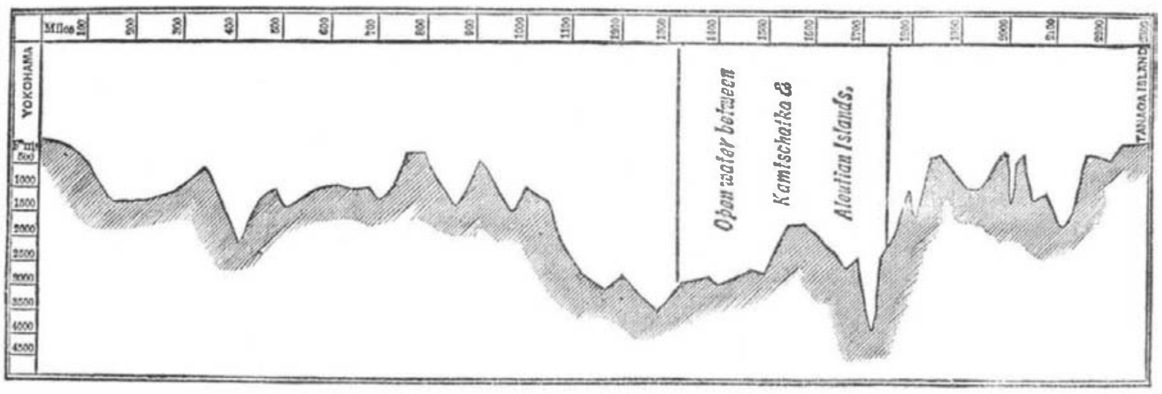
THE PACIFIC OCEAN TELEGRAPH.

The latest advices from the Tuscarora and the party engaged in surveying the bed of the Pacific ocean, to find a suitable route for the cable, report progress from Yokohama, Japan, along the shores of the Kurile Islands and of some of the Aleutian group, and thence across the Kamchatka Sea. "For 1,000 miles from Yokohama," says a correspondent of the *Tribune*, from which journal we take the illustrative diagram, "the depths ranged from 300 to 2,270 fathoms. The greatest slope within the distance is from lat. 40° 01' N., long. 142° 57' E., to lat. 41° 09' N., long. 144° 01' E., being 161 feet to the mile. From lat. 47° 44' N., long. 154° 15' E., the depth gradually increased to 3,754 fathoms at position lat. 50° 19', long. 159° 39', a distance of 260 miles, giving a slope of about 60 feet. Just before entering the Aleutian group, a most remarkable depression was ascertained. It was in lat. 52° 06' N., long. 171° 15' E., and its depth was 4,037 fathoms (24,222 feet), while the preceding and succeeding casts, each only 29 miles distant from this one, were in 2,460 fathoms (14,760 feet) of water, which gave a slope of 326 feet to a mile, the greatest as yet found by us since our departure from San Francisco. From the position of this great depth to one about three miles from the island of Atchka, lat. 51° 58' N., long. 174° 31' E., a distance of 125 miles, the water shoaled to 332 fathoms, being at the rate of 187 feet to a mile, and from that position to Tanaga Island the depth ranged from 200 to 1,800 fathoms, with but one heavy slope of 250 feet between lat. 51° 08' N., long. 178° 35' W., and lat. 51° 28' N., long. 177° 57' W. This is nearly as much as the greatest slope found between Honolulu and Yokohama. This route thus far is not impracticable, so far as the plateau goes.

Ooze similar to that previously found, and grayish black sand, gravel, and lumps of lava, were found along the Kurile Islands, and grayish black sand, gravel, and sponge in the Aleutian group. After sighting the Agatton island, the line was run skirting along the shores to the island of Tanaga. From this point it will be run to the northward, to the island of Ounalaska. The deductions from aerial temperatures in connection with currents, corroborate previous observations upon the latter. In lat. 51° 39' N., the counter current which sets to the southward and westward along the shores of Kamchatka and the Kurile Islands, extends to long. 164° E., with a surface temperature of 42° Fah., from which point to long. 174° E., in the same latitude, there is the Kamchatka current, which is a branch of the Japan stream, setting up through Behring's Straits. This stream has a surface temperature in this latitude of from 46° to 47° Fah."



BED OF THE PACIFIC OCEAN ALONG THE TUSCARORA'S COURSE.

As will be seen by the sectional view of the ocean bed, the course is along a range of submarine mountains, which (in the Kurile and Aleutian Islands) occasionally rise above the surface of the water. The ocean currents are very numerous, and their temperatures vary widely.

The Tuscarora completed this course, and put into Glory of Russia Bay, Tanaga, one of

THE ALEUTIAN CHAIN OF ISLANDS.

During the summer months, which are supposed by the natives to be a delightful season of the year, the islands are continually vailed in obscurity by fogs; and, in approaching them, cautiously feeling the way, there is a danger presented by strong, treacherous currents, as well as lack of confidence as to their positions. During the nine winter months, or from September to June, the winds are extremely violent. "After having waited patiently for nearly three days for a sufficiently clear day that would permit us, at even a ship's length, to see land, we, on the 19th, were fortunate in sighting the island of Tanaga in the morning, and at 6 P. M. anchoring safely in 10 fathoms of water in Glory of Russia Bay, which is proposed as an intermediate station for the cable. At an elevation of 2,650 feet, but a short distance back from the beach, upon the mountain side, is a glacier of considerable extent, which was visited by several of our officers. The short stay prevented any measurements of its rate of movement. The soil is spongy, owing to continued dampness, and of course destitute of trees or bushes, and inhabited solely by fowls of the air. There is here a

FINGAL CAVE,

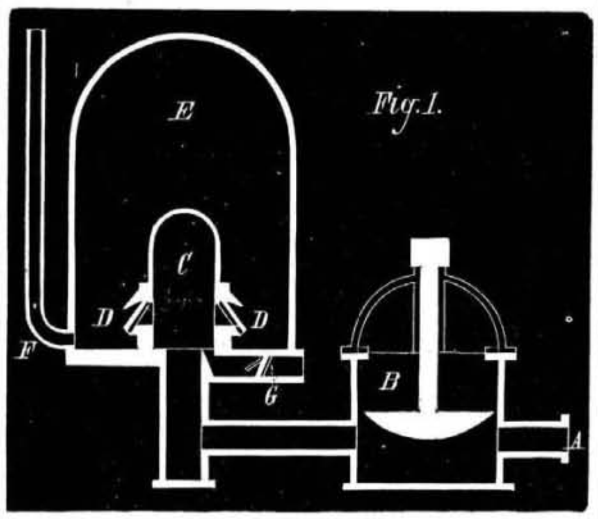
with its basaltic columns, which is scientifically interesting. But, taking everything into consideration, should this place be selected as an intermediate station, the operator whose headquarters it will be is not likely to regard it as a paradise. Although the practicability of the northern route is beyond dispute, the labor, uncertainty of success, and dangers involved, in even the passage of a steamer over the route just sounded by us, cause me to apprehend no small difficulty in an attempt to lay down a submarine cable.

Then consider the exertion of dredging for a broken cable in waters either clouded in a fog or beneath a gale, compared with those to be experienced on the southern route. Again, there is the submarine valley of over 4,000 fathoms depth just to the southward of the Aleutian Islands, through which the cable will have to pass. In laying the cable here, at least six and a half or seven miles of it will be suspended from the stern of the vessel, the weight of which the cable may be of insufficient strength to sustain, even if at the time the most favorable weather prevails. To sum it all up, the most obvious advantages in favor of the northern route are the smaller amount of cable required, and its being mostly within our own possessions.

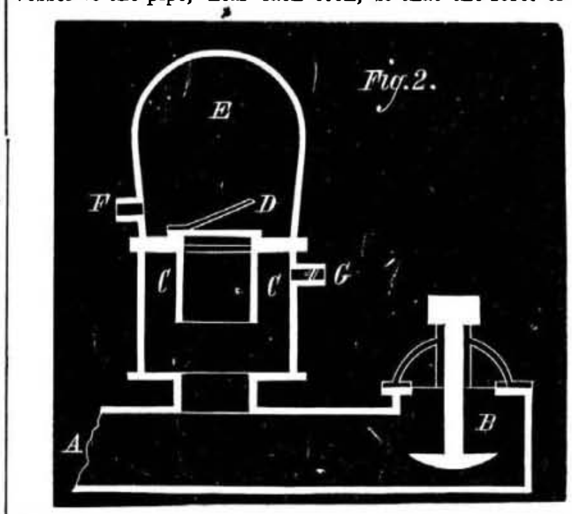
We arrived at Ounalaska on July 29; everything most satisfactory to date, as far as the accomplishment of our work is concerned. A line will next be run back to Tanaga island outside, or to the southward of the islands; then from here to where we left off last fall, and then to San Francisco, where the work will be completed."

THE HYDRAULIC RAM.

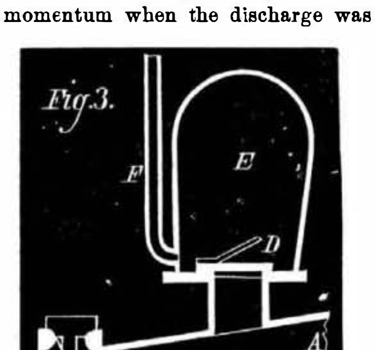
Many of our readers, on shutting the cock in a water pipe where there was considerable pressure, must have observed that the sudden arrest of the motion of the water caused a shock, sometimes producing sound and jarring the pipe.



Indeed, the water pipes in houses have often been burst by suddenly shutting off the water from a basin, and plumbers frequently provide against this accident by attaching an air vessel to the pipe, near each cock, so that the force of the

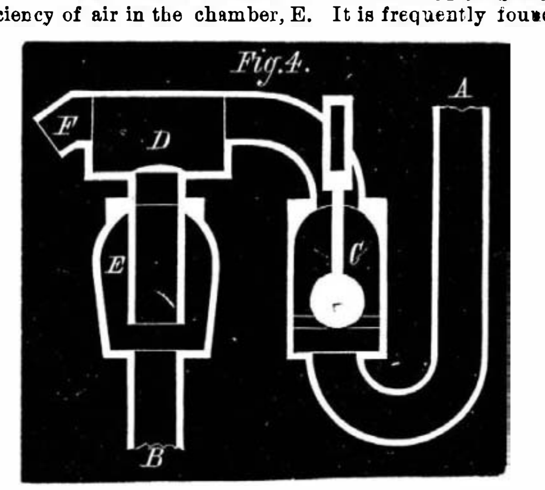


blow may not be suddenly arrested. Whitehurst, an Englishman, contrived a machine, in 1772, for raising water by utilizing its momentum when the discharge was suddenly



stopped. Machines on a similar principle are constructed today, for use in cities where the pressure in the mains is deficient. For instance, there are many buildings in the lower part of New York in which the pressure in the mains will not raise the water to the upper stories. Most of these buildings have tanks into which the water is forced by hand or steam power; and some of them have machines like those of Whitehurst, which are set in action every time water is drawn and shut off in the lower stories.

In 1796, Montgolfier, whose connection with the invention of balloons is well known, contrived an automatic machine for performing continually the work that Whitehurst's machine had done when controlled by hand. The Montgolfier ram, as at first constructed, is shown in Fig. 1; and Fig. 2 represents another form of the machine, embodying the same principles, and somewhat easier to build. The two figures are lettered alike, so that a description of the action of one will apply to the other. Water from a source higher than the ram flows through the pipe, A, and the discharge valve, B, being open, runs to waste. Some resistance being offered to its passage through the waste outlet, the water closes the valve, B; and its motion in this direction being suddenly arrested, it has sufficient force to open the valves, D D, and rise some distance in the delivery pipe, F. When the force is expended, the valve, B, again opens, and the former operation is repeated. It will be observed that, when the valve, B, closes, the air in C and E is compressed by the force of the water. When the force is expended, the air in C expands again, and presses back the water in the pipe, A, so that the valve, B, can more readily open, and the air in E also expands, forcing the water up the delivery pipe, F. Thus the air in C tends to make the valve, B, open more quickly than it otherwise would, after the water has exerted its force in the pipe, F, and the air in E makes the delivery more regular and continuous. The air in these vessels is liable to diminish in quantity, since water absorbs it under pressure. The entering water brings some air along with it, to make up the deficiency; but as this supply is frequently insufficient, a small air valve, G, opening inwards, is fitted, which admits air into the ram, whenever the pressure in the vessels falls below that of the atmosphere. A simpler and cheaper form of ram is shown in Fig. 4, which is the kind generally built by pump makers. It will be seen that it has no air vessel for aiding the opening of the waste valve, B, and no valve for supplying any deficiency of air in the chamber, E. It is frequently found



necessary, for the successful operation of this form of ram, to make a small hole in the pipe, A, so that air will be drawn in by the running water. It would be easy to render these rams more efficient by the addition of a casting that would change them into machines of the kind represented in Fig. 2, as will be rendered plain by an inspection of Figs. 2 and 3. The air valve, G, Figs. 1 and 2, is so low down that if the ram should become submerged it would admit water. An improved ram, patented a few years ago in France, has the air valve elevated to a considerable distance so as to overcome this difficulty.

The hydraulic ram, or, rather, a modification of it, is also employed to draw water from lower points. This form of the machine is sketched in Fig. 4. The pipe, A, leads to a source of supply higher than the ram, and connects with the place which is to be drained. The distance from the end of the pipe, A, to the valve, D, must not be greater than the hight to which water will rise in a vacuum—that is to say, 34 feet,—and for successful working, it should not exceed 26 feet. The action of the machine is as follows: The valve, C, being open, water flows through the pipe, A, and is discharged at F. When sufficient velocity is acquired, the valve, C, closes; and the water continuing to flow through F, a vacuum is formed behind it, so that water is drawn through the pipe, B, and valve, D, and discharged at F. Then the valve, C, again opens, and the same cycle of operations is repeated. E is an air chamber, aiding the continuity of discharge, as in the former cases.

The hydraulic ram finds various applications in industrial pursuits. It is largely employed for raising water into dwelling houses and farm yards. It was used at the Mont Cenis tunnel, working under a head of 85 feet, to compress air to five atmospheres for the purposes of ventilation and power. It will work under extremely low heads, and will raise water to almost any desired hight, and, when properly proportioned, is reasonably efficient. The efficiency is not, however, a matter of great importance in many cases. For instance, a man may have a spring on a hillside, at consider-