Meran owes its high reputation as a resort for consumptive and nervous invalids to the purity of its air and its comparative immunity from wind and rain in winter. It stands in 46° 41′ N. lat., at a height of 1050 feet above the sea, and has a mean annual temperature of about 54° Fahr. Meran enjoys three seasons, being also visited in spring for the whey-cure and in autumn for the grape-cure. The arrangements for the comfort of the visitors are very complete; and the environs afford opportunity for numerous pleasant walks and excursions. The favourite promenade of the inhabitants is on a massive dyke, built to protect the town against the encroachments of the Passer. Nearly twenty old castles and chateaus are visible from the bridge over the Passer, the most interesting being Schloss Tyrol, an ancient edifice which has given its name to the entire country. Meran is now frequented by about 6500 patients and 8000 to 9000 passing travellers annually. In 1880 its population, including Obermais and Untermais, amounted to 5334 souls.

Meran is probably the representative of the Roman Urbs Majensis, afterwards known as Mairania. It became a town in 1290, and down to 1490 was the capital of the counts and dukes of Tyrol. The town suffered somewhat during the Peasants' War in the 16th century, and subsequently from destructive floods. As a health-resort it has been known for about forty years. The whole region in which it lies is singularly rich in historic interest.

Authorities.—Beda Weber, *Meran*; Düringsfeld, *Aus Meran*, 1868; Noë, *Der Frühling von Meran*; Stampfer, *Chronik von Meran*, 1867, and *Geschichte der Stadt Meran*, 1872; Pircher, *Meran als Klimatischer Kurort*, 1870; Plant, *Führer durch Meran*, 2d ed., 1879; Knoblauch, *Meran*, 5th ed., 1881.

MERCATOR, GERARDUS (Latinized form of Gerhard Krämer) (1512–1594), mathematician and geographer, was born at Rupelmonde in Flanders, May 5, 1512. Having completed his studies at Louvain, he devoted himself to geography, and, after being for some time attached to the household of Charles V., he was appointed cosmographer to the duke of Juliers and Cleves in 1559, taking up his residence at Duisburg, where he died December 2, 1594. One of his earliest cartographical works was a terrestrial globe (1541), followed in 1551 by a celestial globe. In 1552 he published a treatise *De usu annuli astronomici* (Louvain), and at Cologne in 1569 his *Chronologia, hoc est temporum demonstratio . . . ab initio mundi usque ad Annum Domini* 1568, *ex eclipsibus et observationibus astronomicis, sacris quoque Bibliis*, &c. In the same year was published the first map on Mercator's well-known projection, with the parallels and meridians at right angles, for use in navigation. At Cologne, in 1578, appeared his *Tabulæ geographicæ ad mentem Ptolemæi restitutæ et emendatæ*. The work by which he is chiefly known is his atlas, published in 1594 at Duisburg, in folio, under the title of *Atlas, sive Cosmographicæ meditationes de fabrica mundi*. It contains, besides the maps, cosmographical and other dissertations, some of the theological views in which were condemned as heretical; it was completed by Hondius in 1607. Several of the maps had been previously published separately, the atlas being delayed to allow Ortelius to complete his. Mercator also published in 1592 a *Harmonia Evangeliorum*.

MERCURIAL AIR-PUMP. This name is given to two distinct instruments, one of which is founded on statical, the other on hydrodynamical principles.

1. *The Statical Pump.*—The famous spiritualist Swedenborg was the first to conceive an air-pump in which a mass of mercury, by being made to rise and fall alternately within a vertical vessel, should do the work which in the ordinary instrument is assigned to the piston. He published a description of his pump in 1722; but it is questionable whether his design was ever realized. Of numerous subsequent inventions the only one which, in fact, has survived is the admirably simple and yet efficient instrument first described in 1858, but constructed some time before, by H. Geisler of Bonn, which at once, and justly, met with universal acceptance.

The general scheme of Geisler's pump is shown in fig. 1. A and B are pear-shaped glass vessels connected by a long narrow india-rubber tube, which must be sufficiently strong in the body (or strengthened by a linen coating) to stand an outward pressure of 1 to $1\frac{1}{2}$ atmospheres. A terminates below in a narrow vertical tube *c*, which is a few inches longer than the height of the barometer, and to the lower end of this tube the india-rubber tube is attached which connects A with B. To the upper end of A is soldered a glass two-way stop-cock, by turning which the vessel A can either be made to communicate through *s* and a hole in the hollow cock with the vessel to be exhausted (I., fig. 2), or through *g* with the atmosphere (II., fig. 2), or can be shut off from both when the cock holds an intermediate position. The apparatus, after having been carefully cleaned and dried, is charged with pure and dry mercury, which must next be worked backwards and forwards between A and B to remove all the air-bells. The air is then driven out of A by lifting B to a sufficient level, turning the cock into position II., and letting the mercury flow into A until it gets to the other side of the stop-cock, which is then placed in the intermediate position. Supposing the vessel to be exhausted to have already been securely connected with *b*, we now lower the reservoir B so as to reduce the pressure in A sufficiently below the tension in the gas to be sucked in, and, by turning the cock into position I., cause the gas to expand into and almost fill A. The cock is now shut against both *a* and *b*, the reservoir lifted, the gas contents of A discharged through *a*, and so on, until, when after an exhaustion mercury is let into A, the metal strikes against the top without interposition of a gas-bell. In a well-made apparatus the pressure in the exhausted vessel is now reduced to $\frac{1}{10}$ or $\frac{1}{20}$ of a millimetre, or even less. An absolute vacuum cannot be produced on account of the unavoidable air-film between the mercury and the walls of the apparatus.

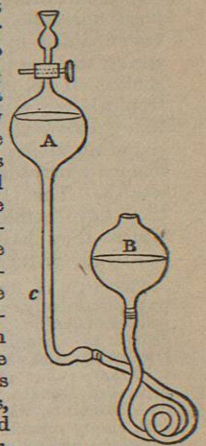

FIG. 1.—Geisler's Mercurial Air-Pump.

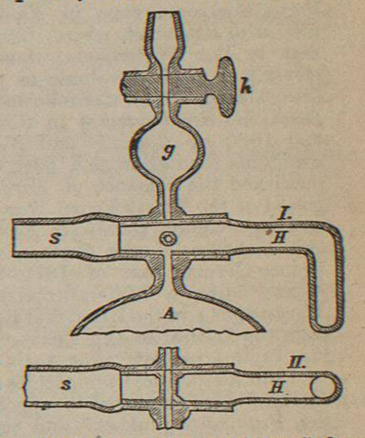

FIG. 2.—Arrangements of Stop-Cock in Air-Pump.

The great advantage of the mercurial over the ordinary air-pump is that it evacuates far more completely than the latter, that it affords direct and unmistakable evidence of the exhaustiveness of its work, and—last not least—that it enables one to transfer the gas sucked out to another vessel without loss or contamination, so that it can be measured and analysed. On account of this latter feature more especially, the instrument is highly valued as an auxiliary in gasometric researches. Without it the researches on which rests our present knowledge of the gases of the blood could not have been carried out. The actual instrument, as constructed for various kinds of work, has of course various complexities of detail omitted in the above description. For these the reader must refer to handbooks of practical physiology.

As it takes a height of about 30 inches of mercury to balance the pressure of the atmosphere, a Geisler pump necessarily is a somewhat long-legged and unwieldy instrument. It can be considerably shortened, the two vessels A and B brought more closely together, and the somewhat objectionable india-rubber tube be dispensed with, if we connect the air-space in B with an ordinary air-pump, and by means of it do the greater part of the sucking and the whole of the lifting work. An instrument thus modified was constructed by Poggendorff (see his *Annalen*, vol. cxxv. p. 151, 1865), and another, on somewhat different principles, by Prof. Dittmar (see the "*Challenger*" *Reports*).

Even a Geisler's stop-cock requires to be lubricated to be absolutely gas-tight, and this occasionally proves a nuisance. Hence a number of attempts have been made to do without stop-cocks altogether. In Töpler's pump[1] this is attained by using both for the inlet and the outlet vertical capillary glass tubes, soldered, the former to somewhere near the bottom, the latter to the top of the vessel. These tubes, being more than 30 inches high, obviously act as efficient mercury-traps; but the already considerable height of the pump is thus multiplied by two. This consideration has led Alexander Mitscherlich (*Pogg. Ann.*, cl. 420, 1873), and quite lately F. Neisen (*Z. f. Instrumentenkunde*, 1882, p. 285) to introduce glass valves in lieu of stop-cocks. As glass floats on mercury, such valves do not necessarily detract from the exhaustive power of the pump.

2. *The Dynamic Pump.*—This was invented in 1865 by H. Sprengel. The instrument, in its original (simplest) form (fig. 3), consists of a vertical capillary glass tube *a* of about 1 mm. bore, provided with a lateral branch *b* near its upper end, which latter, by an india-rubber joint governable by a screw-clamp, communicates with a funnel. The lower end is bent into the shape of a hook, and dips into a pneumatic trough. The vessel to be exhausted is attached to *b*, and, in order to extract its gas contents, a properly regulated stream of mercury is allowed to fall through the vertical tube. Every drop of mercury, as it enters from the funnel, entirely closes the narrow tube like a piston, and in going past the place where the side tube enters entraps a portion of air and carries it down to the trough, where it can be collected. If the vertical tube, measuring from the point where the branch comes in, is a few inches greater than the height of the barometer, and the glass and mercury are perfectly clean, the apparatus slowly but surely produces an almost absolute vacuum.

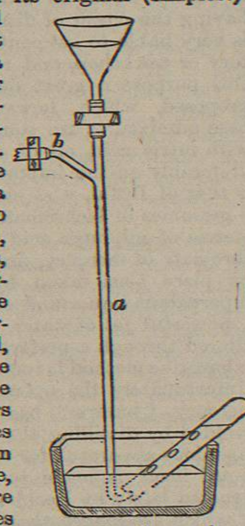

FIG. 3.—Sprengel's Air-Pump.

The great advantages of Sprengel's pump lie in the simplicity of its construction and in the readiness with which it adapts itself to the collecting of the gas. It did excellent service in the hands of Graham for the extraction of gases occluded in metals, and since then has become very popular in gas-laboratories, especially in Britain. Many improvements upon the original construction have been proposed. One of these which deserves mention is to pass the mercury, before it enters the "falling" tube, through a bulb in which a good vacuum is maintained, by means of an ordinary air-pump or a second "Sprengel." (W. D.)

MERCURY was the Roman god who presided over barter, trade, and all commercial dealings. His nature is probably more intelligible and simple than that of any other Roman deity. His very name, which is connected with *merx*, *mercator*, &c., shows that he is the god of merchandise and the patron of merchants. In the native Italian states no merchants and no trade existed till the influence of the Greek colonies on the coast introduced Greek customs into the cities of the land. All the usages and terminology of trade, and all the religious ceremonies connected with it, were borrowed by the Romans from the Greeks. It was no doubt under the rule of the Tarquins, when the prosperity of the state and its intercourse with the outer world were so much increased, that merchants began to ply their trade in Rome. Doubtless the merchants practised their religious ceremonies from the first, but their god Mercurius was not officially recognized by the state till the year 495 B.C. Rome frequently suffered from scarcity of corn during the unsettled times that followed the expulsion of the Tarquins. Various religious innovations were made to propitiate the gods; in 496 the Greek worship of Demeter, Dionysus, and Persephone was established in the city (see LIBER), and in 495 the Greek god HERMES (*q.v.*) was introduced into Rome under the Italian name of Mercurius (Livy, ii. 21, 27). Preller thinks that at the same time the trade in corn was regulated by law, and a regular college of merchants was instituted. This *collegium* was under the protection of the gods their annual festival was on the Ides of May, on which day the temple of the god had been dedicated at the southern end of the *circus maximus*, near the Aventine; and the members were called *mercuriales* as well as *mercatores*. The Ides of May was chosen as the feast of Mercury, obviously because Maia was the mother of Hermes, *i.e.*, of Mercury (see MAIA); and she was worshipped along with her son by the *mercuriales* on this day. According to Preller, this religious foundation had a political object; it established on a legitimate and sure basis the trade between Rome and the Greek colonies of the coast, whereas formerly this trade had been exposed to the capricious interference of the Government officials for the year. Like all borrowed religions in Rome, it must have retained the rites and the terminology of its Greek original (Festus, p. 257). Mercury became the god, not only of the *mercatores* and of the corn trade, but of buying and selling in general; and it appears that, at least in the streets where shops were common, little chapels and images of the god were erected. There was a spring dedicated to Mercury between his temple and the *Porta Capena*; every shopman drew water from this spring on the Ides of May, and sprinkled it with a laurel twig over his head and over his goods, at the same time entreating Mercury to remove from his head and his goods the guilt of all his deceits (Ovid, *Fasti*, v. 673 *sq.*). The art of the Roman tradesman was evidently like that of an Oriental tradesman in modern times, and the word *mercurialis* was popularly used as equivalent to "cheat." In the Latin poets Mercury is often gifted with some of the manifold characters of the Greek Hermes, but this finer conception seems to have had no real existence in Roman religion.

Roman statuettes of bronze, in which Mercury is represented, like the Greek Hermes, standing holding the caduceus in the one hand and a purse in the other, are exceedingly common. The caduceus must have been introduced as a symbol of Mercury at a very early time, for it is found on Italian coins as early as the 4th century before Christ, and we learn that several were kept as sacred objects in the *adytum* of the sanctuary at Lavinium (Dion. Hal., i. 67). But its foreign origin is shown by the fact that, although it was a sign of peace, it was never borne by the *fetiales*, the old Italian heralds. The very name is derived from the Greek κηρύκειον. Preller's view (*Röm. Myth.*) that *mercuriales* and *mercatores* are the same guild is a tempting one, but its truth is very doubtful. Mommsen thinks that *mercuriales* were a purely local guild, viz., the *pagani* of the Circus valley.

MERCURY, in chemistry, is a metal (symbol Hg) which is easily distinguished from all others by its being liquid at even the lowest temperatures naturally occurring in moderate climates. To this exceptional property it owes the synonyms of *quicksilver* in English (with the Germans *quecksilber* is the only recognized name) and of *hydrargyrum* (from ὕδωρ, water, and ἄργυρος, silver) in Græco-Latin.

[1] See *Dingler's Polytechn. Journal*, 1862; an improved form by Bessel-Hagen is described in *Wiedemann's Annalen*, xii. 425, 1881.

This metal does not appear to have been known to the ancient Jews, nor is it mentioned by the earlier Greek writers. Theophrastus (about 300 B.C.) mentions it as a derivative of cinnabar. With the alchemists it was a substance of great consequence. Being ignorant of its susceptibility of freezing into a compact solid. they did not recognize it as a true metal. and yet, on the authority of Geber, they held that mercury (meaning the predominating element in this metal) enters into the composition of all metals, and is the very cause of their metallicity. When, about the beginning of the 16th century, chemistry and scientific medicine came to merge into one, this same mysterious element of "mercury" played a great part in the theories of pathology; and the metal, in the free as in certain combined states, came to be looked upon as a powerful medicinal agent, which position, on purely empirical grounds, it continues to hold to the present day.

Mercury occurs in nature chiefly in the form of a red sulphide, HgS, called cinnabar, which, as a rule, is accompanied by more or less of the reguline metal,—the latter being probably derived from the former by some secondary reaction. The most important mercury mines in Europe are those of Almaden in Spain and of Idria in Illyria; these until lately furnished the bulk of the mercury of commerce, but they are now almost eclipsed by the rich deposits of New Almaden in California. Considerable quantities of mercury are said to be produced in China and in Japan; minor deposits are being worked in the Bavarian Palatinate, in Hungary, Transylvania, Bohemia, and Peru. At Almaden the ore forms mighty veins traversing micaceous schists of the older transition period; in Illyria it is disseminated in beds of bituminous schists or compact limestone of more recent date.

Chemically speaking, the extraction of mercury from its ores is a simple matter. Metallic mercury is easily volatilized, and separated from the gangue, at temperatures far below redness, and cinnabar at a red heat is readily reduced to the metallic state by the action of iron or lime or atmospheric oxygen, the sulphur being eliminated, in the first case as sulphide of iron, in the second as sulphide and sulphate of calcium, in the third as sulphurous acid gas. To the chemical mind a close iron retort would suggest itself as the proper kind of apparatus for carrying out these operations, but this idea is acted upon only in a few small establishments,—for instance, in that of Zweibrücken in the Palatinate, where lime is used as a decomposing agent. In all the large works the decomposition of the cinnabar is effected by the direct exposure of the ore to the oxidizing flame of a furnace, and the mercury vapour, which of course gets diffused through an immense mass of combustion gases, is sought to be recovered in more or less imperfect condensers.

At Almaden this roasting distillation is effected in prismatic furnaces, which, by a second upper (brick) grating are divided into two flats, the lower one serving for the generation of a wood fire, while the upper accommodates the ore, which is introduced through an opening in the dome-shaped roof. To avoid an excessive dilution of the mercury vapour with combustion gases, part of these are led out laterally into a chimney and the rest allowed to strike up through the heap of ore. The large mass of metalliferous vapour produced passes out through a system of pipes inserted laterally into the dome and so arranged that they follow first a descending and then an ascending plane, to lead ultimately into a condensation chamber which communicates in its turn with a chimney. The pipes are formed each of a large number of elongated pear-shaped earthenware adapters (called *aludels*), which are telescoped into one another as in the case of the iodine-distillation apparatus, the joints being luted with clay. The lowest row of aludels, which lie in the line of intersection of the two inclined planes, are pierced with holes below, so that what arrives as liquid mercury there runs out into a gutter leading to a reservoir. What of mercury vapour remains uncondensed in the aludels passes into the chamber, the intention being to have it condensed there; in reality a large proportion of the mercury passes out through the chimney (and through the numerous leaks in the aludels) into the atmosphere to poison the surrounding vegetation and the workmen. Similar furnaces to the Almaden ones are used in Idria and at New Almaden; only the condensation apparatus are a little less imperfect. But in all three places the loss of metal is very considerable, at New Almaden it is said to amount to close upon 40 per cent.

The mercury obtained is purified mechanically by straining it through dense linen bags, and then sent out into commerce in leather bags, or in wrought-iron bottles provided with screw plugs, each holding about 75 ℔ avoirdupois.

According to Balling's *Metallurgische Chemie* (Bonn, 1882), the production of mercury in the years named was as follows:—

Austria, exclusive of Hungary (1880)	369 tons.
Hungary (1879)	180 ,,
Italy (1877)	55 ,,
Spain (1873)	929 ,,
United States (1875)	2054 ,,

Assuming the amount to be the same from year to year, this gives a total of 3587 tons.

The price of the metal is subject to immense fluctuations; it generally ranges from 2s. to 7s. 6d. a pound avoirdupois.

Commercial mercury, as a rule, is very pure chemically, so that it needs only to be forced through chamois leather to become fit for all ordinary applications; but the metal, having the power of dissolving most ordinary other metals, is very liable to get contaminated with these in the laboratory or workshop, and requires then to be purified. For this purpose a great many chemical methods have been proposed, which, however, all come to this, that the base admixtures are sought to be removed by treatment with nitric acid, oil of vitriol, or other agents which act preferably on the impurities. The best of these methods is that of Brühl, who shakes the metal with a solution of 5 grammes of bichromate of potash and a few cubic centimetres of sulphuric acid in one litre of water, until the red chromate of mercury, first produced, has disappeared, and its place been taken by green chromic sulphates. The supernatant liquor and chromic scum are washed away by a powerful jet of water, and the clean metal is dried and filtered through a perforated paper filter. The only really exhaustive method is redistillation out of a glass apparatus. Unfortunately the operation is difficult of execution, as mercury "bumps" badly on boiling; but this can be avoided by distilling the metal in a *perfect* vacuum. An ingenious apparatus for this purpose, in which the distilled metal itself is made to keep up the vacuum, was constructed lately by Leonhard Weber. A U-tube, the limbs of which are longer than the height of the barometer, is filled with pure mercury, and inverted, the one limb being made to dip into a vessel with pure, the other into another containing the impure, mercury. This second limb is inflated above so that the meniscus is about the middle of the bulb. This bulb is heated, and the consequence is that the metal there distils over into the first limb to add to the supply of pure metal, the impure rising up in the second by itself to maintain a constant level. Dewar has modified the apparatus so that there is no need of a supply of pure metal to start with. Absolutely pure mercury does not at all adhere to any surface which does not consist of a metal soluble in mercury. Hence the least quantity of it, when placed on a sheet of paper, forms a neatly rounded-off globule, which retains its form on being rolled about, and, when subdivided, breaks up into a number of equally perfect globules. The presence in it of the minutest trace of lead or tin causes it to "draw tails." A very impure metal may adhere even to glass, and in a glass vessel, instead of the normal convex, form an irregular flat meniscus.

Properties.—The pure metal is silver-white, and retains its strong lustre even on long exposure to ordinary air. At $-38°{\cdot}8$ C., *i.e.* $-37°{\cdot}9$ F. (Balfour Stewart), it freezes,

with considerable contraction, into a compact mass of regular octahedra, which can be cut with a knife and be flattened under the hammer. The specific gravity of the frozen metal is 14·39; that of the liquid metal at 0° C. is 13·595 (water of 4° C. = 1). Under 760 mm. pressure it boils at 357°·3 C. (675°·1 Fahr.) (Regnault). At very low temperatures it seems to be absolutely devoid of volatility (Faraday); but from $-13°$ C. upwards (Regnault) it exhibits an appreciable vapour tension.

The following table gives the tensions "p," in millimetres of mercury of 0° C., for a series of centigrade temperatures "t" according to Regnault:—

t = 0°	10°	20°	50°	100°	150°	200°
p = ·02	03	·04	·11	·75	4·27	19·90
t = 250°	300°	350°	400°	450°	500°	
p = 75·75	242·1	663·2	1588	3384	6520	

According to the same authority, its average coefficient of expansion k per degree C. is as follows:—

	0–100° C.	0–200° C.	0–300° C.
k =	·0001815	·0001841	·0001866
or	1/5510	1/5432	1/5359

Its specific heat in the liquid state is ·03332; that of the frozen metal (between $-78°$ and $-40°$ C.) is ·0319 (Regnault). Its electric conductivity is $\frac{1}{57}$ of that of pure silver (Matthiesen). Its conductive power for heat is greater than that of water, and is proved (by Herwig) to be perfectly constant from 40° to 160° C. Its vapour density (air of the same temperature and pressure = 1) is 6·976 (Dumas), or 100·93 for hydrogen = 1. Hence its molecular weight ($H_2 = 2$) is 201·86. The atomic weight, by chemical methods, was found = 200·0 (Erdmann and Marchand); hence mercury-vapour molecules consist of single atoms. Mercury does not appreciably absorb any chemically inert gas.

Mercury is in constant requisition in the laboratory. It is used for the collecting and measuring of gases, in the construction of thermometers, barometers, and manometers, for the determination of the capacity of vessels, and many other purposes. In medicine it serves for the preparation of mercurial ointment and of "hydrargyrum cum creta" (the chief component of "blue pills"); both are obtained by diligently triturating the metal with certain proportions of grease and chalk respectively until it is "deadened," *i.e.*, subdivided into invisibly small globules (see below).

Alloys.—Mercury readily unites directly with all metals (except iron and platinum) into what are called amalgams. In some cases the union takes place with considerable evolution of heat and large modification of the mean properties of the components. Thus, for instance, sodium when rubbed up with mercury unites with it with deflagration and formation of an alloy which, if it contains more than 2 per cent. of sodium, is hard and brittle, although sodium is as soft as wax and mercury a liquid. Liquid amalgams of gold and silver are employed for gilding and silvering objects of copper, bronze, or other base metal. The amalgam is spread out on the surface of the object by means of a brush, and the mercury then driven off by the application of heat, when a polishable, firmly adhering film of the noble metal remains. Copper amalgam containing from 25 to 33 per cent. of the solid metal, when worked in a mortar at 100° C., becomes highly plastic, but on standing in the cold for ten or twelve hours becomes hard and crystalline. Hence it is used for the stuffing of teeth. A certain amalgam of cadmium is similarly employed.

Oxides.—There are two oxides of mercury, namely, an oxide, Hg_2O, called mercurous, and another, HgO, called mercuric oxide. The latter can be produced directly by keeping the metal for a long time in air at a temperature somewhat below its boiling point, when the oxide is gradually formed as a red powdery solid. This solid has long been known as "red precipitate," or as *mercurius præcipitatus per se.* Priestley made the important discovery that the "precipitate" when heated to dull redness is reduced to metal, with evolution of what has since been known as oxygen gas; but it was reserved for Lavoisier to correctly interpret this experiment, and thus to establish our present views on the constitution of atmospheric air. The oxide is easily prepared by heating any nitrate of the metal as long as nitrous fumes are seen to go off (when it remains as a scaly mass, black when hot, red after cooling), or else by precipitating the solution of a mercuric salt with excess of caustic potash or soda, when it comes down as an amorphous yellow precipitate, which is free of combined water. Mercurous oxide, a black solid, can be obtained only indirectly, by the decomposition of mercurous salts with fixed caustic alkalies. Both oxides are insoluble in water, but dissolve in certain, and combine with all, aqueous acids with formation of mercury salts and elimination of water. Thus, for instance,

$$Hg_2O + 2HNO_3 = H_2O + \underset{\text{Mercurous nitrate}}{Hg_2(NO_3)_2},$$

$$HgO + 2HNO_3 = H_2O + \underset{\text{Mercuric nitrate.}}{Hg(NO_3)_2}.$$

The Nitrates.—When metallic mercury is set aside with its own weight of nitric acid of 1·2 specific gravity, at ordinary temperatures, the normal mercurous salt $Hg_2(NO_3)_2$ is gradually produced, and after a day or two is found to have separated out in colourless crystals. These are soluble (somewhat sparingly) in water acidulated with nitric acid, but are decomposed by the action of pure water, with formation of difficultly soluble basic salts. When this salt (or the metal itself) is treated with excess of nitric acid it is oxidized into mercuric nitrate $Hg(NO_3)_2$, a white crystalline salt, readily soluble in water without decomposition.

The Sulphates.—Cold aqueous sulphuric acid does not act upon mercury, but the hot concentrated acid converts it first into mercurous and then into mercuric sulphate, with evolution of sulphurous acid.

$$Hg_2 + 2H_2SO_4 = 2H_2O + SO_2 + Hg_2SO_4,$$
$$Hg_2SO_4 + 2H_2SO_4 = 2H_2O + SO_2 + 2HgSO_4.$$

Both salts form white crystalline magmas. The mercurous salt is difficultly soluble in water, and consequently producible by precipitation of the nitrate with sulphuric acid. The mercuric salt, when treated with water, is decomposed with formation of a yellow insoluble basic salt, which has long been known as *turpethum minerale.* Its composition is $SO_3 . 3HgO$ when produced by excess of hot water. Mercuric sulphate is of importance chiefly as forming the basis for the manufacture of the two chlorides.

The Chlorides.—These are both extensively used medicinal agents. The mercuric salt, $HgCl_2$, known in medicine as corrosive sublimate, is prepared by mixing the sulphate intimately with common salt, and subjecting the mixture to sublimation, a little binoxide of manganese being added to oxidize the mercurous salt, which is generally present as an impurity. The process is conducted in a glass flask buried in a hot sand-bath. When the decomposition is accomplished, the sand is removed from the upper half of the flask and the temperature raised so that the chloride $HgCl_2$ produced sublimes up and condenses in the upper part as a "sublimate." The salt, as thus produced, forms compact crystalline crusts, which, when heated, melt into a limpid liquid before volatilizing. It is soluble in water, 100 parts of which at 10°, 20°, 100° dissolve 6·57, 7·39, 54 parts of salt. Corrosive sublimate dissolves in 3 parts of alcohol and in 4 parts of ether. This salt, on account of its solubility in water, is a deadly poison. Mercurous chloride, Hg_2Cl_2, better known as "calomel" (from καλός, fair, and μέλας, black, because it becomes dead-black when treated with ammonia, mercuric chloride yielding a white product), is prepared by mixing corrosive sublimate with the proper proportion of metallic mercury ($HgCl_2$: Hg) or mercuric sulphate with salt and mercury in the proportions of $HgSO_4$: Hg : 2NaCl, and subjecting the mixture to sublimation in glass flasks. The salt Hg_2Cl_2 is thus obtained in the form of white, opaque, crystalline crusts, which, when heated, volatilize, without previously melting, into a mixture of $HgCl_2$ and Hg vapour, which, on cooling, recombine into calomel. For medicinal purposes the sublimate is reduced to an impalpable powder, washed with water to remove any corrosive sublimate that may be present, and dried. Being insoluble in water, it acts far less violently on the organism than mercuric chloride does. Its action, no doubt, is due to its very gradual conversion in the stomach into mercury and corrosive sublimate. Finely divided calomel can be produced, without trouble, by the precipitation of a solution of mercurous nitrate with hydrochloric acid or common salt; but this preparation is liable to be contaminated with mercurous nitrate, and, even when pure, has been found to act far more violently than ordinary calomel does. Hence its use is not tolerated by the pharmacopœias. According to Wohler a mercurous chloride, more nearly equivalent to the sublimed article, is producible by heating corrosive sublimate solution with sulphurous acid—

$$2HgCl_2 + H_2SO_3 + H_2O = H_2SO_4 + 2HCl + Hg_2Cl_2.$$