THE FIREMAN'S RESPIRATOR.

In a paper read by Captain Shaw, of the Metropolitan Fire Brigade, at the Society of Arts, on January 19, an ingenious apparatus was described for enabling persons to breathe in dense smoke or poisonous vapors. It consists essentially of a close-fitting hood, with a respirator, holding a filter, the

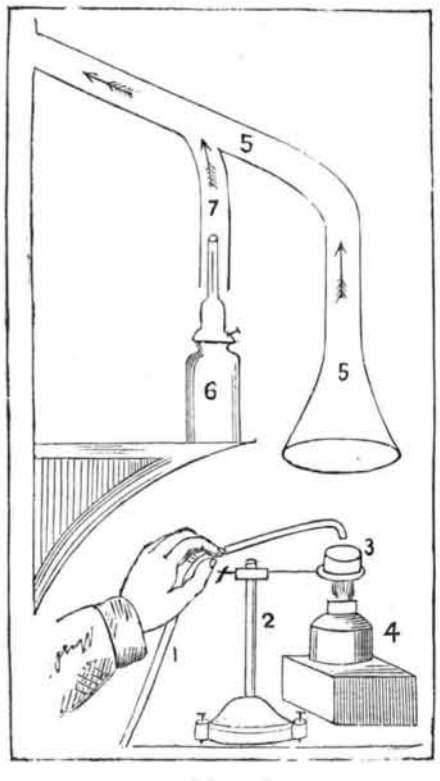
nvention of Professor Tyndall, which consists of a valve chamber and filter tube about 4 inches long screwed on outside, with access to it from the inside by a wooden mouthpiece. The charge for the filter consists of the following materials, which are put in with the tube turned upside down, and the lower valve removed : Half an inch deep of dry cotton wool, an inch deep of the same wool saturated with glycerin, a thin layer of dry wool, half an inch deep of fragments of charcoal, half an inch deep of dry wool, half an inch deep of fragments of lime, and about an inch of dry wool. The whole can be put on and adjusted in a few seconds by the wearer.—*Science Record.*

A New Light.

We described, not long ago, the new light for photographic purposes, produced by the combustion of bisulphide of carbon and binoxide of nitrogen. The only drawback to the utility of the light was the danger of explosion. Further experiments in the same path have recently been made, and Messrs. Riche and Bardy communicate to the French Academy the details of the apparatus, by which a new light, having an actinic power superior to the oxyhydrogen light, is produced, with economy and safety. The light is made by melting sulphur in an open vessel; and when the sulphur is in flames, a jet of oxygen gas is directed upon it, producing a bluish light of great actinic power.

Another method, which produces a brilliant white light, but of less actinic power than the other, consists in filling the vessel with nitrate of potassium, and heating until the salt begins to decompose, then throwing small pieces of sulphur upon the surface of the salt.

The following is the apparatus for the sulpho-oxygen light:



No. 1, a glass tube connecting the gas bag with burners No. 2, an iron stand to hold the small crucible. No. 3, a crucible. No. 4, a small alcohol lamp to ignite the sulphur. No. 5, a funnel to receive the product of combustion. No. 6, a petroleum lamp employed to establish a current of air in the chimney. No. 7, a shaft connected with the chimney, in which the current of air is formed by means of gas or a lamp.

It is not necessary, says Professor E. Stebbing, in the *British Journal of Photography*, to employ the oxygen under much pressure, for with too much of that gas the flame is white instead of blue, and therefore less photogenic.

PROFESSOR FORSTER, of Berlin, discovered, on February 25, a new planet of the twelfth magnitude.

THE NEW REVELATIONS OF A SNOW FLAKE.

It is difficult to believe that the pure white flake, which settles noiselessly upon the earth, and which seems, even when moderately magnified, but a mass of exquisite white ice crystals, is, after all, but a scavenger of the atmosphere. But such, nevertheless, is the fact, and henceforth we must regard the snow drops but as so many sponges which absorb into their porous substance the myriads of microscopic bodies which form that peculiar atmospheric dust, found near the surface of the earth, and most largely in the vicinity of cities. This dust is itself a queer mixture of heterogeneous substances. M. Gaston Tissandier, who has been making a

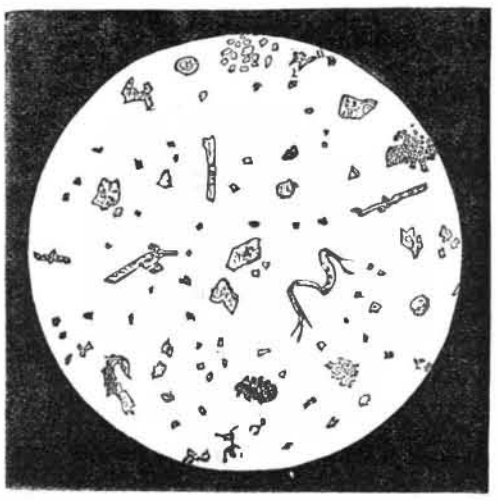


Fig. 1.—Corpuscles suspended in a drop of snow water.

number of very interesting investigations on the snow, states that, in a drop of water obtained from a single flake and magnified 500 times, he found pieces of coal, fragments of cloth, grains of starch, sandy matter, and an immense variety of other substances, not a fragment of which exceeded in diameter three ten-thousandths of an inch. Some idea of the numbers in which these infinitesimal particles must exist in the snow can be gained from Fig. 1, which represents a drop of snow water gathered at the summit of Notre Dame towers, in Paris, and magnified under the microscope 500 diameters. The fibers of fabrics and bits of coal are easily recognized.

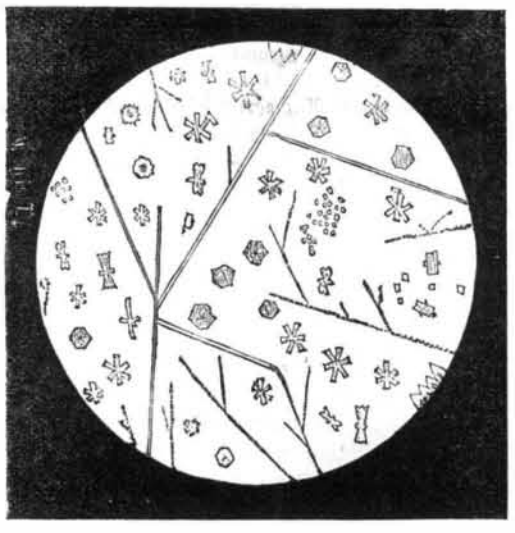


Fig. 2.—Crystals obtained by evaporating a drop of snow water.

By examining large volumes of snow water, M. Tissandier has been able to determine the weights of these corpuscles. A quart of water collected in the city and evaporated gave 3·2 grains of residue, and the same quantity obtained in the country yielded about half that weight. The residue is an impalpable pulverulent gray powder, composed, in round numbers, of 70 per cent mineral and 30 per cent organic substances. It is very rich in carbon, burns brilliantly, and contains certain chlorides and sulphates in appreciable quantities, besides carbonate of lime, alumina, silex, and sufficient iron to be readily recognized by reagents. Nitrate of ammonia is also detected in the proportion of about 0·015 grains per quart of water.

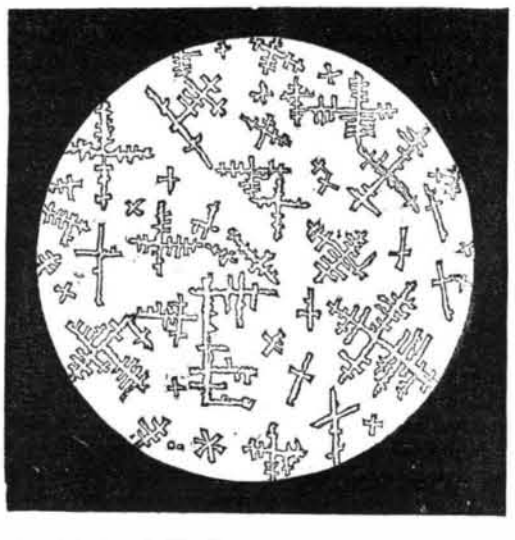


Fig. 3.—Crystals obtained by evaporating a drop of snow water.

M. Tissandier states that, by evaporating a drop of snow water, in dry air on a glass slide, and examining subsequently with the microscope, crystals, some needle-like, some prismatic, and others star-shaped, as represented in Fig. 2, were observed to form. During the course of one experiment, however, he remarked a noticeable difference in the crystallization. The crystals appeared to ramify, throw off other needles, these last others again, until the slide under the lens presented the beautiful appearance represented in Fig. 3.

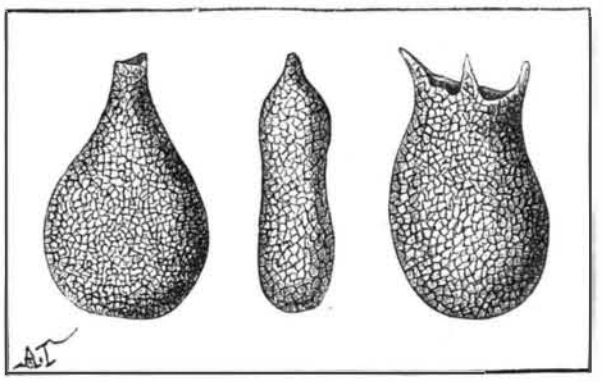


Fig. 4.—Microscopic aerolites (largely magnified).

Under the influence of a high temperature, these new crystals evaporated, but it was not difficult to prove them to be the nitrate of ammonia, the presence of which chemical analysis had previously indicated. Further investigation showed also that, among the nitrate of ammonia crystals, were scattered others of different form and totally unlike those of the rhomboidal system. Some were cubical, indicating them to be probably sea salt, others resembled the sulphate of soda crystals. The last probability was rendered quite certain by throwing a few flakes into a supersaturated solution of sulphate of soda, in which they immediately caused crystallization to take place. All the crystals, it appears, formed on the edges of the drop, while the corpuscles formed a dense group in the center.

As regards the particles of iron found, while it is very possible that they came from the surface of the soil, it is not improbable that they may have reached the atmosphere from without the same, and therefore be due to the disaggregation of aerolites, destroyed on entering the aerial ocean. Nordenskjold has collected, on the great snow fields of the arctic regions, a dust which contains iron, carbon, nickel, cobalt, and phosphorus, elements especially characteristic of extra-terrestrial bodies. Ehrenberg, the celebrated German microscopist, has examined the ferruginous dust, which, to the naked eye, appears to be but an agglomeration of minute grains, as represented in Fig. 5. When very highly magnified, however, the curious shape of the particles becomes clearly apparent (Fig. 4), showing that, at some time, they must have been in a state of fusion, and hence very probably due to some mass of meteoric iron rendered incandescent and melted by friction with our atmosphere.

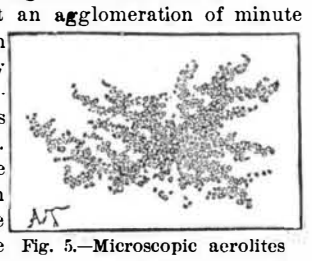


Fig. 5.—Microscopic aerolites (natural size).

The iron and other particles in the snow probably are not without some effect upon vegetation, the exact nature of which future investigation will determine. Certainly, however, it appears that heavy snow falls, besides protecting the ground against excessive cold, serve to fertilize the same through the nitrate of ammonia, conveyed to the soil by the melting of the snow.

New and Valuable Printing Press.

A new printing press made in Liverpool, Eng., by Duncan and Wilson, for the *Christian Union* newspaper of this city, is a remarkable novelty in this class of mechanism. It prints, folds, pastes, and binds the paper inside of a cover, which it also prints; and delivers the numbers, thus completed, at the rate of 5,000 copies per hour, and may be worked up to 6,000 per hour. The paper is drawn from a roll. The whole machine is 27 feet long, 7 feet high, and the cost is $20,000. The folding apparatus may be disconnected whenever necessary, and the machine used to print without folding. Various attempts have been heretofore made to attach folding machines to printing presses; but this, we believe, is the first successful example of the kind.

Rather Cold.

A correspondent of the Toronto *Globe* wrote from Bridge Creek, British Columbia, on February 19: "The thermometer at this place was frozen up, so we could not tell how cold it was. A bottle of good brandy and a bottle containing two pounds of mercury were put out as a test on February 14. In the morning both were frozen solid. This cold snap has lasted for more than two weeks, with no signs of mild weather. The mercury in the thermometer has been frozen every night."

German Locomotives.

The sixth annual report of the artisans of the German railway administration states that locomotive boilers made of sheets of cast steel have not fulfilled the expectations entertained for them, although it is hoped that more favorable results will be obtained when improvements have been made in the manufacture of steel plates. Copper bolts are recommended for the first row; steel ones are only to be employed when the feed water and fuel are both good.