

DISCOVERIES CONCERNING THE NEBULÆ.

Modern astronomical observations prove that our sun is simply an individual star, forming only a single unit in a cluster or mass of many millions of other similar stars; that this cluster has limited dimensions, has ascertainable length, breadth and thickness, and, in short, forms what may be expressed by a universe of solar systems. Different clusters exhibit their component stars, seen with the same magnifying power more or less distinctly. This may be explained either by difference of distance or by the supposition that they may consist of stars of different magnitudes, and crowded more or less closely together. The appearance of the stars composing some of the clusters is also very gorgeous. The telescope shows that the cluster which surrounds Crucis, in the southern hemisphere, occupies the forty-eight part of a square degree, or about the tenth part of the superficial magnitude of the moon's disk, and consists of about 110 stars from the seventh magnitude downwards, eight of the more conspicuous stars being colored with various tints of red, green and blue, giving to the whole the appearance of a rich piece of jewelry.

Cluster compared with cluster shows all gradations of smallness and closeness of the component stars, until they assume the appearance of patches of starry powder. These varieties are obviously ascribable to varying distances. Then follow those patches of starry light which are seen in so many regions of the heavens, and which have been denominated nebulae, appearing with very different degrees of magnitude and brightness. That these are still clusters of which the component stars are indistinguishable by reason of their remoteness, there are the strongest evidence and most striking analogies to prove. Every augmentation of power and improvement of efficiency the telescope receives, augments the number of nebulae which are converted by that instrument into clusters. The labors of eminent astronomers, the colossal telescopes constructed, and the erection of observatories in multiplied numbers in climates under skies more favorable to observation, have all tended to augment the number of nebulae which have been resolved, and it may be expected that this progress will continue.

FISH CHUTES FOR DAMS.

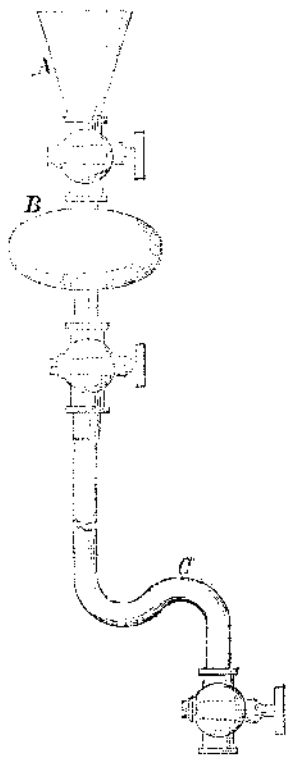
It is well known that "fish of passage," such as salmon and shad, have been prevented from returning to their spawning grounds by dams erected across many of our creeks and rivers, and, as a consequence, they have entirely disappeared from waters in which they were formerly very numerous. To provide a remedy for this evil and allow such fish to return to their old summer haunts, Mr. S. P. Sleppy, of Wilkesbarre, Pa., proposes (in a recent letter to us) that a zig-zag inclined chute, somewhat resembling a gold miner's ruffie, should be erected at the side of every dam, by which the fish may be enabled to ascend pretty high falls. Simple inclined chutes have been put up at the sides of dams on several European rivers (laws being passed for this purpose) to accomplish the same objects; but a zig-zag chute is better adapted for all kinds of fish, as only salmon (which have great ascending powers) are capable of moving up a high and steep incline. The proposition of our correspondent impresses us favorably, and we hope to see it acted upon very generally by the owners of dams on our creeks and rivers. If they do not carry out this suggestion voluntarily, we recommend the passage of laws for accomplishing the object. There is a positive obligation resting upon all our State governments to pursue such a policy, because it will benefit many persons and do harm to none. Although the dams of saw-mills and factories are of great benefit to the individuals engaged in the industrial manufacturing arts, they have injured the people in many sections of our country. Thus, the shad used to ascend the Susquehanna river, and the people in the Wyoming Valley (as our correspondent informs us) were then periodically supplied with an abundance of this fine fish. Now, they cannot ascend these waters, owing to the dams which have been erected on this river; and as a result, fresh shad is now unknown to the dwellers in this interesting portion of our country. By erecting zig-zag inclined chutes on these dams no loss of water-power would be sustained, while the fish, we think, would be enabled to ascend by the whirls and occupy their old grounds. The project is at least worthy of a trial; and it is during the summer months, when the waters are low, that these contrivances should be erected.

NOVEL AIR PUMP.

[Translated for the Scientific American.]

The accompanying figure represents a curious air-pump proposed by A. Gairaud, of France, to supersede the common piston air pump. The agent for producing a vacuum in this pump is mercury, acting by gravity; and instead of a flap valve, as in the air pump, air-tight faucets are substituted.

It is conceded by all philosophers that, with the common air pump, the rarification of the air can be carried on only to a certain limit; the best air pump not being able to bring the column of mercury in the barometer attached to it below one-sixteenth of an inch; and it is obvious that the air in the receiver will not be able to raise the valve, on account of its rarity. These defects are proposed to be removed by the mercurial air pump which is the subject of this article. This pump consists of a barometer tube about 33 inches long and 5-16 to 3-8 of an inch in diameter. Its lower end C, is bent in the form of an σ , and it is closed by a cock. The upper end of the tube is firmly secured to a glass egg-shaped vessel, B, containing from half a pint to one quart, and is provided with a stop-cock below and with another one above; this latter faucet being covered by a funnel, A. The several fastenings and cocks are all made of iron, and the apparatus is screwed on a table.



To set the pump in operation it is filled with mercury through the funnel on the top, and the upper cock is closed. By opening the stop-cock at the lower end of the tube the mercury escapes into a vessel placed underneath, a column of 30 inches remaining in the tube; and a complete vacuum is obtained in the egg-shaped vessel, forming in this case the vacuum of Toricelli.

To apply this apparatus to the Magdeburg hemispheres, the lower one is secured to the top of the tube and a hole is drilled in the upper one, which is stopped up by a cock, so that it can be filled with mercury and closed. By opening the stop-cock at the lower end of the tube a perfect vacuum is attained in the hemispheres.

To exhaust or to rarify the air in a common receiver this apparatus is also superior to the common air pump, as by its aid the rarification can be carried on *ad infinitum*. The receiver is placed on the table and made to communicate with the glass egg-shaped vessel on the top of the tube by means of an iron pipe which is provided with a stop-cock. If the contents of the receiver and of the glass egg-shaped vessel are equal, the density of the air is reduced one-half by each operation, and after repeating the operation ten times, its density is not more than 1-1024, and after twenty times it is not more than 1-1048576 of its original density. In this case, however, it is desirable to place the receiver on a ring or dish of india-rubber instead of closing the joint by means of tallow.

This apparatus is much cheaper than any of the common air pumps; and by the aid of 20 or 25 lbs. of mercury all the usual experiments can be performed. It

would be still less expensive if made of gutta-percha. If the tube is long and large enough, water may be used instead of mercury, and the apparatus may be employed for exhausting the air wherever it is desirable to make use of the atmospheric pressure, or in order to boil certain substances in a partial vacuum.—*Dingler's Polytechnic Journal*.

MECHANICAL HORSE-TAMER.

With a philosophical indifference to the lofty teachings in horse-taming as practiced by Professor Rarey (with whose feats the whole world resounded in 1858), J. G. Bunting, of London, has taken out a patent for what he calls a "Mechanical Horse-tamer." It consists of a post driven into the ground and having at its upper end a stout pin, to which are secured two horizontal poles. Upon the outer ends of these are attached axle-arms to carry heavy cart wheels and they are arranged to form a sort of cradle in which the horse to be tamed is fastened by suitable straps. He is unable to plunge by the weight of the wheels, or to lie down on account of the under straps, and he is prevented from running backward by a prop which is fixed to the hind pole. In this contrivance the unruly animal is coerced into obedience; but as to the extent of his training, or how long it takes to *break him in*, we are not informed.

THE MAELSTROM NOT A MYTH.—The ancient accounts of the above-named whirlpool on the coast of Norway were imposing for the terror which were ascribed to it. It was stated to be several miles in extent—a large boiling cauldron circling round in one great eddy, into which whales and ships were sometimes drawn and carried down forever beneath its horrid waters. That such a whirlpool does exist would appear to be true, but it is not such a terrific affair after all. M. Hagerup, the Minister of Norwegian Marine, has recently given some account of it. He states, that the great whirl is caused by the setting in and out of the tides between Lofoden and Mosken, and is most violent half-way between ebb and flood tide. At flood and ebb tide it disappears for about half an hour, but begins again with the moving of the waters. Large vessels may pass over it safely in serene weather, but in a storm it is perilous to the largest craft. Small boats are not safe near it at the time of its strongest action in any weather. The whirls in the Maelstrom do not, as was once supposed, draw vessels under the water, but by their violence they fill them with water or dash them upon the neighboring shoals.

A GREAT TEMPERANCE MOVEMENT.—On the morning of the Fourth of July we saw a number of men employed in tapping the hydrants in Broadway, from the Battery to Fourteenth-street (about three miles), and attaching a tin cup by a chain, so that the multitudes who crowded to see the military procession might slake their thirst with pure Croton water, instead of being forced into grog-shops and bar-rooms to obtain a cooling beverage of doubtful liquor. This might well be done to all the hydrants, and if water-fountains were well distributed in the more depraved parts of our city much crime and debauchery would cease. The Fourth of July movement was the inauguration of a great temperance reform, one likely to be of more practical value than forming temperance societies. Pure water, pure air, and whitewash are wonderful reformers, and we wish that the value of the three was more highly estimated by our city authorities than they are.

NEW MODE OF RIPENING PEARS.—In Hovey's *Magazine* it is stated that, at a late meeting of the English Horticultural Society, H. O. Carre, of Guernsey, communicated the results of some experiments he had made with regard to improving the flavor of various kinds of pears by heat and light under glass. Last autumn he placed on a broad shelf in the warmest part of a greenhouse, near the glass at the top, various kinds of pears, as soon as they were gathered from the trees out-of-doors; and likewise some near the front sashes; the fruit was thus exposed to heat and sunlight, and the improvement in flavor, as regards some varieties, was most remarkable. He intends to prosecute his experiments; and from his success last season, he is led to believe that in many parts of England, where pears do not ripen well, they may be rendered much more melting and sugary by adopting the plan of exposing them to light and heat, when gathered, than if kept in the ordinary way.