merits of the projectiles consist in their answering fully the expectations desired of them—their ready fabrication and adaptation to guns, their ease of loading, as it required but little more force to send the projectile to the bottom of the bore, than is needed to move a body of like weight, on a smooth surface; the certainty of the expansion of the filling, and its firm true hold in the grooves of the gun; the greased canvas wipes the rifling clean and leaves the bore in a condition to receive readily the next charge, and which is also a sure protection to the bore from injury in loading and when the gun is discharged. These conditions commend the guns and projectiles to the favorable considerations of the government."

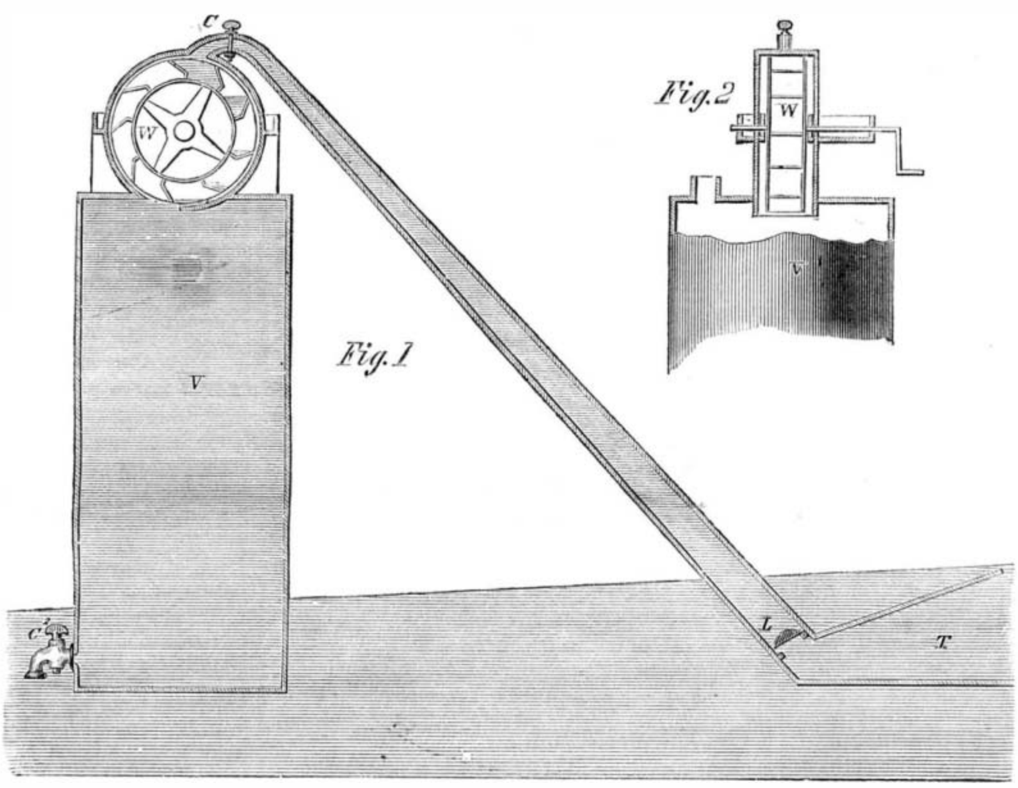
IMPROVED HYDRAULIC MOTOR.

The use of hydraulic power has been a broad field for inventors, and the ideas on the subject do not seem yet to be exhausted. The accompanying engravings represent a plan for using the momentum of water in swiftly-running streams, for which Letters Patent were granted to Morrill A. Shepard, of Orio, Illinois, July 19, 1859.

T represents a tapering tube placed in the water, with its largest part up stream. As the water rushes into this tube, it is carried by its momentum, on to the wheel, W, to which it imparts motion by filling the buckets on one side of the wheel. The vacuum cylinder, V, is to be made air-tight, and the ends of the axle of the wheel should be enclosed in water jackets, so as to encompass the wheel in an air-tight case. The wheel is to be started and stopped by opening and closing the cocks, C and C2. The valve, L, prevents the water from reflowing out of the tube back into the stream, when the wheel is stopped.

The object of this invention is to use the power of rapid streams in a way that will save the expense of damming.

The inventor, Morrill A, Shepard, will be happy to furnish any information in regard to his novel improvement. His address is Parkersburgh, Richland county, Illinois.



SHEPARD'S HYDRAULIC MOTOR.

THE HEAT-CONDUCTING POWER OF METALS.

As there are many erroneous ideas afloat regarding the qualities of different metals for conducting heat, Messrs. F. Grace Calvert and R. Johnson—distinguished English chemists—have lately reported to the Royal Society the results of a series of experiments performed by them to exterminate all the perplexities connected with this subject. These experiments were conducted by placing bars of a certain size of the pure metals, also alloys, in a box so constructed as to prevent radiation, and then applying the heat to them through hot water in such a manner as to secure very accurate results. From these the conductibility of the pure metals have been arranged as follows:—Silver (standard), 1,000; pure gold, 981; rolled copper, 845; cast, 811; mercury, 677; aluminum, 665; rolled zinc, 641; cast, 608; cadmium, 577; malleable iron, 436; tin, 422; steel, 397; platinum, 380; sodium, 365; cast-iron, 359; lead, 287; cast antimony, 215; bismuth, 61. These results are entirely different from those which are usually appended to works on the conducting power of metals. Gold is set down in common tables at 1,000 and silver at 973; here the case is nearly reversed. Platinum is usually set down at 981 (the same as the gold above), while, by the experiments of Calvert and Johnson, it is placed as low as 380—far beneath that of malleable iron. The latter metal is placed in common tables at 347, while above it is ranged at 436. These are very important differences, and should not be overlooked by mechanics and chemists in choosing metals for their conducting powers in any of their operations.

It was also found in these experiments that the molecular condition of the metals greatly affected their conducting powers. Thus, rolled copper, compared with silver at 1,000, was 845, while that of cast was but 811; and while cast-iron was but 359, malleable iron was 436. It is probable that, as the particles of rolled metal are in closer contact, they may thus conduct the heat more rapidly, according to Joule's theory of heat traveling by the vibrations of matter. It was also found that there was a difference in the conducting powers of bars cast vertically and horizontally. Zinc cast vertically was as 628 to 608 of a bar cast horizontally. There is a very great difference in the crystallization of bars cast in different positions, a fact which deserves the attention of all machinists who use cast metal for any purpose. Those bars cast vertically had their crystals more closely arranged, and better disposed for strength and conduction. The higher conducting power of wrought iron over steel and cast-iron shows how much superior it is for boilers and all articles for transmitting heat.

A very remarkable result, developed by these experiments, was the inferior conducting power of alloys—the pure metal always giving the best results. Thus, an alloy of gold, with one per cent of silver, is inferior to pure gold in the proportions of 840 to 981. In making brass, composed of copper and zinc, for boiler tubes, it has always been considered the conducting power of the alloy was in proportion to the copper it contained. This is not so, according to the experiments referred to. Instead of the superior metal (copper) elevating the conducting power of the inferior, the latter brings down the former nearly to its lower standard. Thus, in a brass alloy, containing 49.32 copper and 50.68 zinc, the calculated power is 718; but its actual power, obtained from experiment, was only 688. Again, by increasing the quantity of copper to 66.06, the zinc being 33.94, the calculated power of which brass is 748, it was found by experiment to be about 621. Common yellow brass is composed of 64 parts of copper, zinc, 56, and has a a conducting power of 558, which is higher than that of iron for the tubing of boilers; all other alloys, however, of copper and zinc in other proportions; also, the bronze alloys, containing copper, tin and zinc, possess no higher conducting powers than wrought and cast-iron.

A brass composed of equal parts of copper and zinc is of a beautiful gold color, and crystallizes in prisms. Experiments were made to discover, if possible, whether alloys are simple mixtures of metals or definite chemical compounds; but they were not able to determine this question. When suffered to cool slowly, several alloys have a tendency to form crystallizable compounds, differing in composition in various parts of the cast bars. The less fusible are found on the exterior, the most fusible in the interior of the mass. This will afford an explanation of phenomena sometimes witnessed in rolled iron bars and tubes, namely, that one part will be quite fibrous, while another, not over 18 inches from it, will be highly crystalline.

SEA-WATER AND MARINE AIR.

The density of sea-water is greater than that of ordinary soft water; it varies between the extreme limits of 1.02 in the case of the waters of the Dead Sea, and of 1.00057 in that of the waters of the Frozen Ocean; and M. Aime has ascertained the density of the water of the Mediterranean to be precisely the same at the depth 1750 yards, which it is at the surface. As to the temperature of the ocean, the surface is exposed to the action of local disturbing causes, but there is a zone, of course at a depth varying with the latitudes in which the temperature is constant; below this zone, the temperature decreases, and at the bottom of the ocean the temperature is notably less than it is upon the line of the average. Much has been written upon the subject of the source of the mineralization of sea-water, but, the whole of this question is involved in such mystery that no solution hitherto presented can be considered satisfactory. The presence of the chloride of sodium in such large proportions, and with such strange permanence over the face of the globe, must be considered to be one of the original conditions of matter; and all the attempts hitherto made to account for its presence upon secondary causes only substitute effects for cause. It has been ascertained that the mineralization of sea-water increases with the depth from the surface, but the distance from the equator has little influence upon its composition: in its normal state, sea-water appears to contain 35 parts of solid residue in every 1,000, of which the chloride of sodium constitutes 81 per cent. It is singular that, with the exception of Bouis, no chemist has yet been able to detect iodine in sea-water, although it is notorious that sea-weeds derive their supply of this metalloid entirely from this source. Is analytical chemistry, then, so incompetent to discover the real constitution of a body so universally diffused as sea-water?

It has been ascertained that sea air contains not only the chloride of sodium in a highly comminuted state, but also the hydro-sulphuric acid, the hydro-iodic, and the hydro-bromic acids, combined with ammonia and lime; and in addition to these substances, it also contains at times organic substances. The influence of these agents upon the human frame is great; but their mode of action has hitherto escaped analysis. It is hardly so with their influence upon building materials; for the decay of the latter in so many instances when exposed to the sea air has been traced in its chemical and mechanical bearings with considerable success.

Grape Jelly.—Put the grapes into a jar and place the jar in an oven, or on the top of a stove, to draw out the juice; then squeeze them through a cloth, and to every pint of juice add one pound of loaf sugar, and boil nearly an hour; after which, pour it into the pots, and let it stand till next day; then cover with paper and tie up tight.

Prevention of Pitting from Smallpox.—A new remedy against this result has been recently communicated to the Glasgow Medical Society, by Mr. Branton, clerk to the Infirmary, as having been used repeatedly with success. It consists of glycerine, nitrate of silver and collodion.