ordinary dose. But I would advise it to be given at first in very much smaller quantity (3ss.), and to be gradually increased.

(*e.*) *Ointment of iodine.*—This is composed, according to the Dublin Pharmacopœia, of a scruple of iodine to an ounce of lard. If this be too irritating, the quantity of lard must be increased. The colour of this compound is brown, but, by keeping, it becomes paler; and hence should always be made when wanted. It is employed as a local application to scrofulous tumors, bronchocele, &c.

Antidotes.—In the event of poisoning by iodine, or its tincture, the first object is to evacuate the poison from the stomach. For this purpose, assist the vomitings by the copious use of tepid demulcent liquids—especially by those containing amylaceous matter; as starch, wheaten flour, sago, or arrow-root, which should be boiled in water, and exhibited freely. The efficacy of these agents depends on the iodide of starch, which they form, possessing very little local action. In their absence, other demulcents, such as milk, eggs beat up with water, or even tepid water merely, may be given to promote vomiting. Magnesia is also recommended. Opiates have been found useful. Of course the gastro-enteritis must be combated by the usual means.

Order IV. Bromine.

Bromin'ium.—Bro'mine.

History and Etymology.—This substance was discovered by M. Balard, of Montpelier, in 1826. He at first termed it *muride* (from *muria, brine*), in allusion to the substance from whence he procured it; but, at the suggestion of Gay-Lussac, he altered this name to that of *brome*, or *bromine*, (from βρῶμος, *a stench* or *fetor*,) on account of its unpleasant odour.

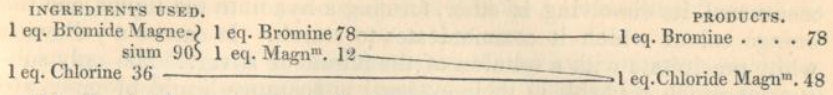
Natural History.—It is found in both kingdoms of nature, but never in the free state.

(*a.*) *In the inorganized kingdom.*—Hollander detected it in an ore of zinc, and Cochler recognised it in Silesian cadmium (Gmelin, *Handbuch der Chemie.*) It exists in sea water and many mineral waters, in combination with either magnesium or sodium, or sometimes with both. Thus it has been found in the waters of the Mediterranean, the Baltic, the North Sea, the Frith of Forth, the Dead Sea, many of the brine springs of Europe and America (as those of Middlewich, Nantwich, Ashby-de-la-Zouch, and Shirleywich, in England), and in many other mineral springs of Europe and America (as the Pittville spring at Cheltenham, the water of Llandridod and of Bonnington.) It has been justly observed by Dr. Daubeny (*Phil. Trans.* 1830), that the detection of bromine in brine-springs is a fact interesting in a geological point of view, as tending to identify the product of the ancient seas, in their most minute particulars, with those of the present ocean.

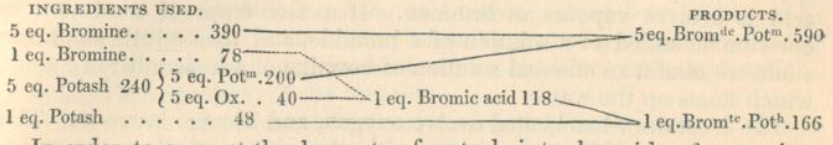
(*b.*) *In the organized kingdom.*—Bromine has been found in the sea-plants of the Mediterranean, and in the mother-waters of Kelp. It has likewise been detected in marine animals, and in the sea-sponge (*Spongia officinalis*), in the stony concretion found in this animal, and in the ashes of the *Janthina violacea*, one of the gasteropodous mollusca.

Preparation.—Bromine is usually procured from *bittern* (the mother

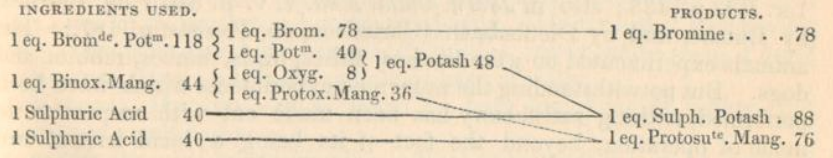
liquor of sea-water, from which the chloride of sodium has been separated by crystallization). A current of chlorine gas is passed through this liquid in order to decompose the bromide of magnesium, and thereby to form chloride of magnesium and set free the bromine, as shown by this diagram :—



The liquid through which the bromine is diffused is then to be strongly agitated with ether, by which an etherial solution of this substance is obtained, which floats on the water. To the decanted etherial solution add caustic potash : six equivalents, or 468 parts of bromine, react on six equivalents or 288 parts of potash, and produce five equivalents or 600 parts of bromide of potassium, and one equivalent or 168 parts of bromate of potash, as shown by the following diagram :—



In order to convert the bromate of potash into bromide of potassium the mass is exposed to a dull red heat, by which six equivalents or 48 parts of oxygen are evolved. The bromide of potassium is then distilled with sulphuric acid and binoxide of manganese, and the disengaged bromine condensed in water. One equivalent or 118 parts of the bromide react on one equivalent or 44 parts of the binoxide of manganese, and on two equivalents or 80 parts of sulphuric acid; and by this reaction one equivalent or 78 parts of bromine, one equivalent or 88 parts of sulphate of potash, and one equivalent or 76 parts of the sulphate of the protoxide of manganese, are produced.



PROPERTIES.—At ordinary temperatures bromine is a dark-coloured very volatile liquid, which, seen by reflected light, appears blackish red; but viewed in thin layers, by transmitted light, is hyacinth red. Its odour is strong and unpleasant, its taste acrid. Its sp. gr. is about 3; water being 1. When exposed to a cold of —4° F. it is a yellowish brown, brittle crystalline solid. At ordinary temperatures liquid bromine evolves ruddy vapours, so that a few drops put into a small vessel immediately fills it with the vapour of bromine. At 116½ F. bromine boils. The vapour is not combustible: a lighted taper plunged into it is immediately extinguished, but before the flame goes out it becomes red at the upper and green at the lower part. Antimony or arsenicum take fire when dropped into liquid bromine: when potassium or phosphorus is dropped in, a violent explosion takes place. Bromine is a nonconductor of electricity: it is a bleaching agent: it dissolves very slightly only in

water, more so in alcohol, and much more so in sulphuric ether. It communicates a fine orange colour to starch.

CHARACTERISTICS.—Liquid bromine is recognised by its colour, odour, volatility, and the colour of its vapour. To these characters must be added its powerful action on antimony, arsenicum, and potassium, before mentioned, its dissolving in ether, forming a hyacinth red liquid, and the orange colour which it communicates to starch. It causes a yellowish white precipitate with a solution of the nitrate of silver. The only substances which resemble in their external appearance liquid bromine, are the terchloride of chromium and the chloride of iodine.

The soluble *bromides* cause white precipitates with the nitrate of silver, acetate of lead, and protonitrate of mercury. The precipitates are bromides of the repective metals. Bromide of silver is yellowish white, clotty, insoluble in boiling nitric acid, and in a weak solution of ammonia (by which it is distinguished from chloride of silver), but dissolves in a concentrated solution of this alkali. Heated with sulphuric acid it evolves vapours of bromine. If a few drops of a solution of chlorine be added to a solution of a bromide, and then a little sulphuric ether, we obtain an ethereal solution of bromine of a hyacinth red colour, which floats on the water.

The *bromates* when heated evolve oxygen, and become bromides. The bromates cause white precipitates with the nitrate of silver, the protosalts of mercury, and with strong solutions of the acetate of lead. Bromate of silver is not soluble in nitric acid, but dissolves readily in solution of ammonia. If a few drops of hydrochloric acid be added to a bromate, and then some ether, a yellow or red ethereal solution of brome is obtained.

PHYSIOLOGICAL EFFECTS.—(*a.*) *On vegetables.*—I am unacquainted with any experiments made with bromine on plants.

(*b.*) *On animals generally.*—The action of bromine on animals has been examined by Franz, (quoted by Wibmer, *Die Wirkung d. Arzneim.* 1er. Bd. p. 433; also in *Journ. Chim. Méd.* t. v. p. 540;) by Barthez, by Butske, and by Dieffenbach (Christison, *on Poisons.* p. 187.) The animals experimented on were leeches, fishes, birds, horses, rabbits, and dogs. But notwithstanding the numerous experiments which have been performed, nothing satisfactory has been made out with respect to its mode of operation, beyond the fact of its being a local irritant and caustic, and, therefore, when swallowed, giving rise to gastro-enteritis. Injected into the jugular vein it coagulates the blood, and causes immediate death, preceded by tetanic convulsions. No positive inferences can be drawn as to the specific influence of bromine on any organs of the body. Some of the symptoms (such as dilated pupil, insensibility, and convulsions) would seem to indicate a specific affection on the brain. Franz frequently observed inflammation of the liver.

(*c.*) *On man.*—Bromine stains the cuticle yellowish brown, and by continued application acts as an irritant. Its vapour is very irritating when inhaled, or applied to the mucous lining of the nose or to the conjunctiva. Franz, by breathing the vapour, had violent cough, and a feeling of suffocation followed by headache. Butske swallowed a drop and a half of bromine in half an ounce of water, and experienced heat in the mouth, œsophagus, and stomach, followed by colicky pains.

Two drops occasioned nausea, hiccup, and increased secretion of mucus.

The constitutional effects resulting from the continued use of bromine have not been determined. They are probably analogous to those of iodine.

Hitherto no cases of poisoning with it in the human subject have been seen.

USES.—It seems to possess the same therapeutic influence as iodine, and has been administered in bronchocele, in scrofula, in tumors, in amenorrhœa, and against hypertrophy of the ventricles. It is usually regarded as possessing more activity than iodine.

ADMINISTRATION.—It may be administered dissolved in water. An aqueous solution, composed of one part by weight of bromine and forty parts of water, may be given in doses of five or six drops properly diluted and flavoured with syrup. This solution has also been used as an external agent in lotions.

The bromides of potassium, iron, and mercury, have been employed in medicine, and will be described hereafter. An ointment containing bromide of potassium and liquid bromine has been used, and will be noticed when speaking of the bromide.

ANTIDOTES.—The treatment of cases of poisoning by bromine should be the same as for poisoning by iodine. Barthez has recommended magnesia as an antidote.

ORDER 5.—HYDROGEN, AND ITS COMPOUNDS WITH OXYGEN AND CHLORINE.

Hydroge'nium.—Hy'drogen.

HISTORY AND SYNONYMES.—Cavendish may be considered as the real discoverer of hydrogen, though it must have been occasionally procured, and some of its properties known, previously. He termed it *inflammable air*. Lavoisier called it hydrogen (from ὕδωρ, *water*, and γεννάω, I *beget* or *produce*), because it is the radicle or base of water.

NATURAL HISTORY.—It is found in both kingdoms of nature, but always in combination.

(*a.*) *In the inorganized kingdom.*—Next to oxygen, it may be regarded as the most important constituent of the terraqueous globe. It constitutes 11·1 per cent. by weight of water, presently to be noticed. It is an essential constituent of some minerals (as coal and sal ammoniac) in which it does not exist as an element of water. Lastly, it is evolved from volcanoes or from fissures in the earth, in combination with carbon, sulphur, chlorine or nitrogen, under the forms of light carburetted hydrogen, sulphuretted hydrogen, hydrochloric acid, and ammonia.

(*b.*) *In the organized kingdom*—Hydrogen is an essential constituent of all organized beings (animals and vegetables), either combined with oxygen, to form water, or otherwise. Certain fungi exhale both night and day hydrogen gas (Decandolle, *Phys. Vég.* tom. i. p. 459.)

PREPARATION.—Hydrogen is always procured by the decomposition of water, but this may be effected in three ways—by the action of electricity,