("inorganic" iron, so called), and, on the other, in that peculiar combination in which the metal occurs as a constituent of the animal body, as in hæmoglobin ("organic" iron). "Inorganic" iron is precipitated from solutions by alkaline sulphides, but "organic" iron resists such attack unless the sulphides are present in excess. According to the theory, therefore, ordinary medicinal iron, being, as it is, "inorganic" iron, is all precipitated by the sulphides of the alimentary canal, and consequently is not absorbed at all. "Inorganic" iron, then, can cure chlorosis indirectly only, by promoting in some way assimilation of the "organic" iron of the subject's dietary. And two such ways have been assumed: the one, by simple improvement of digestion generally, through local action of medicinal iron upon the intestine, and the other by vicarious sacrifice of the "inorganic" iron itself as follows: It is assumed (Bunge) that in chlorosis there is an excess of sulphides in the *primæ viæ* whereby even the "organic" iron of the foods is attacked and precipitated. By reason of such precipitation, then, the food iron is not absorbed in full, and the chlorotic condition results. But if now a chalybeate is taken, the sulphides seize upon such "inorganic" iron in preference to the "organic" food iron, and so the latter is saved for absorption.

But to this theory of the non-absorption of "inorganic" iron there are fatal objections. First, under the theory, anything else than iron equally effective either to improve digestion or to precipitate sulphides ought to be just as good as iron at curing chlorosis, whereas such is distinctly not the case. Secondly, iron should be inoperative if introduced in the form of sulphide into the intestine; but again the fact is the other way. Thirdly and conclusively, absorption of "inorganic" iron introduced into the alimentary canal has positively been demonstrated, and in different ways, by a number of experimenters upon animals.

The non-excretion by the kidneys of ingested iron is very simply explained by the fact that, as in the case of other heavy metals, iron is excreted mainly by the *intestines*. The history of iron in the animal system is undoubtedly this: It is absorbable from the intestines, whether originally presented as "inorganic" or "organic" iron; and, after absorption, so much as may be wanted for physiological needs is stored away, mainly in the liver and spleen, thence to be put forth, as may be required, in the form of "organic" iron. What is absorbed in excess of needs is excreted, but this excretion, as just said, is principally by the same avenue as that of entry into the system, namely, by the intestines.

It is unfortunate that the theory of non-absorption of "inorganic" iron should have gained such vogue as has been the case. For the result has been, on the one hand, undeservedly to discredit the ordinary chalybeates, and, on the other, to flood the market with new and expensive preparations purporting to offer iron in a condition especially fit for assimilation, when, as a matter of fact, the standard and cheap preparations of the Pharmacopœia are just as good.

Being itself a normal constitutent of the animal substance, iron is non-poisonous so far as constitutional effect is concerned in any ordinary dosage. Locally, however, there is the widest possible difference in the action of the different iron preparations, some being absolutely bland, while others are irritant or astringent and styptic.

The character of an iron compound, *in re* astringency or irritation, is determined in part by the solubility of the salt, and in part by the character of the salt's acid radical. For, of course, in the first place, all compounds insoluble, or but sparingly soluble, in fluids of aqueous basis are locally bland, so that metallic iron, ferrous carbonate, and ferric hydroxide, hypophosphite, and valerianate are bland irrespective of the quality of their several acids. Of aqueously soluble compounds, those that are salts of the so-called organic acids—lactic, acetic, citric, and tartaric—and the mixed salts of the United States Pharmacopœia passing under the names of "phosphate" and "pyrophosphate," are comparatively bland—the citrates, tartrates, and phosphates being quite so, the lactate and acetate not so purely. The salts of the strong so-called mineral acids are in varying degree astringent, irritant, or both, as follows: Powerfully styptic, are *ferric chloride, ferric nitrate,* and the two grades of *ferric sulphate,* normal and basic ("tersulphate" and "subsulphate," respectively); powerfully astringent, but with proportionately less coagulating faculty, *ferrous sulphate* ("green vitriol," "sulphate of iron") and *ammonio-ferric sulphate* ("iron-alum"); decidedly irritant, but not distinctively astringent, *ferrous iodide.* True "organic" iron is always bland.

Clinically, the respective local effects of the two broad groups thus defined are as follows: The astringent or irritant compounds have a harsh, *puckery,* generally sour and disagreeably inky taste, and, upon frequent taking, tend to blacken and even to corrode the teeth. The blackening is removable by a tooth-brush, but the corrosion is, of course, a serious matter, and necessitates the clinical rule to order solutions of astringent chalybeates to be taken through a glass tube set far back over the tongue, and the mouth to be well rinsed after the swallowing. Upon the healthy stomach, small doses of the astringents, in common with most other not over-noxious irritants, tend to excite appetite and quicken digestion, but large doses to derange. Upon a stomach the seat of a decided catarrh—as is unfortunately often the case in the very circumstance of anæmia calling for chalybeate medication—even comparatively small doses act so unkindly that the astringents have to be set aside and a bland chalybeate substituted. Upon the bowels there is a strong tendency to constipate—so strong that in a considerable course of medication with an astringent iron salt the condition of the bowels must carefully be watched and regulated. In overdose the astringents are irritant poisons—fatal, it may be, in sufficient volume and concentration of solution.

Of these various effects there is seen but a shadow, or not even that, among the bland preparations. Some of the soluble ones may taste a little inky and blacken the teeth, but they do not corrode. Some tendency to constipation may be noted, but far less in degree than with the astringent compounds; while severe irritation of the stomach, poisoning, and local stypticity are entirely wanting. Chalybeates of the bland group that are insoluble of course have practically no taste and absolutely no astringency, and do not blacken the teeth. After being swallowed such preparations are attacked by the free acid of the gastric juice, and being changed thereby to soluble form, are capable of absorption, and thus of full chalybeate constitutional power.

All chalybeates, finally, bland and astringent, blacken the stools by their presence therein in the condition of tannate or sulphide. These derived salts thus discharged in the *dejecta* may, in part, represent a certain portion of the iron dose that has entered the blood, and, after a due career in the circulation, has been excreted by the bowels, and in part they may be, and undoubtedly are, the simple excess of dose that, unabsorbed, has been passed along the alimentary canal to the rectum. Of course, the blackening of the stools is of no consequence; the only point is that the patient should be forewarned of the circumstance, lest the unusual color of the fæces excite alarm.

Therapeutically, the two main applications of iron compounds are their internal administration for the cure of *anæmia*—in which case the medicine is referred to as a *chalybeate*—and the local use of the ferric styptics for the control of hemorrhage. There are, however, certain special applications of certain compounds, which will be detailed in due place.

II. MEDICINAL PREPARATIONS OF IRON.—The preparations of iron official in the United States Pharmacopœia are derived from the following chemical conditions of the metal: 1. The metal uncombined, in state of powder. 2. The metal in ferrous combination, as, severally, *carbonate, lactate, sulphate,* and *iodide.* 3. The metal in ferric combination, as, severally, *hydroxide* ("hydrated oxide"), *acetate, citrate, ammonio-citrate, potassio-tartrate, ammonio-tartrate, sodio-phosphate* ("phosphate"), *sodio-pyrophosphate* ("pyrophosphate"), *hypophosphite, valerianate, chloride, basic sulphate* ("subsulphate"), *normal sulphate* ("tersulphate"), *ammonio-sulphate,* and *nitrate.* These several compounds will be discussed seriatim, together with the preparations of the United States Pharmacopœia derived from each.

Iron Uncombined.

Metallic iron, in the condition of fine powder, is a valuable chalybeate of the bland variety, characterized by richness, tastelessness, and perfect blandness, combined with promptness and efficiency. Because of these qualities metallic iron is especially serviceable in the case of children or of subjects of any age with sensitive stomachs or squeamish palates. Iron in powder is easily obtainable by reducing ferric oxide, heated in a reduction tube, by a stream of hydrogen gas. The product is official in the United States Pharmacopœia under the title *Ferrum Reductum,* Reduced Iron, also known as *Quevenne's iron,* and *iron by hydrogen.* Reduced iron, pulverulent at the forming, is subjected to further fine pulverization, and then appears as a soft, smooth, heavy powder of a lustreless, blackish-gray hue. It is, of course, insoluble in neutral fluids, such as water, alcohol, or glycerin, but it dissolves, with effervescence of hydrogen, in dilute acids, by entering into saline combination therewith. Its medicinal activity is determined by this reaction, the acids of the gastric juice acting as solvents. Reduced iron should be kept, well dried, in a tightly stoppered bottle, in order to prevent oxidation, a reaction to which the preparation is very prone. Purity is important, since impure specimens give rise to eructations of disagreeable gas after taking. A good sample is a gray-black, and not deep black, and on treatment with dilute sulphuric acid, warmed, dissolves wholly, and the hydrogen gas evolved is nearly without odor. Black specimens, effervescing but slightly with dilute acids, are spurious.

The dose of reduced iron ranges from 0.20 to 0.40 gm. (gr. iij. to vi.), given three times a day. Being tasteless, the preparation may be given, even to children, in powder, or it may be ordered in pill, or, convenient for children, in chocolate lozenge. The administration should be at or about meal-times, so as to secure the prerequisite of presence of acid gastric juice; and if digestion be sluggish, it is well even to add an acid, for which purpose the innocent acid of lemonade is perfectly efficient.

Ferrous Carbonate: $FeCO_3$.

Ferrous carbonate, also insoluble, closely resembles reduced iron in combining perfect blandness with efficiency. But since the salt undergoes rapid spontaneous decomposition, it is available for prescribing only in certain pharmaceutical preparations wherein decomposition is prevented by the presence of sugar. These preparations, in the United States Pharmacopœia, are as follows:

Ferri Carbonas Saccharatus, Saccharated Ferrous Carbonate. A solution of ferrous sulphate is added to one of acid sodium carbonate; ferrous carbonate forms as a pale, bluish-white precipitate, which is collected, washed, drained, and, while still moist, mixed with sugar. Then the mixture is dried over a water-bath, and the product is pulverized. Such powder is to be kept in small bulk, in tightly stoppered bottles. Saccharated carbonate of iron thus made is a dull, greenish-gray powder of a saccharine and faintly ferruginous taste. It is neutral in reaction; in water only the sugar of its composition dissolves, but in dilute acids the entire powder disappears by chemical conversion of the iron salt, the reaction attended by copious evolution of carbon dioxide. The dose is from 0.30 to 2 gm. (gr. v. to xxx.), three times a day, given in powder or pill. But if the pill form be desired, the following official preparations are better:

Massa Ferri Carbonatis, Mass of Ferrous Carbonate, known also as *Vallet's mass,* or *Vallet's ferruginous pills.* Ferrous carbonate is precipitated as in making the foregoing preparation, but now from a syrupy instead of from a simple aqueous solution of ferrous sulphate, and syrup instead of plain water is used for the washings. The protective influence of sugar is thus utilized from the start, with the result of securing a quite perfect preservation of the ferrous salt. After collection, the precipitate of the carbonate is incorporated with honey and sugar, and the mixture evaporated to a certain weight. A greenish-black, soft, pilular mass results. The mass contains about half its weight of the iron salt, and may be given in doses, thrice daily, of from 0.20 to 0.30 gm. (gr. iij. to v.), of course in pill.

Pilulæ Ferri Carbonatis, Pills of Ferrous Carbonate, "Ferruginous Pills," "Chalybeate Pills," "Blaud's Pills." These pills are an imitation of the famous French "*Blaud's ferruginous pills,*" and are compounded of ferrous sulphate, potassium carbonate, sugar, tragacanth, and marshmallow, made into pilular consistence with a few drops of glycerin and water. The usual double decomposition occurs between the ferrous sulphate and the alkaline carbonate, with the production of ferrous carbonate. The pills should be made freshly when wanted, and from two to six may be given at a dose.

Ferrous carbonate is the salt of iron present in the following preparation of the United States Pharmacopœia, designed to afford the association of iron with myrrh for prescription to women, when anæmia is complicated with menstrual debility or an hysterical tendency:

Mistura Ferri Composita, Compound Iron Mixture, "Griffith's Mixture." In this mixture, rose-water, flavored with spirit of lavender, and charged with the necessary sugar, holds in suspension myrrh and ferrous carbonate, the latter precipitated by mixture of ferrous sulphate and potassium carbonate. The mixture, despite the sugar present, does not keep well, and should be made fresh on prescription. From 30 to 60 gm. (fl. ℥ i. to ij.) may be given three times a day.

Lastly, ferrous carbonate is the condition in which iron exists ordinarily in chalybeate waters, the salt being held in solution by the excess of carbonic acid with which the waters are charged. The rust-colored deposit which these waters yield is due to the ferric hydroxide resulting from the usual spontaneous decomposition of the carbonate.

Ferrous Lactate: $Fe(C_3H_5O_3)_2.3H_2O$.

Ferrous lactate was proposed as a medicine from theoretical considerations. On the assumption that many chalybeates become lactates in the stomach through the action of lactic acid in the gastric juice, it was thought that the lactate itself would prove exceptionally easy and quick of absorption. Clinical experience, however, fails to show any decided superiority of the salt. Ferrous lactate is official in the United States Pharmacopœia under the title *Ferri Lactas,* Ferrous Lactate, and presents itself in dingy-green crystalline grains or crusts, sparingly soluble only in cold water (in forty parts at 15° C.). It is a fairly good chalybeate, but is a trifle irritant as compared with reduced iron or the carbonate. It may be given in doses of from 0.12 to 0.20 gm. (gr. ij. to iij.) in pill or mixture.

Ferrous lactate is the salt of iron used in preparing the United States Pharmacopœia official syrup entitled *Syrupus Hypophosphitum cum Ferro,* Syrup of Hypophosphites with Iron. This preparation is simply the syrup of hypophosphites (see Hypophosphites), holding one per cent., each, of ferrous lactate and potassium citrate in solution. The lactate is selected for this application solely for the chemical reason that it does not form a precipitate with the hypophosphites. The syrup may be given in teaspoonful doses three times daily. It should be made fresh when wanted.

Ferrous Sulphate: $FeSO_4.7H_2O$.

Ferrous sulphate is the salt so well known as *greeen vitriol,* and also in the impure state as *copperas.* Medicinally, it is of triple interest, being efficient as a chalybeate, an astringent, and a disinfectant. The salt can be obtained in the condition of large crystals, crystalline grains, and in the powder that results from depriving the crystals, by efflorescence and heat, of the greater part (six molecules) of their water of crystallization. All three conditions are official in the United States Pharmacopœia, the crystalline being entitled *Ferri Sulphas*, Ferrous Sulphate; the granular, *Ferri Sulphas Granulatus*, Granulated Ferrous Sulphate; and the powder of efflorescence, *Ferri Sulphas Exsiccatus*, Dried Ferrous Sulphate. The official crystals represent a pure form of the article, such as alone should be used if intended for internal giving. The crystals are large monoclinic prisms of a pale bluish-green color, and effloresce slowly on exposure. The crystalline grains—the "granulated sulphate" of the United States Pharmacopœia—result from pouring a solution of ferrous sulphate slowly, with constant stirring, into alcohol. The salt then, being insoluble in alcohol, separates in a crystalline powder, which powder is of the same tint as the ordinary crystals, and also effloresces in dry air. The third, the "dried" form, is obtained by heating the previously effloresced salt so long as it yields water of crystallization, and then pulverizing. It is a fine, grayish-white powder, of which a little over three parts are the equivalent in chalybeate value of five of the crystals.

Ferrous sulphate in all its forms dissolves in water, the two varieties of crystals fully and freely, the effloresced powder more slowly and with a small residue. In alcohol it is insoluble. The salt, although not truly styptic, is strongly astringent and is capable, in overdose, of producing irritant poisoning. Medicinally it can be used as a chalybeate, and is important in being the only decidedly astringent chalybeate that can conveniently be given in pill form. When prescribed internally, therefore, it is commonly in such form, and for this the dried sulphate should invariably be selected, since the crystals, by efflorescence, would tend to disintegrate a pill mass. The dose is from 0.05 to 0.10 gm. (about gr. i. to ij.), three times a day. If ordered in solution (in which condition, however, ferrous sulphate presents no particular reason for selection), one of the crystalline forms should be prescribed, and care should be taken to avoid in the solution any of the many chemical incompatibles of the salt. These are catalogued as the alkalies and their carbonates, soaps, lime water, calcic and basic chlorides, sodium borate and phosphate, silver nitrate, and lead acetate and subacetate.

If, furthermore, the iron sulphate contain any of the hydroxide, as it is very apt to do, anything charged with tannic or gallic acid, as are many vegetable infusions, will make ink on admixture. This reaction, however, can be prevented by the addition of a small quantity of any of the pharmacopœial dilute mineral acids—an addition rarely objectionable under the circumstances in which the chalybeate is likely to be prescribed. Ten drops of diluted sulphuric acid to a 100 c.c. bottleful (about four fluidounces) of a half-per-cent. solution of ferrous sulphate and tannic acid has been found competent to prevent the usual precipitation.

Ferrous sulphate can be used locally for the usual purposes of the mineral astringents, but is rarely so employed, since it presents no advantage over the time-honored salts of silver, copper, zinc, etc. If used, it is to be applied in solution, whereof the strength will range from one-fifth per cent. to about two per cent., according to the sensitiveness of the part; or it may be made into ointment of from one per cent. to three per cent. in strength.

Thirdly, ferrous sulphate has an old-time reputation as a so-called "disinfectant." Recent exact experiments have shown that the salt may fail utterly as a germicide, although capable, in 0.5-per-cent. solution, to inhibit temporarily the vital activity of certain microzymes. Limitations in the employment are that the salt, not being volatile, is useless for aerial disinfection, and that, because of its staining, it must not be employed to treat textile fabrics, floors, or walls. But for bed-pans, close stools, sinks, drains, cesspools, privies, etc., ferrous sulphate is unobjectionable, and has the positive advantages of being cheap and odorless. For application, the very cheap commercial copperas answers just as well as the pure pharmacopœial salt. A handful of the crystals may be put into a bed-pan or close stool that is to receive offensive or contagious discharges, or, where a solution is more convenient, this may be made of about fifteen per cent. strength, and should be used liberally. When large quantities are wanted, a convenient plan is to suspend a basket holding about sixty pounds of copperas in a barrel of water, from which barrel the solution is dipped out as wanted.

Lastly, concerning ferrous sulphate, it is the iron salt present in the official preparation of the United States Pharmacopœia entitled *Pilulæ Aloës et Ferri*, Pills of Aloes and Iron. (This preparation, being rather one of aloes than of iron, has been discussed under *Aloes*, which see.)

Ferrous Iodide: FeI_2.

In the medicinal virtues of ferrous iodide, the iodine, because of its small actual quantity in allowable doses of the compound, plays a very subordinate part. The salt is therefore essentially a chalybeate, with but a dash, so to speak, of iodine virtues. Ferrous iodide is irritant, without being astringent, and is somewhat remarkable for a tendency to relax rather than to constipate the bowels. It is sometimes also diuretic. As a chalybeate it is efficient, and is most commonly selected in cases in which the action of iodine is desired along with that of iron—this rather on theoretical grounds. Chemically, ferrous iodide, like the carbonate, is hopelessly unstable, so that the prescriber is again restricted to special pharmaceutical forms for the administration. These in the United States Pharmacopœia are as follows:

Ferri Iodidum Saccharatum, Saccharated Ferrous Iodide. Iron wire and iodine are brought together in the presence of water; direct union of the elements results, and the ferrous iodide dissolves as it forms in the water. After the reaction is complete the solution is filtered into a vessel holding an appropriate quantity of sugar of milk. The whole is then evaporated to dryness, mixed with an additional portion of sugar of milk, to which also a little reduced iron is added, and the final product pulverized. The preparation is then to be put at once into small, well-dried bottles, tightly stoppered, and is to be kept in a cool and dark place. This saccharated iodide is a grayish powder, very hygroscopic, because of a strong deliquescent tendency of ferrous iodide, is of a sweetish ferruginous taste, and is wholly soluble in water (in seven parts at 15° C.). It is only partially soluble in alcohol. It contains twenty per cent. of ferrous iodide, and may be administered in doses, thrice daily, of from 0.12 to 0.30 gm. (gr. ij. to v.).

Syrupus Ferri Iodidi, Syrup of Ferrous Iodide. Ferrous iodide is formed in solution exactly as in the foregoing instance, and the solution, with proper manipulations of heating and filtering, is mixed with syrup, of the proper quantity to make the product contain ten per cent. of ferrous iodide. When freshly made this syrup is of a clear, pale-green color, is odorless, and of a combined sweet and harshly ferruginous taste. Despite the sugar of its composition, it is very prone to change, in which case the color passes from green to yellow, or even brown. This change occurs mainly through exposure to the oxygen of the atmosphere, the iodide being in part decomposed, the iron suffering oxidation, and the iodine being set free. To prevent change the syrup should be kept in small vials, well stoppered, fully filled, and exposed to diffused daylight. If discoloration have taken place, the original clearness and color can be reproduced by treating the syrup with sodium hyposulphite. A four-per-cent. solution of this salt in water is made, of which 1 c.c. (♏ xv.) may be added to half a litre (one pint) of discolored syrup. If the discoloration have proceeded to a distinct brown, the dose of hyposulphite solution must be increased. Syrup of ferrous iodide is a very

frequently used and thoroughly efficient chalybeate. It is given in doses, thrice daily, of from 0.50 to 2 gm. (about from ♏ vi. to xxx.), which doses, because of the extreme chemical vulnerability of the preparation, should never be made constituent to a composite prescription, but always given alone, simply well diluted with water, and even this dilution done only at the time of administration. The medicine, furthermore, being very liable to attack the teeth, should be taken through a glass tube and the mouth well rinsed after each dose.

Pilulæ Ferri Iodidi, Pills of Ferrous Iodide. Iodine and reduced iron, the latter in slight excess, are made to react in presence of water, until all the iodine is converted into iodide. Then certain proportions of licorice, sugar, extract of licorice, and gum arabic are added, and the mixture is evaporated to pilular consistence. The mass is then cut up into pills, and the individual pills are coated with balsam of tolu dissolved in a little ether, to protect them from the action of the atmosphere. These pills are in imitation of the so-called *Blancard's pills*, and are an efficient representative of the virtues of ferrous iodide. Each pill contains about 0.065 gm. (gr. i.) of ferrous iodide, and 0.012 gm. (gr. $\frac{1}{5}$) of reduced iron, and from one to two pills constitute a dose.

Ferric Hydroxide ("Hydrated Oxide"): $Fe_2(OH)_6$.

Ferric hydroxide is peculiar among the medicinal *ferric* compounds in being insoluble in water. Furthermore, it seems to resist obstinately the solvent powers of the alimentary juices, for when taken internally, even in quite large quantities, in anæmia, it produces very little effect. Locally, as might be inferred, it is absolutely bland. Because of its feebleness, the hydroxide is practially useless as a chalybeate, and its medicinal value is solely because of a peculiar chemical reaction it affords with arsenical compounds, whereby it becomes a possible chemical antidote in poisoning by arsenicals. The reaction is that ferric hydroxide, when freshly made and still moist, attacks arsenical compounds in solution, and forms out of them a ferrous arsenate which is insoluble, and therefore inert. So long as the arsenical is in solid condition there is no reaction, but as fast as solution takes place the hydroxide, if upon the ground, attacks the dissolved compound, as described. For the reaction in full, the estimate is that twelve parts of antidote are needed for each part of poison; but since the hydroxide is harmless, the practice is to give it freely and frequently so long as the symptoms of poisoning persist.

Ferric hydroxide is easily obtainable by treating with an alkali a solution of a ferric salt. The salt is decomposed, its acid radical going over to the alkali, and its basic precipitating as ferric hydroxide. The precipitate thus occurring is brick-red, pulpy, tasteless, and perfectly bland. Washed and mixed with the proper amount of water, it forms a magma, in which condition it is given in teaspoonful doses every five minutes, in application as antidote to arsenic. Two formulæ for procuring the hydroxide are authorized by the United States Pharmacopœia, and since the physician may need himself to prepare the antidote, the formulæ are here reproduced in full:

Ferri Oxidum Hydratum, Ferric Hydrate. "Solution of ferric sulphate, 100 c.c.; ammonia water, 110 c.c.; water, a sufficient quantity. To the ammonia water, previously diluted with 250 c.c. of cold water, add, under constant stirring, the solution of ferric sulphate, previously diluted with 1,000 c.c. of cold water. As soon as the precipitate has subsided, draw off the clear liquid by means of a siphon, then mix the precipitate intimately with about 1,000 c.c. of cold water, again draw off the clear liquid after subsidence of the precipitate, and repeat this operation until a portion of the decanted liquid gives not more than a slight cloudiness with barium chloride test solution.* Finally, transfer the precipitate to a wet muslin strainer, and, after it has drained, mix it with sufficient cold water to make the mixture weigh 250 gm.

"When ferric hydrate is to be made in haste, for use as an antidote, the washing may be performed more quickly, though less perfectly, by transferring the precipitate at once to a wet muslin strainer, pressing forcibly with the hands, until no more liquid passes, and then adding enough water to make the whole weigh about 250 gm. NOTE.—The ingredients for preparing ferric hydrate as an antidote should always be kept on hand in bottles containing, respectively, 200 c.c. of the solution of ferric sulphate, and 220 c.c. of ammonia water" (U. S. P.).

The objection to this process is the time consumed in the washing and straining, and accordingly the following preparation is offered, in which the hydroxide is precipitated by magnesia instead of ammonia, and the excess of magnesia and the magnesium sulphate resulting from the reaction with the iron sulphate are permitted to remain, since they are harmless. Accordingly the preparation is ready for use at once:

Ferri Oxidum Hydratum cum Magnesia, Ferric Hydrate with Magnesia. "Solution of ferric sulphate, 50 c.c.; magnesia, 10 gm.; water, a sufficient quantity. Mix the solution of ferric sulphate with 100 c.c. of water, and keep the liquid in a large, well-stoppered bottle. Rub the magnesia with cold water to a smooth and thin mixture, transfer this to a bottle capable of holding about 1,000 c.c., and fill it with water to about three-fourths of its capacity. When the preparation is wanted for use, shake the magnesia mixture to a homogeneous thin magma, gradually add to it the iron solution, and shake them together until a uniform, smooth mixture results. NOTE.—The diluted solution of ferric sulphate, and the mixture of magnesia with water, should always be kept on hand, ready for immediate use" (U. S. P.).

Ferric hydroxide, dried, is the compound of iron contained in the two following official preparations of the United States Pharmacopœia:

Trochisci Ferri, Troches of Iron. These are compounded of ferric hydroxide, dried by heat; vanilla, sugar, and mucilage of tragacanth. Each lozenge contains 0.30 gm. (gr. v.) of dried hydroxide.

Emplastrum Ferri, Iron Plaster. This plaster contains nine per cent. of dried ferric hydroxide in admixture with lead plaster, olive oil, and Burgundy pitch. It is commonly known as *strengthening plaster*, but, of course, any specific virtues due to the iron are imaginary.

Of the next following salts of iron, the acetate and the various citrates, tartrates, and phosphates have so many features in common as to constitute a distinct subclass. These salts are all soluble in water, bland in action, and of little taste; they decompose spontaneously in aqueous solution, and, obtained in solid form by evaporation of such solution, present the appearance of thin, shining scales, looking like broken bits of thin, colored gelatin. They are valuable, medicinally, as affording bland chalybeates whose solubility and freedom from taste enable them to be given without objection in fluid form. They are common as the iron basis of many fancy fluid pharmaceutical preparations. They should be kept in well-stoppered bottles, protected from light.

Ferric Acetate: $Fe_2(C_2H_3O_2)_6$.

Since acetic acid is a pretty sharp acid, ferric acetate has a sharp quality, and, accordingly, is not so purely bland as are the citrates and tartrates. It is an excellent chalybeate of its type, and is official in the United States Pharmacopœia, not in solid form, but in the two following pharmaceutical preparations only:

Liquor Ferri Acetatis, Solution of Ferric Acetate. "An aqueous solution of ferric acetate, containing about thirty-one per cent. of the anhydrous salt" (U. S. P.). It is made by saturating glacial acetic acid with freshly precipitated ferric hydroxide, and bringing the solution to standard strength by the addition of water. Like most of the solutions of the present series of compounds, this preparation is a deep reddish-brown fluid of mild ferruginous flavor only. It may be given as a medicine in

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* An aqueous solution of the salt, 12.2 per cent. in strength.