

to allow anything to be removed from the room in a condition to carry the poison without.

"After a fair trial of many years, assisted also by several of my brother practitioners (among whom I may mention Drs. L. B. Read, F. A. Smith, and J. A. Walther), I am able to state that, in a list of about fifty cases carefully observed, I have succeeded, in all but two, in confining the infection or contagion to the patient first attacked. In the two instances of failure I had abundant evidence that the quarantine was grossly neglected.

"Dr. F. A. Smith had the kindness to report to me a most interesting test of this method which occurred in his own hands last winter. In an institution which the doctor was attending professionally a case of well-marked scarlatina broke out in the midst of scores of young children who slept in the ward. The case was removed to the nurse's room, and there quarantined by means of the filter, according to the method described above. The consequence was that not another case occurred in the institution. On other occasions, where the usual modes of isolation were alone adopted, the same institution had been swept with epidemic force. Dr. Smith expressed to me his belief, founded on experience, that, without the method mentioned in the case reported, he would have had scores of cases on his hands in a fortnight.

"The simplest way to sprinkle the sheet is to pour the disinfectant solution in a flat dish, and dip a hair-brush in it, and with this throw the liquid over the filter. There are three positive points gained by using this method: 1st. The air of the sick-room is not mixed with the air in the rest of the house. 2d. Visitors are much less likely to visit the sick-room. 3d. The air of the sick-room is kept more easily at an even temperature.

"In all of my cases I have found it unnecessary to close the ordinary door, the filtering sheet taking its place."—*Medical Record*

FILARIA SANGUINIS HOMINIS.

In the twenty-first issue of the Chinese Customs Medical Reports Dr. Myers records some further interesting observations concerning the filaria sanguinis hominis, made in the island of Formosa. It seems that although this island is only separated from the mainland, where filaria disease abounds, by a channel 180 miles wide, three cases only of elephantoid disease have presented themselves in nine years among 15,000 general hospital patients, and the three filaria-infested persons Dr. Myers saw all came from the mainland (Amoy and district). This fact—that the disease does not spread in the island, as Manson conjectured it might have done into Barbados—is the more remarkable, as communication with the mainland is constant, and there is an abundance of mosquitoes, so that Dr. Myers surmises that the particular species of mosquito which is the true intermediary host of the filaria exists on the mainland, and probably not on the island. He is at present carrying out a systematic investigation of the different species of mosquito. First, Dr. Myers put a conveniently willing and infected man to sleep in a gauze-covered mosquito house, into which he turned mosquitoes collected promiscuously from all parts of Formosa. These gorged insects he examined day by day, and found that the next morning after their feed they contained several lively embryos, which at later date became digested, and had evidently not got into their true host, for Manson has found that mosquitoes containing filaria sanguinis hominis, when fed on an infected dog, digested the filariae of the latter. Secondly—Dr. Myers has also made some observations on the periodicity of the appearance and disappearance of the filariae embryos in respect of the blood circulation in the case of a man suffering from glandular swellings and recurrent lymphatic fever, but otherwise healthy. The tables given show a result in complete accord with Manson's observations. The embryos appeared in the blood circulation regularly between 6 P.M., and 8 P.M., generally a little after 6 P.M., and were present in greatest numbers about midnight, after which they gradually decreased, and pretty well disappeared by 6 A.M., to 8 A.M. This period of twelve hours is just the time that, as Manson has shown, the mosquito is in active search for food. Thirdly—Dr. Myers tries to make out what becomes of the embryos when they disappear from the blood circulation, whether this disappearance is final as regards the swarm, and caused by death, or whether they only lie dormant for the time, perhaps in some viscera, as the lungs. He made prolonged and careful observations on the condition of the embryos at the times of their appearance in the circulation and their disappearance, and he found that the most marked and unmistakable contrast existed between their excessively active vigorous condition at the former time and their increasingly torpid and feeble, shriveled, straightened-out state at the latter time. He thinks the disappearance is final as regards the swarm, and he further argues that unless the parent or parents breed only once or at long intervals, the circulation would get almost blocked by the myriads of filariae if there were not some more wholesale method of removal than mosquito sucking. Dr. Myers suggests the possibility of the diurnal solution of dead embryos. Fourthly—Dr. Myers watched the behavior of the embryos with such substances as bisulphate of quinine, salicylic acid, arsenious acid, and santonin. The quinine affected them most, but the upshot of the matter is that the quantity of any of these substances necessary to kill the embryos would kill the host also. The problem, therefore, seems to be how to diagnose the exact situation of the parent worm (generally lying in the superficial glands) with an accuracy sufficient to extract it.—*Lancet*.

THE VAPOR-DENSITY OF IODINE.

By M. BERTHELOT.

THE laws of Dulong and Petit, of Gay-Lussac, and of Mariotte, constitute the sole scientific base upon which rests the physical determination of molecular weights, and consequently the numeration of the atoms in present theories. In case these laws should not hold good for certain elements the physical definition of the molecular weights of their atoms would become mere conventions. The author has already shown that the experiments of M. M. Kundt and Warburg, on the speed of sound in mercurial vapor, are irreconcilable with the totality of the three fundamental laws above mentioned. The experiments of M. V. Meyer, on the decrease of the gaseous density of iodine and the halogens, under constant pressure, but at temperatures widely remote from each other, are still more contrary to the admitted laws. The only law absolutely and universally applicable to the elements is the invariability of the relations of weight, according to which they combine. This notion and that of the energy brought into play in their reactions are the sole firm foundations of chemical science.

ON THE PURIFICATION OF GAS BY AMMONIA.

By F. D. MARSHALL, Engineer and Manager of the Danish Gas Company, Copenhagen.

As the formation of a company (a prospectus of which appeared in your issue of the 6th ult.) for working the "ammonia soda" process in conjunction with gas manufacture appears to be a *fait accompli*, and as the objects of the company are of universal interest, it may be worth while to consider more fully the details of the process.

In the first place, we may feel sure that the validity of the scheme will receive the fullest and most impartial consideration from Mr. G. Livesey; and, knowing this, one feels a little diffidence in remarking that the published results of the experiments by Professor C. W. Heaton are not so full or exhaustive as could be desired, and have apparently only proved that carbonic acid and sulphureted hydrogen are removable by crude ammonia.

It does not appear from the published statements whether the vital question of obtaining mono or bicarbonate of ammonia from ordinary gas scrubbers or washers, in a tolerably pure state, has been satisfactorily accomplished; for it must be admitted that on this depends the success of the scheme, at least the part of it which applies to the production of ammoniacal gas.

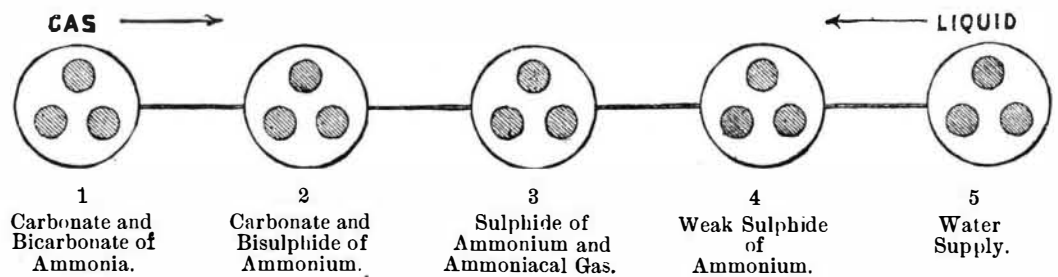
It may be recollected that this process formed the subject of a paper read by me before the British Association of Gas Managers in 1878, and it will be further remembered that, in the process described, it was proposed to employ a series of scrubbers or washers in which the gas is subjected to a process of "fractionation" or divisional scrubbing.

By "scrubbing," in the ordinary acceptance of the term, we imply the removal of impurities—such as ammonia, sulphureted hydrogen, and carbonic acid—by water; and the resultant "liquor," charged with these impurities (both in the free and combined state), is collected in one common vessel or tank.

Now, if we draw off and examine samples of the liquor taken from different heights in its passage down an ordinary scrubber, we should find that it contained the ammonia, sulphureted hydrogen, and carbonic acid in varying degrees of combination; and we should further find that the liquor at the bottom contained a larger proportion of carbonic acid in combination than the liquor at the top of the apparatus. For the liquor, in descending, would absorb carbonic acid in preference to sulphureted hydrogen, which would be continually expelled, and find its way to the top of the scrubber.

By the fractionation process it is proposed to make these reactions apparent, and, instead of using very tall scrubbers, it may be desirable to cut them transversely into sections, placing these sections side by side, and so converting a tall scrubber into a group of small ones, each one of the group having its own receiving tank.

Let us now imagine a series of these groups, numbered respectively 1, 2, 3, 4, 5, in which the gas passes through the series from 1 to 5, while the water or liquid is pumped from 5 to 1; so that by the time it arrives at group 1 it is converted into moderately strong liquor or a mixture of sulphide and carbonate of ammonia. This liquor is pumped up and down group No. 1 for some time, so that by contact with

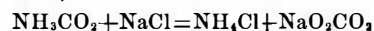


carbonic acid contained in the crude incoming gas, its sulphureted hydrogen is displaced and pushed forward to groups Nos. 2 and 3, where it is absorbed as sulphide of ammonium. Ammoniacal gas obtained by a subsequent process is pumped into group No. 3, to absorb any free sulphureted hydrogen and sulphur compounds pushed forward from groups Nos. 1 and 2.

On the contents of group No. 1 assuming the desired form of carbonate or bicarbonate of ammonia, they are withdrawn, and subjected to heat in a suitable vessel at a temperature of 180° Fah., and the ammoniac carbonate is driven off in a vaporous form to be condensed in another vessel. The residual liquor, after the ammoniac carbonate is driven off, is principally water containing a small quantity of carbonate and sulphocyanide of ammonium, and this may be reintroduced into the scrubbers.

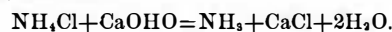
So far the process may be conducted in a gas-works, but the following operations constitute the ammonia-soda process, as at work on the Continent, and are preferably conducted in a separate establishment.

(a.) The concentrated ammoniac carbonate is mixed in a suitable vessel with an equivalent of common salt (chloride of sodium, NaCl)—



Chloride of ammonium and carbonate of soda are formed. The carbonate of soda being soluble would be difficult to obtain as such, but recourse is had to its conversion into an insoluble bicarbonate by an addition of an equivalent of carbonic acid. This carbonic acid in the first instance would be obtained from an extraneous source; but the bicarbonate of soda once formed is eventually heated, and the equivalent of carbonic acid given off is stored for future use. The bicarbonate of ammonia is separated from the chloride of ammonium by centrifugal force.

(b.) The ammoniac chloride is then heated in a boiler with slaked lime, with the formation of ammoniacal gas, chloride of calcium, and water—



The calcium chloride, representing the whole of the lime used, is withdrawn in a soluble form, and may be afterwards employed for sanitary purposes.

(c.) The ammoniacal gas, liberated in the last operation, is carried by pipes to the gas-works, and is pumped back into group No. 3, as previously described.

In reviewing the process, it is at once seen that the entire success of the scheme depends upon the production of a carbonate, or preferably bicarbonate of ammonia in the first group; and the statements recently published do not refer to this, or say whether later experiments have been successful in displacing sulphureted hydrogen from a mixture of sul-

phide and carbonate of ammonium such as gas liquor, and obtaining a tolerably pure carbonate of ammonia.

Referring to my figures and experiments published in the *Journal* of July 23, 1878, it will be seen that we employed scrubbers containing in the first group sulphide of ammonium, and in the second group caustic ammonia; and that by passing crude gas through the series the carbonic acid was absorbed by the sulphide of ammonium, while the sulphureted hydrogen of the ammoniac sulphide was displaced and pushed forward to be absorbed by the caustic ammonia in group No. 2. The composition of the ammoniac sulphide was—

Ammonia.....	4.90 per cent.
Sulphureted hydrogen.....	3.25 "

and assuming the crude gas to contain 4 per cent. of carbonic acid, the theoretical quantity of gas to be passed to convert the sulphide of ammonium into monocarbonate of ammonia would be 39 cubic feet, or into bicarbonate 78 cubic feet.

In our first scrubber, originally containing sulphide of ammonium, we increased our ammonia from 4.9 to 6.89 per cent., and we also found 9.66 per cent. of carbonic acid absorbed.

To convert the 6.89 per cent. of ammonia into monocarbonate of ammonia, it would require 8.9 per cent. of carbonic acid, or a proportion of 22 of carbonic acid to 17 of ammonia; instead of which we have a proportion of 24 of carbonic acid to 17 of ammonia, clearly proving the formation of a bicarbonate of ammonia and a thorough chemical expulsion of the sulphureted hydrogen. For as sulphureted hydrogen cannot exist along with sesquicarbonate or bicarbonate of ammonia except in the free state, the 0.66 per cent. of sulphureted hydrogen remaining in the first group of scrubbers must have assumed the free state, and have been held mechanically in solution; that is, about 15 per cent. of the original 3.25 per cent. of ammonia (in the sulphide of ammonium) remained in the free state after all the ammonia had been converted into more than a monocarbonate of ammonia.

These experiments were eminently satisfactory in proving the expulsion of sulphureted hydrogen by carbonic acid from a solution of pure ammoniac sulphide. But in substituting ordinary ammoniacal liquor for sulphide of ammonium we could never thoroughly expel the sulphureted hydrogen; and although far more than the theoretical quantity of gas was passed, yet the liquor, on analysis, while containing more than the original quantity of carbonic acid, was largely contaminated with sulphureted hydrogen in both the free and combined state. I am exceedingly anxious to know whether the experiments of Mr. Heaton have in any way advanced this matter, or whether the Ammonia and Alkali Company, when adopting the process on a large scale, intend utilizing another source for the production of ammoniacal gas necessary for the success of the scheme.—*Journal of Gas Lighting*.

IMPROVED METHODS IN REFINING PETROLEUM.

THE Special Committee appointed by the State Board of Health to investigate the effluvia nuisances in and around

Hunter's Point, Newtown Creek, and the water fronts of New York, Brooklyn, and Long Island City, have reported a marked improvement in the methods of the petroleum refineries. The committee say:

We visited each of the twelve great oil refineries, and found that the guarantee given by Mr. Henry H. Rogers for the twelve refineries, on the 29th ult., in the name of said several refineries, promises to conduct the business of refining oil in such a manner as not to produce noisome or offensive smoke or smells; to prevent the open exposure of spent or sludge acid at any place within fifteen miles of any city in the State of New York during the warm season, or within eight miles of any such city during the cold season; also that such impure acid shall not be allowed to flow, leak, or waste into or upon the ground or streams; also, that cokes, tarry or oil wastes, used as fuel, shall be so perfectly consumed that no hurtful or offensive smoke or stenches shall be produced, and, finally, that the business of the refineries shall be so conducted as to prevent any just cause of complaint on account of any noxious or offensive smells produced by them in any manner. This had been in process of fulfillment, with the following results:

First.—As regards offensive smoke and vapor from firing where a few months since numerous lofty chimneys were pouring forth black, smoky vapor, laden with offensive gases, destined to be wafted for miles, to the annoyance and discomfort of the people of the environs, we found the process of firing going on without smoke. Great care had been taken in the management of the stoking, and a minute and careful supervision had been exercised over those whose duty it is to keep the fires fed with fuel. It seemed to the committee that the smoke nuisance had been almost, if not wholly, abated.

Second.—As to the nuisance heretofore existing from the escape of deleterious and noisome gases into the air during the opening and cleaning out of the stills. By a system of metal hoods and air-tight conduits devised by Prof. H. B. Nason, of the Rensselaer Polytechnic Institute, chemical expert adviser to the refineries, each still as it is opened discharges its gases into these closed tubes instead of into the air, as formerly. These are conducted by means of strong suction to the furnaces, where they are totally consumed without any possibility of their escape into the surrounding atmosphere. It is found that the gases and vapors produced by the opening and clearing out of one still will supply fuel enough to heat one furnace for the space of twenty minutes, thus actually proving of pecuniary advantage to the manufacturers themselves. We regard this system, if properly attended to, as it appears to be, a total prevention of nuisance from the escape of vapor and gases injurious to health during the process above mentioned.

Third.—Spent or sludge acid. We found no evidence that spent or sludge acid was used or manipulated by the oil