

in solution, either in a free state or in combination with a base, can be easily detected by adding a few drops of a solution of nitrate of silver, which at once forms a white curdy precipitate, insoluble in the strongest acids, but readily soluble in ammonia. In this manner the presence of chlorides in well and river waters can easily be detected and, by taking suitable precautions, their quantity can be estimated.

Nitro-Hydrochloric Acid or Aqua Regia, is the name given to a mixture of hydrochloric and nitric acids, which is chiefly remarkable for the property it possesses of dissolving gold and platinum, metals which resist the solvent action of all other acids.

Compounds of Chlorine with Oxygen.—There are three oxides of chlorine known, viz., chlorine monoxide Cl_2O , which yields with water the corresponding acid, hypochlorous acid, HClO ; chlorine trioxide Cl_2O_3 , yielding chlorous acid HClO_2 , and chlorine tetroxide Cl_2O_4 , to which there is no corresponding acid yet discovered. There are in addition two other oxygen acids of chlorine, viz., chloric acid HClO_3 , and perchloric acid HClO_4 , whose corresponding oxides have not yet been isolated. These oxides of chlorine have no immediate interest to the brewer, but it is well to mention that the substance called chloride of lime, or bleaching powder, is a mixture of calcium hypochlorite and calcium chloride, and is manufactured on an enormous scale by passing chlorine gas over layers of slaked lime; this chloride is its well-known bleaching and disinfecting agent. If it is exposed to the air, the carbonic acid in it is sufficiently strong to liberate chlorine from the compound. Of the other salts formed by the oxygen acids of chlorine, it is sufficient to mention the chlorate of potassium KClO_3 , which is used for generating oxygen gas.

Iodine.—Symbol *I*.—Combining Weight 127.

This element, which is closely allied to chlorine in its chemical characteristics, is found chiefly in seaweeds and sea-water in combination with sodium and potassium, and also in small quantities in many mineral waters. Iodine is a bluish black solid possessing almost metallic luster, but it volatilizes at a comparatively low temperature (about 350°F), and then forms a most beautiful purple colored gas. Iodine possesses a peculiar odor very similar to that of chlorine; it is slightly soluble in water, readily so in alcohol, and also in a solution of iodide of potassium. Iodine combines with hydrogen to form hydriodic acid HI , which corresponds to hydrochloric acid, and the acid forms a series of salts with metallic elements called iodides, analogous to the corresponding chlorides. There are several compounds of iodine and oxygen which form acids and salts similar to the corresponding chlorine compounds. Iodine and its compounds, although of importance in some industrial processes, and especially so in medicine, have no special interest to the brewer except in one important respect. This element constitutes a most delicate test for starch, with which it forms an intense and beautiful blue color. For this purpose the iodine must be in a free state and in solution. The test solution is easily prepared by dissolving a few grains of solid iodine in a little alcohol or in a dilute solution of iodide of potassium. It is important that it is not made too strong, and its color should not exceed that of dark amber ale. If a few drops of this iodine solution be added to a liquid containing only the minutest trace of starch, a dark blue color is immediately formed, and if the quantity of starch be large, a quantity of the blue iodide of starch immediately separates. It is evident that this test must be a valuable one to the brewer, for by means of it he can detect the presence of starch in his worts. It has been estimated that as small a quantity as 0.0001 per cent. of starch can be detected in 200 c.c. There are, however, several precautions to be observed. The solution to be tested must not be hot, as heat causes the blue color to immediately disappear. The solution to be tested must also be dilute and neutral or very slightly acid, as an alkaline solution completely prevents the formation of the blue iodide of starch. The different sugars give no color whatever with iodine, but several of the intermediate compounds between starch and sugar give colors varying in intensity from dark blue to an almost reddish brown. Pure dextrine gives no color with iodine, but there are several transformation products of starch of a dextrinous nature which are colored by iodine. In some cases a distinct red is produced, and therefore it is quite possible that the practical brewer in testing a wort for starch by means of iodine, may in some cases be deceived unless he is very careful, as the red color combined with reddish brown of the iodine itself tends to disguise the blue color produced by traces of starch. The following suggestions for testing for starch with iodine were made by Mr. Pickering in a recent communication: When iodine is added in excess to a mixture of starch and dextrin, the colors produced are blue, violet, purple, claret, red-brown, or brown, according to the various proportions in which the two substances are present. When the iodine is added gradually to the mixed solutions the colors produced, both temporary and permanent, follow the same order as those above mentioned, the blue colors appearing first, and the red ones only on the addition of larger amounts of iodine. Conversely, when the colored solution is allowed to stand, the red tints disappear first, and the blue ones last. Obviously, therefore, the gradual addition of iodine affords an easy and delicate means of detecting starch in the presence of even a large amount of dextrin. Another way in which starch may be detected in similar cases is to add an ample sufficiency of iodine to produce a permanent color, and then to heat the liquid; the brown iodine-dextrin is decomposed at a comparatively low temperature, while the blue iodine-starch remains till the heat is raised considerably higher, and again, on cooling, the blue tint reappears long before the brown or red tint does; even when there is not sufficient starch to yield satisfactory results by this method, it may often be detected by the liquid being of a more bluish tint after the heating than it was before it. Iodine, however, is a most useful test for starch, and one that ought to be used by every brewer during his mashing operations.

Sulphur.—Symbol *S*.—Combining Weight 32.

Sulphur is an element which exists abundantly in nature in both the free and combined states. In the neighborhood of volcanoes it is found in large masses and comparatively pure, and it is also extensively diffused through the globe in combination with the metals, often forming large rock formations. Iron pyrites and various lead, silver, and zinc sulphides are examples of these minerals. Sulphur also occurs in combination with oxygen and other elements, and often in enormous quantities. The beds of heavy spar and gypsum found in some parts of England are examples of these compounds. The soluble sulphates are also met with in most well and river waters, and, as is well known, the

peculiar character of the Burton waters is due to the presence of a large proportion of sulphate of lime. Sulphur is also found to some extent in both plants and animals, especially the latter. The presence of this element in the white of egg, which is almost pure albumen, is evidenced by its action on a bright metallic surface, due to the formation of a black sulphide. Sulphur is a solid at the ordinary temperature, but can easily be converted into a liquid and even into a gas by application of a moderate heat. From a molten mass it separates in crystals, having the form of octohedra with rhombic bases. Sulphur is insoluble in water, but slightly soluble in ether and some oils, and readily soluble in bisulphide of carbon. Sulphur possesses the peculiar property of existing in three distinct states, each possessing peculiar physical properties of its own. The first of these so-called allotropic modifications is that in which sulphur usually occurs, namely, the crystalline. If these crystals be melted and then allowed to cool again, the mass crystallizes in long transparent prismatic needles of lower specific gravity, and different in many respects from the original sulphur; but these crystals gradually revert back to their original form. If sulphur be still further heated and then poured into cold water, it assumes a soft plastic form closely resembling caoutchouc; but this third allotropic modification also soon reverts to its original state. These modifications of sulphur are curious, and this element in this respect resembles the allotropism displayed by carbon and other elements. Sulphur, as is well known, is inflammable, forming in combination with oxygen sulphurous acid. —*Brewers' Guardian*.

A SULPHURETED HYDROGEN APPARATUS.*

By PETER HART.

WHEN hydric sulphide is only occasionally required, and then in small quantities, an apparatus which so furnishes it is useful, especially when it can be used repeatedly without washing out or replenishing. The one I have contrived seems to me to fulfill these conditions. There have been many invented, but they mostly require either many joints or especially formed pieces of glass. This one can be made by any one possessing only very small skill in fitting up apparatus. It consists of two test-tubes, the larger of one inch internal diameter, the other of such smaller diameter as to slide easily without friction into the larger. This smaller tube is by means of the blowpipe perforated at the bottom with a quarter-inch hole and is also provided with a rubber stopper and a gas leading tube bent twice at right angles. The larger tube has a piece of rubber tube two inches in length, and of rather smaller diameter than itself, pushed over its mouth, one inch on the tube and one inch projecting. This completes the apparatus. To work it fill the larger tube from one-third to one-half full of a mixture of sulphuric acid and water—one part acid, three parts of water. Drop a lump of iron sulphide into the smaller tube, insert the stopper with leading pipe firmly into this, and thrust its lower perforated end through the rubber mouth of the larger tube, pushing it down until it reaches the acid, and allowing sufficient of this to enter the perforation to cover the sulphide iron. Gas immediately commences to be evolved and can be bubbled through the solution to be examined. When sufficient has been obtained, raise the upper tube until the lower end is out of the acid, the remains of which at once drain away from the sulphide, and all action ceases, or practically so. It is only necessary to hang up the apparatus until again needed, when, by heating the end of the lower tube containing the acid over a Bunsen burner, and pushing down the upper, it commences full action again. This can be repeated until the acid becomes saturated, or so much so as to require replenishing.

Of course it need not be limited to the dimensions I have named. A much larger upper tube might be employed, which, combined with a suitably sized lower bottle, would furnish gas enough for a quantitative analysis. By occasionally sinking the upper tube deeper into the acid the stream may be fairly regulated, sufficiently so at all events for ordinary work.

SPONTANEOUS IGNITION OF VEGETABLE SUBSTANCES BY NITRIC ACID.

THE *Berichte der deutschen chemischen Gesellschaft* of February 28 and March 23, 1881, contain respectively two interesting and important articles upon the spontaneous combustion of vegetable substances by nitric acid, the one by K. Krant, of Hanover, and the other by R. Haas, of Carlsruhe, in both of which is pointed out the great danger of conflagrations accompanying the transport of nitric acid.

The spontaneous ignition of vegetable substances by nitric acid has long been conjectured by some, but freely doubted by others. The spontaneous ignition of a railway-wagon on the Bavarian Railway in 1879, however, led the managers to place the matter in the hands of the Polytechnic laboratory of Carlsruhe, and R. Haas, the author of the second paper above mentioned, was charged with the investigation of the matter. Before giving the results of his researches in this direction he, however, alludes to the previous paper by K. Krant.

The results of both Krant's and Haas' experiments admit of being shown as a lecture experiment, if not in the lecture-room itself, at least in an open yard or under a spacious stink-chamber.

K. Krant fills a square wooden box, 25 centimeters long and 40 centimeters deep, to the height of 15 to 20 centimeters with either straw, hay, tow, cotton-wool, or shavings, upon which he places a glass flask or beaker containing 25 to 100 c.c. of nitric acid of a specific gravity of at least 1.5. He then fills up the remainder of the box with one of the materials above mentioned, breaks the glass vessel containing the nitric acid, and at once closes the box with a well-fitting lid. In about one or two minutes vapors become visible, and a few minutes later a dense white smoke appears, due to the decomposition of the nitric acid, which is soon followed by the smoke arising from the combustion of the packing material. Upon opening the box five or, at the latest, ten minutes after the commencement of the experiment, the contents are found in a carbonized and lively smouldering condition, and upon the admission of air burst into flame, which often consumes the box itself.

With nitric acid of a specific gravity of 1.45 this author has not been able to effect a combustion.

Haas operates in very nearly the same way as Krant, but places the box containing the material to be operated on inside a larger box, and packs it in this with hay and tow so as to prevent loss of heat by radiation, which he considers

to most nearly represent the conditions in a railway wagon. By this means he finds that even a weaker nitric acid than that used by Krant is sufficient to cause spontaneous combustion, especially in warm weather and when a large quantity of nitric acid is called into play, conditions which must often occur in railway and other transit.

REPORT OF THE COMMITTEE FROM AMERICAN PUBLIC HEALTH ASSOCIATION ON A PLAN FOR THE PREVENTION OF THE SPREAD OF VENEREAL DISEASES.

By ALBERT GHON, M.D., Medical Director United States Army, Chairman.

YOUR committee, to whom was assigned the duty of suggesting some practicable plan for the prevention of the spread of venereal diseases, with especial reference to the protection of the innocent and helpless members of the community, beg to report:

That they have endeavored to consider the question without bias or prejudice, uninfluenced on the one hand by the misrepresentations of certain pseudo-moralists, who have uncharitably denounced in advance their assumed intention to recommend the governmental license of prostitution, and on the other, by appeals from no less earnest, honest, and righteous persons, who, with equal insistence, have urged the propriety and necessity for just such action.

Certain individuals—few of them physicians—have disputed the statement that syphilis is either very common, or so dangerous that it is beyond speedy and permanent cure. In the absence of exact numerical statistics, your committee believe it will be sufficient to refer to the experience of these medical practitioners who have had opportunities of judging, confident that they will, without exception, declare with Parent Duchatelet that “of all contagious diseases to which the human species is liable, and which cause the greatest evils to society, there are none more serious, more dangerous, or so much to be dreaded as syphilis; its ravages far surpassing those of all the plagues which at different times have terrified society.”

With Professor Gross and Dr. Marion Sims, that “a greater scourge than yellow fever and cholera and smallpox combined is quietly installed in our midst, sapping the foundations of society, poisoning the sources of life, rendering existence miserable, and deteriorating the whole human family.”

With Sir Thomas Watson, that “it counts its victims not only in the ranks of the vicious and self-indulgent, but among virtuous women and innocent children by hundreds and thousands.”

With Sir James Paget, that “it would be difficult to overstate the amount of damage that syphilis does to the population, children being born with diseases induced by it, which render them quite unfit for the work of life.”

With other eminent medical men quoted by Dr. Sims, in his inaugural address as President of the American Medical Association at Philadelphia, in 1876, Sir William Jenner, Prescott Hewitt, and Mr. Simon, chief medical officer of the Privy Council, who have borne testimony of their experience of its ravages among pure women and innocent children.

Statements such as these do not need to be backed by numerical data of questionable value. These can often be distorted to prove any point desired, by selecting for comparison maximum and minimum years—special returns from certain localities—as illustrated by the array of figures by which the opponents of the British Contagious Diseases Act have sought to prove that the sanitary surveillance of public women has actually augmented the amount of venereal disease in countries where it is exacted.

At best, but a small proportion of the venereal diseases ever appears on vital returns. The true statistics of their frequency are the professional secrets of the physician whose aid is sought to relieve them or whose eye recognizes them beneath the mask of other ailments. The most carefully prepared reports fail to exhibit the rheumatisms, the cachexiæ, the cutaneous affections, the defects of vision, the lesions of the spinal cord, the brain, the hair, which have had syphilis for their cause. Especially is this true of transmitted syphilis. Only a few days ago, a distinguished American ophthalmologist declared to one of our committee that the majority of his infant patients were characterized by the oldish features, and notched incisors, and badly-shaped head which mark the syphilitic child, and he boldly asserted that interstitial keratitis was always a consequence of constitutional contamination. The greater proportion of venereal cases stalk about the streets in affected health and never appear in any returns. How many others find expression in suicide, in insanity, in conjugal infidelity, and actions for divorce!

As far as figures can be evidence, the statistics carefully collated by Dr. Frederick R. Sturgis, of New York, are worthy of consideration. A summary of the poor treated, in 1873, at the various hospitals and dispensaries of the city of New York, enabled him to estimate the total number of venereal and syphilitic poor patients, but this did not include those treated at their homes, often by themselves, at physicians' offices, by apothecaries, and by quacks. Notwithstanding these omissions, of 250,536 poor persons receiving aid at public institutions, 12,341 suffered from venereal diseases, 5,045 of these being syphilis; that is, 44 in every 1,000 were venereal cases, 18 per 1,000 syphilitic.

In Mr. Wagstaff's report of the amount and kind of venereal disease under treatment at certain charitable institutions in London, in the year 1868, it is stated that sixty-nine in every thousand patients were venereal, thirty-five of these being syphilitic; and he estimates that, among the 1,500,000 of poor population of the metropolis who received medical relief for disease at hospitals, dispensaries, and at the hands of parochial medical officers, about one in fourteen is affected with venereal disease of some kind, this not including midwifery cases nor the classes excluded in Dr. Sturgis' report.

During the same year, 9,796 venereal patients were treated at the hospitals in Paris, and M. Lecour, prefect of police, estimating these as one-fifth of the total number of venereal patients treated at their homes by physicians, and who seek relief at the hands of apothecaries and charlatans, gives a sum total of 48,980 cases, about one in forty of the entire population. “A formidable array and one probably much below the real amount.”

The same estimate of the proportion of private to public cases of five to one, arrived at by Dr. Sturgis from wholly different data, would give for New York, out of a much smaller population, 61,705 venereal patients in that year, 1873—nearly one in every fifteen of its men, women, and children—a number only dwarfed by comparison with London, where 100,000 poor alone are annually affected with syphilis.

* Paper read before the Manchester Literary and Philosophical Society, March 8, 1881.