(d.) That this instantaneous compression of the air must result in an increased temperature.

(e.) That owing to the heat of friction and of compression, the mixed gas and air must, instantaneously, have a highly exalted temperature.

(f.) That this increase of temperature is sufficient, at less than 100 atmospheres pressure, to dissociate the elements of hydrocarbons. We will illustrate this experimentally with atmospheric air at about 80 atmospheres pressure, which you will see is quite sufficient to reduce chips of wood to ashes.

(g.) That in the event of the compressed gas being oxygen, this gas will instantaneously combine explosively with the dissociated elements, forming water and carbon dioxide. The increase of pressure (e) by heat and (g) by explosion, are additive.

It will, from the foregoing, be obvious that even in the case of an inert gas like nitrogen or CO₂ the actual pressure to be instantaneously borne by the fittings is very far indeed in excess of the pressure in the flask.

It is very possible and easy to adopt precautions of an elementary character which will eliminate all possible risks of danger from explosion.

These precautions are briefly:—

(1.) Careful avoidance of even a trace of oil, or of any hydrocarbon in any of the fittings, or anywhere whence it may leak, penetrate, or be conveyed to the fittings.

(2.) Closing the orifice through which the gas must pass from the flask, by means of a compact porous septum, so as to prevent any outrush of gas.

(3.) Sufficient strength of material and first class workmanship.

(4.) The avoidance of a closed casing for any part of the fittings, since a minute leak into the casing may induce an explosion; sufficient pressure and heat being accumulated before even a weak casing can give way. In the case of a casing for a pressure-gauge, light flaps are employed, to close suitable openings formed in it. This may be combined with a second porous septum completely filling the inlet to the gauge.

It is very usual with some makers to test their gauges by means of an oil pump; such makers' gauges should be avoided for high-pressure gases.

An additional precaution may be found in making all the air spaces in the fittings as small as possible, since the quantity of the air compressed is one measure of the amount of heat developed in the act of compression.

We desire particularly to call attention to two remarkable characteristics of explosions which have been observed as arising from the presence of oil. These are, their intense-ness and their limited localisation. An explosion of mixed hydrogen and oxygen in well made fittings is comparatively innocent, and may take place without any serious damage at all pressures. In the case, however, of an explosion owing to the decomposition of oil, such as we have before spoken of, the explosion is of the most intense character and attended by a temperature sufficient to fuse a considerable mass of steel or brass; whilst it is limited in its effects to a very small portion of the space in which it may occur. Thus, when the explosion has taken place in a tube with a quarter-inch bore, the explosion has been limited to some three or four inches in length, where the walls of the tube have been so fused as to increase the bore to about half an inch, and the tube itself has been completely ruptured. At the same time a pressure-gauge attached to the tube at a short distance has not been damaged. Probably some members of the Society may be tempted to investigate this part of the subject more fully. It may be new to some of them that ordinary oil may under such simple conditions become an explosive of extraordinary power.

THE ANALYSIS OF SNOW FROM THE NEIGHBOURHOOD OF CHEMICAL WORKS AND VARIOUS OTHER PLACES.

BY J. CARTER BELL, A.R.S.M., F.I.C. ETC.

THE Corporation of Manchester, in consequence of complaints from people in the neighbourhood of Mr. Levinstein's works, brought an action against him at the last Manchester Assizes for emitting noxious acid and other vapours from his works, thus polluting the atmosphere. As the ground all round the works was covered with snow, I thought it a good opportunity to collect some, and compare it with the snow which I collected from other places far removed from chemical works.

Place.	Parts per Million.		Chlorine as Chlorides.	Sulphuric Acid as Sulphates.
	Free Ammonia.	Fixed Ammonia.		
1. Corporation St....	0.85	1.00	76.0	3.40
2. Exchange Station.	1.50	0.75	108.0	2.70
3. Broughton Bridge	2.60	1.25	95.0	3.60
4. Broughton Park..	0.200	1.00	7.0	2.90
5. Sewage Works....	0.50	1.50	8.0	4.90
6. Garden on Cliff...	0.60	1.00	7.0	3.30
7. Kersal Moor.....	0.30	1.00	5.0	2.90
8. Owens College....	2.00	1.10	17.0	4.70
9. Outside Mr. Levinstein's Works.	1.00	0.50	8.0	1.80
10. Bank opposite chimney.	0.370	1.00	6.0	3.20

None of the samples contained any free acid, but the chlorine in Nos. 1, 2, and 3, is excessively high. I can only account for this by assuming salt to have been thrown upon the streets as is the custom in Manchester. All the other samples were collected from the upper surface of undisturbed snow. These analyses with other evidence actually proved that the air in the neighbourhood of the chemical works was purer than that found in the Manchester streets.

NOTE ON THE ACTION OF FROST UPON COTTON.

BY C. F. SEYMOUR ROTHWELL, F.C.S.

FROM the literature published on this subject one obtains the idea that cotton is tendered by frost. Hummel, in his "Drying of Textile Fabrics," says, "that although the evidence on this point is quite conflicting, it is quite conceivable that the crystallisation might act injuriously in a mechanical way, and that the atmospheric ozone might also exercise some slight destructive influence." This uncertainty is no doubt due to the fact that until recently no reliable machine for testing the strength of the cloth was available.

The following experiments were made to decide this question:—Two pieces of "madder-bleached" cloth, one of good quality and the other of very poor quality, were placed in water for 10 minutes, withdrawn, and, without squeezing, hung up, full width, the thermometer registering four degrees below zero Centigrade. The cloth was quite stiff in three minutes, and although the temperature never rose higher than -3°C ., in three hours the ice had completely evaporated leaving the cloth quite dry. The strength of the cloth which had been frozen was then tested with Goodbrand's "Dead Weight Cloth Testing Machine," against some of the same cloth in its original condition, when the breaking weight was found to be identical in both cases.

When carefully used the machine is accurate to within 2 per cent.

The above trials were repeated, but when the ice had evaporated—which generally took three to four hours at -3°C. to -4°C. , the cloth was dipped in water and hung out again, this being repeated four times, making the total time the cloth was frozen about 16 hours. The strength of both qualities of cloth was also found in this case to be equal to the original cloth.

From these trials it is evident that cotton is not "tendered" by the freezing of water within it, at any rate not when in the open width.

If the fibres were bound or held in position to a greater or lesser extent, such as obtains in the case of the pieces near the bottom of a waggon-load of cloth when frozen, probably the cloth might be weakened mechanically by the crystallisation of the water, but, although I have only made a few trials in this direction still they indicate that the cloth is practically uninjured.

The prevailing opinion that cloth is weakened when it is frozen has no doubt arisen from the fact that when the fibres are frozen stiff they are easily snapped; but any stiffening body, such as gum, &c., will have the same effect, and this has obviously nothing whatever to do with the actual strength of the fibre.

Meeting held Friday, February 5th, 1892.

MR. IVAN LEVINSTEIN IN THE CHAIR.

ON THE ALUMINOFERRIC PROCESS OF SEWAGE TREATMENT.

BY G. SISON, JUN.

SEVERAL important omissions in the papers of Messrs. Grimshaw and Barrow, in the January number of the Journal, appear to have passed unnoticed. For example, on page 4 there is the following:—"For the purpose of comparing the action of chlorine with that of other precipitants and processes, I have been able to obtain figures ready to hand in relation to the International, Electrical, and Lime processes. These are the only processes which can be said to be in the field for the purification of sewage."

This last sentence shows a remarkable oversight on the part of the writer, as over 30 towns and villages are now using a process not mentioned in the above, viz., the "Aluminoferrie," which is treating at least 20 million gallons of sewage daily.

On page 5, sulphate of alumina is confused with "aluminoferrie." Although the latter contains the former it also contains, as its name indicates, an iron salt, the proportion being sufficient to take up any traces of sulphuretted hydrogen present in ordinary town sewage.

Mr. Grimshaw (page 11) claims that persalts of iron act as carriers of oxygen to oxidise the organic matter of the sewage, by a so-called catalytic action, that is to say, ferric oxide (of course hydrated) becomes ferrous oxide, having given up oxygen to the organic matters; then it re-oxidises to ferric oxide and so on.

No evidence whatever has been brought forward to support this view. No experiments are cited to prove such a reaction, and supposing the whole of the surplus oxygen of ferric hydrate to be available, the amount is quite insufficient to deal with the organic matter present in the sewage. For example, in the addition of 5 grains of Fe_2O_3 per gallon of sewage only 0.5 grains of oxygen are available for this purpose, while sewage such as that of Salford will absorb 5 grains of oxygen per gallon, viz., 10 times as much. Moreover, when a reagent is added to sewage the precipitate formed is soon carried down to the bottom of the settling tank, and is thus removed out of the field of action.

With reference to the cost of different processes, the statements on pages 6 and 7 of the Journal are very confusing; e.g., on page 6 the cost of the aluminoferrie

process is stated to be 67s. per million gallons, while on page 7 it is put down at 75s.—apparently a mistake. The calculations must be based on erroneous data; at all events neither of the figures given is correct. On the same page, after the table of comparison, it is stated that all except the first and last processes propose to filter, thus including the "aluminoferrie" as a process where filtration is required. As a matter of fact filtration is not required, and is indeed unnecessary.

With reference to sludge, the weights given on page 7 also appear to be incorrect. No actual measurements of sludge were taken during the Salford trial with "aluminoferrie," and the figures given must therefore have been obtained by some method of calculation not stated. The lime process, which, it is generally admitted, gives a maximum amount of sludge, is actually credited with a less quantity than that produced by aluminoferrie, thus showing the incorrectness of the figures.

Newcastle Section.

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C. H. Hills.	J. E. Stead.
T. W. Hogg.	John Watson.

Hon. Local Secretary and Treasurer:
Dr. J. T. Dunn, The School, Gateshead.

The names in italics are those of members of Committee who retire at the end of the current Session.

The following have been elected to fill the vacancies and will take office in July next:—Chairman: A. Allhusen. Vice-Chairman: John Pattinson. Committee: John Morrison, W. A. Rowell, and T. W. Stuart.

Notices of Papers and Communications for the Meetings to be sent to the Local Secretary.

Meeting held in the Durham College of Science,
Newcastle, on Thursday, April 7th, 1892.

MR. JOHN PATTINSON IN THE CHAIR.

NOTE ON THE PREPARATION OF SAMPLES OF RICH ARGENTIFEROUS LEAD FOR ASSAY.

BY JOHN PATTINSON, F.I.C., AND H. S. PATTINSON, PH.D., F.I.C.

It has been found that the most satisfactory method of obtaining an average sample of pigs of rich argentiferous lead—containing from 100 to about 1,000 oz. of silver per ton of lead—is to saw each pig through with a circular saw. The fine particles produced by the saw, termed "sawings," are collected, and from them the samples are drawn to be sent to the assayer.

Assays of rich argentiferous lead are best made upon from 200 grains to half an ounce of lead, but such a small quantity of the sawings as this cannot be relied upon to represent the whole bulk of the sample, because of the large size of some of the particles. This difficulty, however, is easily overcome by melting up either the whole of the sample or such a quantity of it as can be relied upon to represent the composition of the whole, and casting the lead into small cakes or "buttons" from which portions weighing from 200 grains to half an ounce can then be cut for assaying. We find that from a sample of sawings of the usual size a button or small bar fairly representing the sample can be cast from about 2,000 grains of the sawings.

When the sawings are melted the button of lead obtained invariably weighs less than the weight of sawings taken.