NEW PHOSPHIDES OF SILVER, AND A METHOD OF ESTIMATING SILVER QUANTITATIVELY BY MEANS OF PHOSPHORUS.

BY WILLIAM FALKE, PROFESSOR OF NATURAL AND PHYSICAL SCIENCES IN MANHATTAN COLLEGE.*

In continuation of my communication commenced on page 148 of the last issue of the SCIENTIFIC AMERICAN: The question now occurred whether the phosphorus solution could be advantageously employed for the estimation of silver; for, as has been previously observed, the whole of the silver can be separated, in a short time, from many of its salts. Silver is generally estimated as chloride, and this is a process in which the very greatest care is requisite to produce accurate results. At first it must be precipitated as a chloride and be allowed to settle, then collected upon a filter and washed very rapidly to prevent any silver from being reduced by the organic matter of the filter, and, lastly, it must be transferred to a crucible and ignited. This method involves more or less difficulty and loss. After a series of experiments, the following phosphorus method is suggested as superseding the use of a filter, and in which the silver is at once weighed in the metallic state. Into a carefully weighed and dried tube or capsule, the salt of silver (the nitrate) is put, and dissolved in a small quantity of water. Then at least one fifth of its weight of phosphorus, dissolved in carbon disulphide, is added, and the tube, with its contents, slowly warmed. At first the silver is reduced with some phosphide admixture, then the carbon disulphide evaporates, and lastly the water is removed by careful evaporation, so as to prevent any spurting. After the whole is nearly dry, which is generally accomplished in less than half an hour, the tube may be heated for a short time, by gradually applying the flame to it. The excess of phosphorus undergoes combustion, and the phosphide also, so that nothing remains in the tube excepting metallic silver and phosphoric oxide, which is dissolved out with some distilled water, and the solution is poured out, as the silver adheres together in a spongy or scaly condition. After washing a few times, by decantation, the tube containing the silver is well dried by semi-ignition, and weighed by subtracting the weight of the tube from the tube and silver, and thus the weight of the silver is known.

A few of very many experiments are given to show how accurate and simple the method is: Tube, 7·275 grammes (112·267 grains); silver nitrate, 0·068 gramme (1·049 grains); phosphorus, 0·025 gramme (0·3858 grains); carbon disulphide 0·5 cubic centimeter (0·0305 cubic inch); water, 3·000 cubic centimeters (0·183 cubic inch.)

After analysis: Tube + metallic silver, 7·318 grammes (112·929 grains) — tube, 7·275 grammes (112·267 grains) = silver 0·0430; calculated in the nitrate, 0·0432, showing a difference of only 0·0002 of a grain.

Another example showed: Silver calculated in nitrate, 0·2617: silver found in nitrate, 0·2615 = 0·0002.

From this it will be seen that (by simply taking a capsule or tube previously well dried and adding the salt of silver or its solution, then the phosphorus dissolved in carbon disulphide, and mixing the whole), by careful evaporation and lastly semi-ignition, and then washing out after cooling the phosphoric acid and again drying, the silver may, as such, be at once weighed and determined. Many other salts of silver are at present under investigation, of which, in the future, more will be heard.

For descriptions of the few compounds of silver and phosphorus thus far known, which are of a very unsatisfactory nature, on account of the difficulty of the investigations, the reader may see Watt's "Dictionary of Chemistry," volume V., page 303.

English Railway Car Signals.

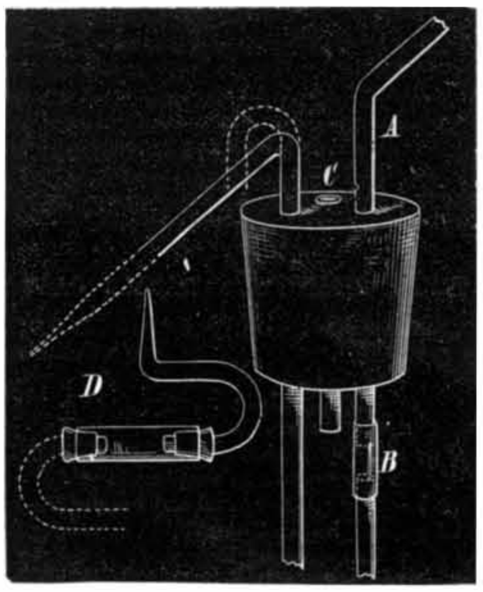
How to establish a suitable means of communication between the interior of the passenger cars and the engine driver is still a harassing and unsettled problem in the minds of our British cousins. The simple cord used in this country, they think, will not do, because they fear that the unruly subjects of the Queen, pent up in the little apartments of the cars, will pull the string when they ought not. Hundreds of devices have been proposed. What John Bull wants is something that is simple, and that will show to a certainty in which of the thirty compartments of a train the signal originated. Here is the last contrivance: Mr. Stewart, patentee of a new flag signal for railway carriages, recently exhibited his invention in the theatre of the Society of Arts. The invention consists of an apparatus which is inclosed in a small wooden box and placed inside of the carriage against one of the top corners of the compartment. On a catch being released by means of a cord suspended from the roof, a flag is projected through the side of the carriage, and at the same time a rope in connection with the apparatus causes the ringing of a bell in the guard's van and the whistle of the engine to be sounded. The intention of the invention is to provide instantaneous communication simultaneously with the guard and driver of the train, and, at the same time, means of informing both, by the exhibition of the flag, of the exact carriage in which the apparatus has been set in motion. A rope, running from end to end of the train, keeps the boxes in the various compartments in connection with the guard's van and the engine. The general opinion of those who examined Mr. Stewart's model was that, provided the machinery should not be liable to get out of order in the working, and that the expense should not deter railway managers from its adoption, it would be a great improvement on the existing means of communication between passengers and guards in traveling trains. The projection of the flag from the side of the carriage in which the bell had been rung was considered to be very valuable, as directing the attention of the guard at once to the spot where his assistance had been called for. Mr. Stewart stated that the probable cost of fitting railway carriages with his apparatus would be about one per cent of the cost of the carriages, which would be $50 for a car costing $5,000.

Correspondence.

An Improved Wash Bottle.

To the Editor of the Scientific American:

I recently noticed at the Stevens Institute of Technology a very handy form of wash bottle, devised by Mr. F. L. Bardeen, of which I inclose a sketch. It may be termed a constant bottle, for it throws a stream as long or longer than is required for most washing purposes. With a globe-shaped flask, holding about a liter (four fifths of a quart), the stream is constant for 45 seconds; and with the hot water bottle of the same size, for 1 minute or more, owing to the expansion of air within. With larger flasks, the time of flowing would of course be lengthened. The length of time, obviously, depends on the size of the jet and amount of air in jected; but for ordinary purposes, the time is about as stated. Globe-shaped flasks should be used, and they should never be more than two thirds full; and as the space for air increases as the water flows out, the stream remains constant for a greater length of time.



The device is made by perforating the cork in three places: the first for the exit tube, which extends to the bottom of the flask, the second for the tube through which the air is forced, and the third for an open tube for stopping the flow by relieving the pressure. On the lower end of tube, A, is a valve, made by slipping a short piece of rubber tubing over the tube, making a slit in the side, at B, and closing the lower end with a piece of glass rod. As this slit opens outwardly, all air forced through it is retained, and the expansion of this produces the jet. At C is the third opening in the cork, in which is a short piece of small tube, left even with the cork at the top and projecting a little way through the cork at the bottom.

The mode of use is as follows: Place the first finger of the hand that holds the bottle over the hole, C, and give a strong blast. If the finger remains over the hole, the water will flow for the space of 1 minute or more. The flow is instantly stopped by removing the finger. By using the movable nozzle, indicated at D, the jet may be directed to any required spot. It is especially convenient, as thus constructed, for washing down the precipitate from an inverted beaker; and as it is frequently desirable not to disturb the latter, in the above device the head is not obliged to follow the bottle into uncomfortable positions and remain so while the washing proceeds. W. KNOWLTON.

New York city.

The Great Engineer for President.

To the Editor of the Scientific American:

"The right man in the right place." This oldfashioned doctrine is revived in your able article nominating James B. Eads for the Presidency.

A statesman, an anti-monopolist, an advocate for the rights of the laborer, a gentleman of the highest scientific attainments and literary culture, James B Eads has rendered more lasting service to the Republic than any man living in the United States.

He is truly a representative of the best type of American citizen. Progressive, energetic, endowed with inventive powers in an extraordinary degree, he has contributed more to the advancement of practical science than any man of the age. Constructing an ironclad navy for the Western waters, he originated many important improvements therefor, which resulted in the building of ironclads of lighter draught than had been deemed possible.

As a civil engineer, James B. Eads occupies an eminent position. There is nothing in scientific history to compare with the St. Louis and Illinois bridge, with its wonderful aisson work. Slender and airy as the masonry of this bridge in its perfect symmetry appears, it contains 103,000 cubic yards of masonry—almost double the amount contained in the piers of any other bridge of equal length. The reports of the projector have been translated into many languages, and form the basis of text books used in schools of engineering in America and Europe

Although yet in the prime of life, James B. Eads has accomplished grand public improvements which might compass a century. The records of the Patent Office exhibit him as the originator of many useful and varied improvements. The Jetty system, now being constructed by this distinguished engineer, at the mouth of the Mississippi river, is one of the grandest works of the nineteenth century. The Mississippi river drains one of the most extensive, fertile, and salubrious valleys on the face of the globe, yet the only outlet to the sea, of this grand region, has always remained blocked by a bar over which commerce has vainly striven to find unfettered passage. The success of this great enterprise is already nearly established.

An honest man, an enlightened gentleman, gifted with administrative abilities of a high order, a statesman of broad, comprehensive views and sound logic, James B. Eads is pre-eminently fitted to fulfil the duties devolving upon the Executive of this great nation.

A PATRON OF HUSBANDRY.

Can We Protect our Bank Vaults?

To the Editor of the Scientific American:

The article in your issue of February 20 on this subject is worth attention; but let me ask how it is that bank safes in London, Paris, and Vienna are not robbed? They certainly keep as much specie and currency generally on hand in London as we do here, yet I cannot call to mind a single case of a bank safe being robbed in that city. When I resided in London, I was informed by a friend who had been employed as clerk in a London bank that, when he first commenced his duties there, he was compelled to sleep on the premises with some three or four other junior clerks, and that it was made obligatory on them that two of them should always remain at home to look after the building, in conjunction with the janitor and his family. Thus a band of burglars could have no opportunity of robbing such a bank, save by collusion with four or five persons. The country banks in England, I am told, are guarded in the same manner. It seems to me that, if we give the burglars full opportunity to work, it is quite useless making strong vaults and safes. Guard the building: that is the true remedy. Our safe deposit institutions have wisely adopted this plan, and so far successfully. DEPOSITOR.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

The computations and some of the observations in the following notes are from students in the astronomical department. The times of risings and settings of planets are approximate, but sufficiently accurate to enable an ordinary observer to find the objects mentioned. M. M.

Position of the Planets for February, 1875.

Mercury.

Mercury, which was seen so beautifully after sunset in the latter part of January, can in March be seen before sunrise. On the 1st of March it rises at 5h. 30m. A. M., and on the 31st at 5h. 15m. A. M. The best time to look at it is on the morning of the 10th.

Venus.

Venus becomes more and more conspicuous in the evening sky, setting on the 1st of March a little before 9 0 P. M., and on the last of March a little after 10 P. M.

As Venus passes the meridian between 2 and 3 in the afternoon all through the month of March, with an increasing apparent diameter and at higher and higher altitude, it can probably be seen with the naked eye at its culmination.

Mars.

Mars rises on the 1st of March at 8h. 33m. A. M., and sets at 10h. 5m. P. M. On the 31st, Mars rises at 7h. 30m. A.M., and sets at 9h. 54m. P. M. The apparent diameter of Mars is now very small, in consequence of its distance, but on the 29th it may be recognized from its nearness to Venus.

Jupiter.

Jupiter continues to be very near to the star β *Scorpii* and its motions can be very nicely followed by comparing its position with that of the star. In the first half of the month of March, Jupiter is seen to be moving away from the star; on the 17th it is stationary, after which its motion becomes retrograde, and on the 31st it is very near the star.

Jupiter is coming into better position for evening observers; on the 31st of March it rises about 10h. 32m. P. M., and comes to meridian at 3h. 10m. the next morning, at which time the star β *Scorpii* is west of Jupiter by about half the diameter of the moon.

Saturn.

Saturn sets before the sun in March, but it rises earlier and earlier through the month, and in the latter part can be well seen in the morning. On the 31st, Saturn rises at 4h. 28m. A. M., and sets at 3h. 5m. P. M. Mercury and Saturn are in conjunction on the morning of the 18th.

Uranus.

On the 1st of March Uranus rises at 3h. 36m. P. M. On the 31st, Uranus rises at 1h. 34m. P. M. Uranus can be found at meridian passage, which on the 1st is at 10h. 37m. P. M., at an altitude (in this latitude) of about 58°. On the 31st, Uranus passes the meridian at 8h. 36m., at an altitude of 58¼°

Sun Spots.

The report is from January 19 to February 20, inclusive. The photographs of January 20 and January 21 show a large spot (followed by a very small one) coming on, a small group near the center, and another on the western limb.

Clouds prevented photographing till January 25, when the group seen going off on January 21 had disappeared; the

* A part of this article formed the subject of a paper read before the New York Academy of Sciences (late Lyceum of Natural History), December 18, 1875.