, gelatin, milk, or paper-pulp, by fermentation, or by the subsidence of the particles in the form of a sediment through long standing.

Colation or **Straining** is usually a very simple operation, so familiar to every one of ordinary experience as to be scarcely worth describing. The strainers are made of cotton flannel, fine muslin, gauze, woolen felt and other fabrics.

Comminution is the process by which the aggregation of the particles of a solid body is overcome, and the body is reduced to pieces of varying sizes. Its object is to increase the area of the surface exposed to the action of solvents,

and it includes the operations of cutting, rasping, grating, crushing, stamping, grinding, pulverizing, triturating, levigating, elutriating, and granulating. Apparatus of various kinds, as cutters, mortars and pestles, mills, etc., are used for the comminution, while spatulas are employed to loosen the particles, and sieves to sift the coarser from the finer. These last-named contrivances are of five sizes, designated by the number of their meshes to the inch, 80, 60, 50, 40, and 20, respectively permitting the passage of powders termed very fine, fine, moderately fine, moderately coarse and coarse.

Crystallization is the process which bodies undergo in passing from the liquid or the gaseous state to the geometrical forms called *crystals*. Six systems of crystals are recognized by crystallography, which has assumed the dignity of a separate science. Bodies which are not capable of crystallization are termed *amorphous*. Every crystallizable body assumes its own peculiar form, or some other form derived from or related to it. The process of crystallization is effected (1) by fusion and partial cooling, as in the cases of some metals and Sulphur; (2) by sublimation, as Benzoic Acid, and Mercuric Chloride; (3) by deposition from hot saturated solutions while cooling; (4) by deposition from a solution during evaporation; (5) by deposition caused by passing a galvanic current through the solution; (6) by precipitation as in the case of Mercuric Iodide; (7) by the addition to the solution of a substance having a strong affinity for water, as the adding of Calcium Chloride to an aqueous solution of sodium chloride, or Alcohol to a solution of potassium nitrate or to an aqueous syrup. In a few cases amorphous solids may crystallize without undergoing liquefaction, as Sulphur, Barley-sugar and Iron wire The methods most frequently employed are those by deposition from supersaturated solutions, and by deposition during evaporation. The more slowly the process is carried on the larger and more regular will be the crystals. The process is facilitated by use of foreign bodies as *nuclei* around which the crystals are deposited; a familiar instance being the thread in the centre of a mass of rock-candy.

The Water of Crystallization is the H_2O with which most substances combine in the act of crystallization, and the number of molecules thereof differs for each body and for the same body frequently under different conditions. *Exsiccation* is the removal of this combined water by heat, the crystals assuming thereby the form of a dry powder. *Efflorescence* is a similar process occurring spontaneously on exposure of the crystals to the air, the effloresced portion appearing as a dry powder on the surface of the crystals. *Deliquescence*, on the other hand, is the act of absorbing water from the atmosphere, a property possessed by some substances which are therefore said to be *hygroscopic*.

Decantation is the pouring or drawing off a supernatant liquid into another vessel. If done by pouring, a guiding-rod for the liquid to run on is an effective adjuvant; if by drawing, the *siphon* in some form is usually employed.

Decoloration, or the removal of coloring-matter from liquids or from solids in solution, is effected by the use of animal charcoal, which in small operations may be arranged in a funnel or a percolator, and the liquid placed thereon. It

should not be forgotten that charcoal absorbs many other principles besides coloring-matter, especially alkaloids, bitter and astringent principles, so that the process of decoloration may be one of serious injury to the efficiency of the preparation.

Deflagration is the heating of an inorganic substance with another which yields oxygen (usually a nitrate or a chlorate), the result being the decomposition of the body with violent and sudden combustion.

Desiccation is the process of removing moisture from solids, and has for its object either the preservation of the substance, the reduction of its bulk or the facilitation of its comminution. The operation should be conducted at as low a temperature as possible. Roots, leaves and seeds are generally dried by being placed in trays of wire network and exposed to a uniform temperature in a room heated by steam. A better method is to suspend organic substances from the ceiling of an attic during warm weather; a slow process, but one which does not result in much loss of active volatile principles. Crystals and precipitates require a higher temperature and are usually dried on a water-bath. When the water of crystallization is to be expelled, as in desiccating alum and ferrous sulphate, a temperature of about 400° F. is required. In absorbing water from alcohol Potassium Carbonate and slaked Lime heated are employed, and in several instances Sulphuric Acid is the desiccator used.

Dialysis is a process by which crystallizable substances are separated from non-crystallizable ones, by suspending a solution containing both upon a porous diaphragm having its under surface in contact with water. The crystalloids pass through the diaphragm, while the non-crystalline remain above it, and are termed *colloids*. Examples of the latter class are gelatin, gum, glue, starch, dextrin, albumin and extractive matters, which are generally the inert and valueless constituents of vegetable drugs. Parchment-paper and bladders are used for the diaphragm; the whole apparatus being termed the *dialyzer*, while the water into which the crystalloids pass is called the *diffusate*.

The unofficial preparation known as Dialyzed Iron (*Ferrum Dialysatum*) is a colloidal substance obtained by treating Ferric Chloride in solution with Ammonia, whereby ferric hydroxide is precipitated and then dissolved by agitation. The mixture being placed on a dialyzer, the crystalloids formed (ammonium chloride and ferric chloride), together with any free acid present, pass into the diffusate, leaving the neutral colloidal liquid (solution of ferric oxychloride) above on the septum.

Distillation consists of two processes, the evaporation of a liquid, and the condensation of the vapor into a liquid in a separate vessel. The agent used in the first part of the operation is heat, in the second part cold. Its object is to separate mixed volatile and fixed substances, or to combine volatile substances which cannot otherwise be mixed, as in the preparation of some of the Waters. The apparatus used is of great variety, from the simple retort and receiver to elaborate and costly stills.

Destructive or **Dry Distillation** is a process of decomposing an organic substance by heat into volatile products, which are collected in a separate vessel, the residue being said to be carbonized. It is employed only by large manufacturers, for the preparation of Acetic and Succinic Acids, Oil of Amber, Wood Tar, etc.

Fractional Distillation is the separation by distillation of substances which are volatile at different temperatures, each being separately driven over and received in a vessel by itself. Different degrees of heat are successively employed in accordance with the volatilizing points of the substances to be obtained.

Expression is the forcible separation of liquids from solids, by subjecting them to pressure. Hand-pressure through straining-cloths may be employed, but mechanical presses are more efficient and are coming into general use. Oils obtained in this manner are called *expressed* or *fixed oils*, to distinguish them from the volatile oils obtained by distillation.

Exsiccation or **Calcination** is the process of depriving a solid of its moisture or other volatile constituents by the application of heat without fusion. The term *Exsiccation* is usually applied to the vaporization of the water of crystallization from a crystalline body; *Calcination* to such operations as the expulsion of carbon dioxide and water from carbonates, as in the manufacture of lime, and magnesia.

Filtration is a process of straining through a medium so fine as to deliver the filtrate in transparent condition. The filters are made of paper usually, though charcoal, asbestos, sand and other articles are sometimes employed, being supported in a funnel of glass or other material held by the ring of a retort-stand. The best filtering-paper is made in Sweden by Munktell, and is white; but a good paper for ordinary use is the *Prat Dumas White*, which should be employed for filtering alkaline or alkaloidal solutions. The gray French papers answer well enough for fluidextracts, tinctures or colored liquids, but should never be used for solutions containing free alkali.

Filtering-paper is folded by doubling a sheet upon itself, and then folding it again directly in the middle. When opened four distinct sections appear, one of which is separated from the other three, and the filter thus formed is placed in a funnel. This arrangement is known as a *plain filter*, which by repeated creasing is converted into the *plaited filter;* the latter being the form generally used in pharmaceutical operations of small extent. In large laboratories special processes are employed with apparatus of more or less complexity for hot filtration, rapid filtration, etc

Fusion is the process of liquefying solids by the application of high heat without the use of a solvent. It is employed in making ointments and plasters, in purifying resins, and for the purpose of decomposition. The degree of heat required varies from a temperature of 90° F., sufficient to melt lard in an open vessel, to one of 800° F., employed in fusing Zinc in an earthen crucible; and may be regulated by the aid of the water-, steam- or sand-bath. The two former appliances limit the degree of heat applied, while the sand-bath prevents sudden changes in the temperature. Oil-baths and glycerin-baths are employed in fractional distillation.

Granulation is a process of reducing a coarsely crystalline substance to a granular powder, by dissolving it in water and evaporating the solution with constant stirring until the product becomes perfectly dry. Many salts are thus treated for convenience in dispensing, as the bromide, the iodide, the carbonate and the citrate of potassium. Ferrous Sulphate, though generally dispensed in the exsiccated powder, may be granulated into minute crystals by filtering an aqueous solution of it into alcohol.

Ignition in pharmacy means the process of strongly heating solids or semi-solid substances, the residue left being the product desired. It is used in the quantitative tests for phosphoric acid, ammonium phosphate and purified antimony sulphide.

Incineration is the heating of organic substances with access of air until the carbon is consumed, the ash being the product desired.

Maceration is one of the processes of extracting the soluble principles from drugs, and consists in steeping the comminuted substance in a suitable liquid called the *menstruum*, generally alcohol, for a period varying from 2 to 14 days, during which it is occasionally agitated. The liquid is then poured off, the residue is expressed, and the mixed liquors are filtered. Several of the official tinctures are prepared by this method, and many others by maceration first and percolation afterwards. A few active principles may be extracted by water alone (*e. g.* morphine) and in some cases the addition of acids or alkalies to the water will effect the chemical solution of many ingredients which are insoluble in plain water. As a rule however Alcohol is the most generally applicable of all simple solvents, but from its hardening the cell-membranes instead of softening them it prevents the osmosis of their contents. Drugs subjected to alcoholic or other menstrua should have their cells thoroughly broken or torn, so that the solvent may be brought into actual contact with the principles contained in them. The degree of disintegration required depends upon the size of the cells, ducts, tubes, intercellular spaces, etc., in which the active principles are enclosed. A very finely powdered state is open to objection from the packing of the particles together into an almost impenetrable mass when treated by the solvent. The average size of vegetable cells is about $\frac{1}{300}$ of an inch, while resin cells and other cavities are larger, averaging about $\frac{1}{100}$ inch. The Pharmacopœia prescribes in each instance the degree of fineness of the powdered drug employed in making certain of its preparations, or its bruising, slicing, etc., when such operations will answer. [Compare the article on COMMINUTION.

Percolation or **Displacement** is a process of obtaining the soluble constituents of a powdered substance by the descent of a solvent through it. Though an ancient process for the making of lye from wood-ashes (lixiviation), it has only within the last fifty years been adopted as an official process in pharmacy,

but it is gradually taking the place of maceration as a means of extracting the soluble principles of drugs. The vessel used to hold the powdered drug is called the *percolator*, of which there are many forms employed by the manufacturers. The liquid used as a solvent is called the *menstruum*, and when coming from the percolator it is termed the *percolate*. The U. S. Pharmacopœia gives very full directions concerning this process.

Precipitation is the process of separating solids from their solutions, and is usually effected by chemical reaction, though it may be accomplished by other methods, as by adding a second liquid in which the substance is insoluble, by heating albuminous solutions, or by exposing solutions of silver salts to the action of light. The most familiar example of chemical precipitation is the addition of a solution of Mercuric Chloride to one of Potassium Iodide, the result being a double decomposition of the salts and the formation of Mercuric Iodide, which falls to the bottom of the vessel as a brilliant, red, insoluble and crystalline powder. The *precipitate* is the separated substance, which is usually thrown down, but it remains suspended in some cases, and in others it rises to the top. The *precipitant* is the substance which is added to produce the precipitation. A *magma* is a thick, tenacious precipitant remaining behind after the supernatant liquid is removed by decantation or otherwise. Precipitates are termed *flocculent*, *gelatinous*, *curdy*, *granular*, *crystalline*, etc., according to the forms assumed. In small operations they are usually collected on plain filters, and washed by the repeated addition of water.

Separation of liquids which do not mix with each other is a simple mechanical process performed with pipettes of various forms, or with funnels having stop-cocks in their necks. Special forms of receivers are used for the separation of volatile oils from the water which may accompany them during distillation.

Solution is the dissolving of a solid or gaseous substance in a liquid, and may be *simple* when the substance undergoes no alteration, being recovered unchanged on evaporation; or *chemical* when the dissolved body is chemically altered by the solvent or some other substance present, and cannot be recovered on evaporation. Syrup is an instance of simple solution, the Syrup of Lime one of chemical solution. The liquid employed is termed a *solvent* before the substance is added to it, after the operation is completed the combined preparation is called a *solution*. If fully charged with the dissolved substance so that it will retain no more, it is known as a *saturated solution*. One liquid may be dissolved in another, or a gas may be dissolved in a liquid. The solution of solids is greatly facilitated by pulverization and by stirring the menstruum. Heat generally aids solution, most substances being more soluble in hot liquids than in cold ones. A saturated solution of one substance may still be capable of dissolving others. Rapid solution of solids without chemical change causes reduction of temperature, while chemical solution produces elevated temperature.

Circulatory Solution is performed by suspending the substance to be dissolved near the surface of the solvent in a gauze bag or on a porous shelf. The portion first acted on descends and produces a circulatory movement in the fluid, facilitating the solution of the whole.

Solvents employed are chiefly Water, Alcohol, Glycerin, Acids, and Oils. Others less frequently used are Ether, Chloroform, Benzin and Carbon Disulphide.

Sublimation is the distillation of a volatile solid, the product being termed a *sublimate*. Its objects are to purify volatile solids from impurities and to collect such as result from chemical action at high temperatures. The operation is carried on in iron, glass or stoneware retorts, and results in *cake sublimates* or *powder sublimates* according as the temperature of the condensing surface is high or low.

Testing and **Assay** are directed by the Pharmacopœia in certain cases, for the purpose of determining the identity and purity of its drugs and their preparations. The Pharmacopœia contains a very complete section on REAGENTS, in which full directions are given for the preparation and use of Test solutions and Volumetric solutions; also instructions for Gasometric estimations, for the determination of the Optical Rotation of organic substances, and for Alkaloidal Assay by immiscible solvents.

Pharmacopœial testing and the volumetric method of determination are necessary to the work of the practical pharmacist, and as the apparatus used is simple and the operations are those in the line of his daily work, he should be familiar with them. On the other hand the proximate analysis of organic substances for their principles, and the ultimate analysis of the same bodies for their elements, require a high degree of skill and long experience, and should be left to the professional chemist.

The apparatus used in testing consists of graduated flasks and jars, burettes, pipettes, funnels, beakers, test-tubes, capsules, crucibles, reagent-bottles, etc. The metric system is directed for all work, and the apparatus employed should be graduated accordingly.

Torrefaction or **Roasting** is the application of heat, in a less degree than for carbonization, to an organic substance for the purpose of modifying some of its constituents, as in the roasting of coffee and of rhubarb. The latter substance, when subjected to this process, loses its cathartic properties, but retains its astringency, and is known as Torrefied Rhubarb.

Trituration is the comminution of a solid to an extremely fine powder by continued rubbing in a wedgewood mortar with an inert and gritty powder, Sugar of Milk being the substance directed to be used. The product is called a Trituration (see that title under OFFICIAL PREPARATIONS). The surfaces of the mortar and pestle-head should coincide closely, and the thorough comminution of the trituration is best accomplished by a circular motion of the pestle

in gradually increasing circles, until the side of the mortar is reached, then reversing the motion and gradually lessening the circles until the pestle reaches the centre again. The process is greatly facilitated by having the pestle attached to a long handle playing in an opening made in a piece of wood nailed at a convenient height. A weight may be fixed on top of the handle if a greater degree of friction is desired.

Pulverization by Intervention is only another name for trituration when performed in a mortar and with solid bodies, the foreign substance used being subsequently removed. Potassium Sulphate may be employed as the medium for the pulverization of Gold and then dissolved out by water. Alcohol or Chloroform may be added to Camphor to aid its pulverization, and then removed by evaporation. Phosphorus may be pulverized by placing it in water, gently heating the latter until the phosphorus is melted, and agitating the whole while cooling.

Levigation is the trituration of a substance made into paste with water or some other liquid, and resembles the old process of grinding oil paints by hand on a slab of stone. The process is used for coarse materials, as chalk, where the refuse is rejected, or for such substances as red mercuric oxide, and zinc oxide. When performed with a porphyry slab and muller it is termed Porphyrization.

Elutriation is a water-sifting process for separating the coarser particles of insoluble substances from the finer. The substance is mixed with water and after the larger particles have fallen to the bottom, the liquid is decanted into another vessel, in which the light and powdery particles are collected.

Vaporization includes the various operations by which volatile matters are separated from fixed substances or from other matters which are less volatile, heat at varying temperatures being the agent used. The operations under this head are—*Evaporation*, *Distillation*, *Desiccation*, and *Sublimation*, the last three of which have been described.

EVAPORATION in pharmacy is the process by which the more volatile constituents of a liquid are driven off by heat for the purpose of reducing its volume or purifying it, as in the preparation of extracts and fluidextracts, and the crystallization of salts. The vessels used should be shallow so as to expose a large surface of the liquid to the atmosphere. The heat used may be regulated by a water-bath, a steam-bath or a sand-bath, and ordinarily should be kept below but near to the boiling point of the liquid treated. As organic substances are usually injured by long heating, small portions only of vegetable preparations should be subjected to this process, and the liquid should be frequently stirred in order to hasten the operation. In large laboratories vacuum-pans are employed to remove the atmospheric pressure, enabling the evaporation to be accomplished at a much lower degree of heat than if the liquid were exposed to the air. *Ebullition* (boiling) is a form of evaporation.

Spontaneous Evaporation is the evaporation of a liquid without the direct application of strong heat, but at the temperature of the room or closet used for the purpose. It is especially applicable to cases in which the residue is liable to injury or loss from much heat, or to secure finer crystals than can be obtained by the quick evaporation of their solution.

Washing is a simple mechanical process for separating soluble from insoluble matter, by pouring upon it a liquid which will dissolve the soluble portion. Various methods of doing this are in vogue and are often dignified with very

high-sounding terms, as Lotion, Affusion, and Ablution. An ordinary wash-bottle, with two glass tubes perforating the cork, is a convenient implement for directing a continuous stream upon a precipitate, while for continuous washing a combination of bottles with a funnel may be used.

PREPARATIONS.

Official Preparations may be presented under various methods of classification, one of the simplest being that which divides them into liquids and solids, the former being subdivided into groups named after their principal bases, viz.:—

LIQUID PREPARATIONS.

Acetone Preparations,—all Oleoresins except one, that of Cubeb.

Acetous Preparations,—the Vinegars, two in number.

Alcoholic,—Fluidextracts, Tinctures, Wines, Spirits, Elixirs, and one Oleoresin, that of Cubeb; one Liniment, that of Belladonna.

Aqueous,—Waters, Solutions, Infusions, Decoctions, Syrups, Honeys, Mucilages, Emulsions, Mixtures; the last five containing sweet or viscid substances.

Ethereal,—Collodions, four in number.

Glycerines,—Glycerites, six in number.

Oleaginous,—Liniments, except that of Belladonna; also Oleates

SOLID PREPARATIONS

Cerates.	Extracts.	Ointments.	Pills.	Poultices.	Suppositories.
Confections.	Masses.	Papers.	Plasters.	Powders.	Triturations.
				Resins.	Troches.

In the following descriptions of the pharmaceutical groups the composition and dosage of the various preparations are omitted, as they are fully detailed in the section on Materia Medica, under the title of the principal constituent in each case.

PHARMACEUTICAL PREPARATIONS.

Pharmaceutical Preparations include the pharmacopœial (official) ones, also those of extemporaneous pharmacy (unofficial). Both classes are described together in alphabetical order, for the sake of easy reference.

Aceta, *Vinegars*,—are solutions of the active principles of certain drugs in diluted Acetic Acid. They are made by maceration and straining, and each one contains the soluble principles from 10 per cent. of drug. Acidulous menstrua form soluble salts with the alkaloids and possess antiseptic qualities. The official Vinegars number 2, viz.:—

Acetum Opii. Acetum Scillæ.