# Scientific Museum.

### Properties of Ether.

Water can dissolve only a small quantity of ether, but alcohol and ether combine in every proportion. Ether is very inflammable, and burns with a much more copious and richer flame than alcohol; the products of its combustion are water and carbonic acid. A few drops put into a detonating bottle full of oxygen gas, which is immediately corked, speedily diffuse themselves through the gas, and form an inflammable mixture that detonates violently on bringing a lighted match to the mouth of the bottle. This is an experiment that should be performed with a very small and strong bottle, as detonating bottles that have not been injured by any other explosive mixtures are frequently broken by this.

From the rapidity with which ether evaporates at the natural temperatures, it is often used to produce an intense degree of cold. If a small quantity be poured into a jar, which is immediately covered with a tray, it speedily evaporates, and on applying a lighted candle to the mouth of the jar it is ound to be full of an inflammable vapor.

If a larger quantity of ether be put into an open jar, and a coil of thin platinum wire, heated to redness in a spirit-lamp, be suspended over it at a particular distance, which is easily found on trying the experiment, instead of becoming cold it remains red hot till the whole of the ether is consumed.

In all experiments with nitric acid and alcohol, great care must be taken not to mix a large quantity of acid with the alcohol at once, as the gaseous products that are immediately produced are apt to throw out the whole of the mixture with explosive violence. The best method of preparing hyponitrous ether is by mixing equal weights of alcohol and the strong fuming acid, prepared by distillation from 2 parts by weight of sulphuric acid with 3 of nitre. The acid re-acts on the alcohol, and in a day or two it is converted into ether, which floats on the top of the remaining liquid, and may be easily removed by a small syphon.

Two or three ounces of alcohol are put into a bottle, and small quantities of the acid are poured into it at a time by a funnel with a long stem, which passes to the bottom of the bottle, mixing them thoroughly after each addition of acid, and then placing the bottle in cold water to prevent any violent re-action taking place. A drachm or two of the acid may be added every quarter of an hour in this manner till it is all mixed with the alcohol. The bottle should be provided with a conical stopple to allow the gas that accumulates to be discharged.

The Dublin College directs the alcohol to be mixed with sulphuric acid in a flask, and the mixture to be poured over bruised nitre in a retort. The proportions they recommend are nearly 865 of nitre, 1345 of sulphuric acid, and 725 of alcohol, by weight. The retort must be placed in a basin of cold water to prevent the action becoming too violent, and it should not be filled more than a third full of nitre.

Hyponitrous ether contains a little acid as it is procured at first, which may be removod by mixing it with a little potassa or lime, and then distilling it. It has a very pale lemon-color yellow, a pleasant smell similar to that of apples, and a strong penetrating taste. It is heavier and more volatile than sulphuric ether, burns with a lambient flame, and soon becomes acid on being kept. When it is purified by distillation, the operation should always be carried on with a very gentle heat, as it is decomposed when distillcd quickly at a higher temperature.

### Aerial Navigation.

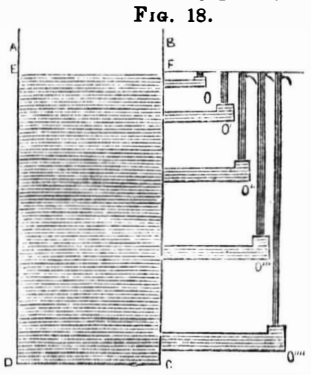
Mr. John Wise, of Lancaster, Pa., well known through the Sci. Am., has presented a memorial to Congress, asking an appropriation of some twenty thousand dollars, to enable him to construct a balloon, 100 feet in diameter, which shall have the power of elevating 16 tons. He states that he has demonstrated to his own satisfaction, and is prepared to demonstrate to the world, that balloons may be made useful and practicable for the transmission of mails and the transportation of passengers. That they can be made even more servicable in war than in peace. He will elevate a balloon at any place designated, above the reach of gun-shot, from whence he can discharge missiles of such a destructive character, as to annihilate any fleet, fort, or army which may be beneath it.

For the Scientific American.

### Hydraulics.

(Continued from page 136.)

Fig. 18.




From the theorem in fig. 17, last week, it is plain that the principle just expressed is true, when the depth of the orifice below the surface is indefinitely small; hence if true in this case, it must, according to what has been already explained, be also true in every other.

It follows, as a necessary consequence, that if the orifices from which the liquid is discharged be presented upwards, the jets of liquid which would escape from them would rise to a height equal to the level of the liquid in the vessel. Thus, in fig. 18, if E F be the surface of the liquid, and O, O', O'', O''', be four orifices at different depths, all opening directly upwards, the liquid will spout from each of them with the velocity which a body would acquire in falling from the level of the surface E F to the orifices, respectively, and consequently the liquid must rise to the same height before it loses the velocity with which it was discharged. Hence the jets severally issuing from the orifices will rise to the height F G.

These important theorems must, however, be submitted to considerable modifications before they can be considered as applicable in practice. In the preceding investigation, we have considered the orifice to be indefinitely small, so that every point of it may be regarded as at the same depth below the surface; we have also considered that the fluid in escaping from the orifice is subjected to no resistance from friction or other causes; and also that in its ascent in jets it is free from atmospheric resistance. In practice, however, all these causes produce very sensible effects; and the consequence is, that the actual phenomena

Fig. 19.

vary very considerably from the results of theory. The velocity of the efflux is, from the moment the orifice is opened, diminished by the friction of the liquid against the sides of the pipe or opening through which it passes. After it escapes, the resistance of the air produces a sensible effect upon the movement of the fluid particles. This resistance increases even more rapidly than the velocity, so that the jets which escape from the lower orifices are still more resisted in proportion than those from the higher, and consequently they do not rise even near the level of the fluid in the vessel.

As the liquid is gradually discharged from the orifice, the contents of the vessel descend, the various particles falling in lines nearly perpendicular; but when they approach near the orifice from which they are to escape, they begin to change their direction, and to tend towards the orifice, so that their motion is in lines, converging towards the opening, and meeting at a point outside it. These effects will be produced whether the opening be in the bottom or in the side of the vessel. They may be rendered visible by using a glass vessel filled with water, in which filings or small fragments of solid substances are suspended, and which are carried along by the motion of the currents.

If a vessel be allowed to empty itself by an orifice in the bottom, the surface of the liquid will gradually descend, maintaining its horizontal position; but, when it comes within a small distance, about half an inch, of the bottom, a slight depression or hollow will be observed in that part of the surface which is immediately over the orifice. This will increase until it assume the shape of a cone or funnel, the centre or lowest point of which will be in the orifice, and the liquid will be observed flowing in lines directed to this centre.

This effect will be better understood by referring to fig. 19, where the direction of the currents and the contracted vein are exhibited.

As the particles of liquid in approaching the orifice move in directions converging to a point outside it, it is plain that the column of fluid which escapes from the vessel will be narrower or more contracted at the point towards which the motion of the liquid converges than it is either before it arrives at that point or after it has passed it. This contraction of the jet produced by the peculiar directions which the motions of the fluid particles take, was first noticed by Newton, who gave it the name of the *vena contracta* or the *contracted vein* of fluid. The distance from the orifice at which the greatest contraction of the jet takes place depends, with certain limitations, on the magnitude of the orifice. If the orifice be circular and small, its distance is equal to half the diameter of the orifice, and the magnitude of the jet at its most contracted point bears to the magnitude of the orifice, according to Newton, the proportion of 1,000 to 1,414, and according to Bossuet, the proportion of 1,000 to 1,600.

It will be evident, upon very slight consideration, that if the liquid be suffered to escape by a cylindrical tube, the contraction of the vein will be greatly diminished. In this case the proportion of the magnitude of the most contracted part to that of the bore of the tube is 1,000 to 1,200.

As the same quantity of fluid which passes in any given time through the orifice must pass in the same time through the narrower space of the contracted vein, it follows that it must past through this place with a proportionally greater velocity. Its velocity, therefore, at the point called the contracted vein, is greater than at the orifice in the proportion 1,414 to 1,000, according to Newton's calculation.

### The Flax Cotton Again.

As we have stated on two former occasions, that we did not believe that the flax cotton, about which so much has been said, could be made to supersede cotton, so at last it has come out just as we predicted. A late number of the "Manchester Guardian" states that it has been tried at that place, and in Rochdale, on fine cotton machinery, and it proved an entire failure. "For all finer purposes, it is totally unfitted by its harshnes, to be spun on fine cotton machinery." We stated that from what we knew of the difficulties of preparing it, we could not see how it could compete with cotton. It seems that it has another difficulty to surmount, viz., the one of harshness mentioned, so as we have already asserted, it turns out to be an attempt to frighten the cotton growers.

### Annual Loss of Life and Property on the Lakes.

The Buffalo Commercial Advertiser publishes from reliable sources, a detailed statement of the disasters on the lakes during the past season, from which it appears that they involve the loss of three hundred and ninety-five lives, and $558,926. Ten steamboats, twenty-one sail craft, and one propeller have gone out of existence entirely. Of the lives lost, 250 resulted from the burning of the steamer Griffith, 65 from the explosion of the Anthony Wayne, and 38 from the collision of the steamer Commerce.

### LITERARY NOTICES.

We noticed, a few week's since, the intended publication of a new literary journal, called the "Western World." The second number is already issued, and contains an interesting variety of entertaining matter, adapted to family reading, and although furnished one year for the low sum of 50 cents, it compares not unfavorably with its cotemporaries at four times the price. It is edited and published by our valued friend, J. F. Bridge, and we wish him the largest success in his new enterprize. A well conducted newspaper is the source from which we derive a vast amount of intelligence, and a corresponding amount of good accrues to the community. The poorest in our land can offer no reasonable excuse for not receiving the weekly visits of one or more papers: certainly, at the low price for which 52 numbers of the Western World are furnished, no reasonable excuse exists why every family (who deem even a dollar paper too high) should not become its permanent patrons and readers. A weekly newspaper, of good size, furnished for 50 cents, is quite a novelty in this country, and must require a large subscription list to make it remunerative. The response to the entertainment to which the public are invited by Mr. Bridge, has been, thus far, gratifying; and we bespeak for him an immense subscription list of cash paying readers.

Harper's New Monthly Magazine, for January, contains an interesting variety of choice literature, besides several illustrations, some of which the ladies will be pleased with, as they relate to fashion—a very interesting subject always. As our taste does not happen to run that way, we plead ignorance as to the merits of this department. The general character of this Magazine is superlatively good, and without doubt it circulates more largely than any other now published. Subscription price $3.

We are indebted to Messrs. Dewitt & Davenport, Tribune Buildings, for a copy of the Experiences of Richard Taylor, Esq.; also a copy of Marston of Dunoran, published at the office of Littell & Co., Boston. They are both highly interesting tales, and will repay a perusal. We speak from experience, having read both.

Geology and Resources of California—This is the title of a very excellent book, with maps, &c., and contains the reports of Persifer F. Smith, and of Lieuts Talbot, Ord, Derby, and Williamson, relating to their explorations in California and Oregon, and their examinations for railroad routes to the eastward from those countries. It is published by Minnifie & Co., Baltimore.

Duggan's Stone, Iron, and Wood Bridges Appendix.—Four parts of the Appendix of Mr. Duggan's excellent work is now completed, the other primary parts having already been published. The Appendix is very valuable; it enters into the merits of Foundations, Coffer Dams, Concrete, &c., and gives some fine specimens of Bridge Architecture.—This is a work which no Civil Engineer and Architect should be without. All the back numbers can be supplied at any moment, by addressing Geo. Duggan, N. Y.