PERPETUAL MOTION.

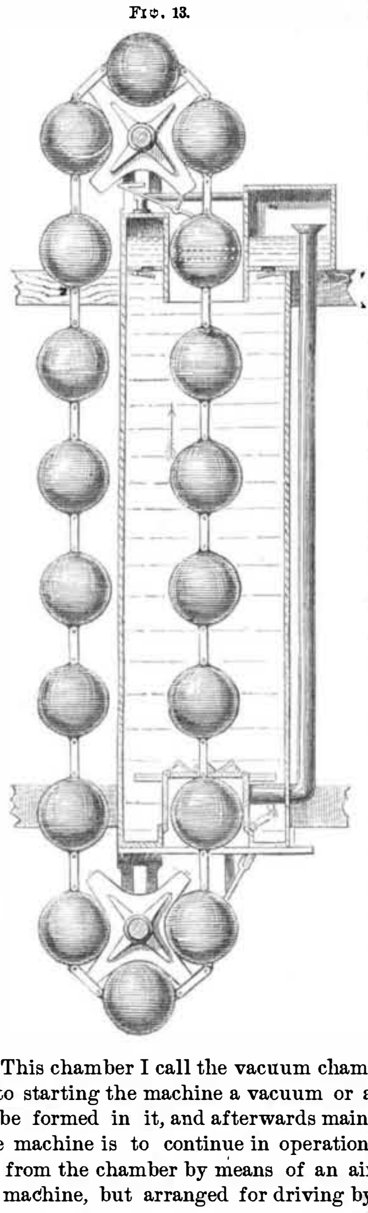
NUMBER VI.

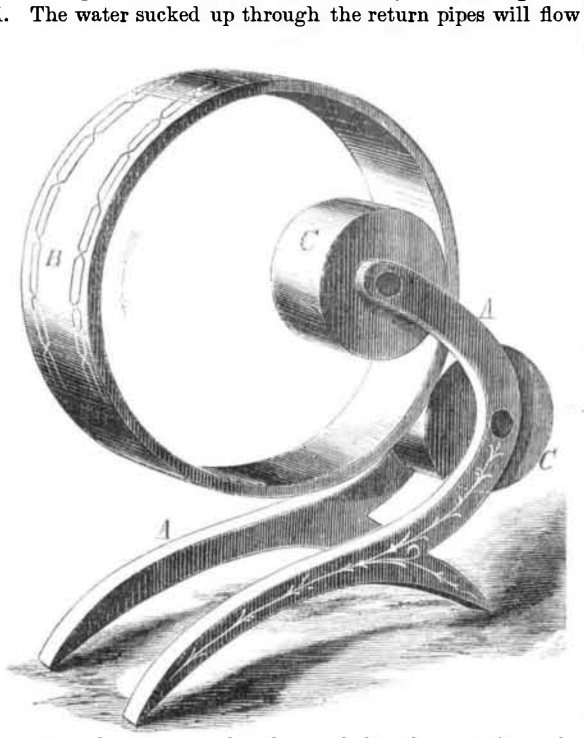
In 1865, Herman Leonhardt, of St. Gall, Switzerland, invented a new motive-power engine, which he thus describes:

"I avail myself of the property of bodies or objects of a certain specific gravity when immersed in a fluid of a greater specific gravity to rise or ascend to the surface of such fluid. This buoyancy represents a greater or lesser force or power according to the greater or lesser difference between the specific gravity of the object and that of the fluid, and the size of or the displacement caused in the fluid by such object. In order to make the said objects, which I will call floats (see Fig. 13), as light as possible, and yet strong enough to resist the pressure of the water, I construct them of thin sheet metal, and in preference, in the form of tubes or hollow cylinders with flat ends. A number or series of these cylinders placed horizontally parallel to each other, are hinged or linked together in a similar manner as the buckets of a chain pump; this chain of floats is passed over two sets of pulleys or disks fixed to two horizontal shafts, the one placed vertically above the other, the said pulleys being formed to suit the diameter of the floats. One half of this chain of floats passes through the center of the tank holding the water or other fluid, and the other half passes outside the tank through the air. The floats, when in motion, enter through the bottom of the tank, in the manner hereafter described, and rise up by their buoyancy through the water; they then pass round the top pulley, descend outside the tank, and passing over the bottom pulley, again enter the tank, and so on. If cylindrical floats are used, as described, they are fixed on the connecting links half a diameter or more apart from each other; therefore supposing the floats to be fifty centimeters in diameter they would be placed twenty-five centimeters apart.

"Now the principal part of my invention consists in relieving the floats, when entering through the bottom of the tank, of the pressure of the water column, which pressure, if not removed or neutralized, would render the rising of the floats in the water impossible, and prevent the machine from acting. The manner in which the floats are relieved from the pressure of the water column when entering the tank is as follows: On the bottom of the tank I form an entrance chamber for the said floats of a depth equal to the diameter of a float; the bottom of the chamber and its top are each provided with double slides which open and close as the floats enter and leave the chamber. Supposing the floats to be in motion, and one of them to have arrived in the center of the chamber, a lever actuated by the moving floats or by the revolving float pulley or disk, will cause the top or egress slides of the chamber to open in the same measure as the float rises; this slide, acting through another lever, will, at the same time, open a slide or valve in the side of the chamber and admit water into it, thereby bringing the water in the tank and in the chamber into equilibrium. When one half of the float has passed through the top or egress slide, the next float will have arrived at the bottom or ingress slide, which latter will now open in proportion to the rise of the float. The egress slide will close in the same measure and at the same time shut off the communication between the tank and the chamber, which was necessary for establishing the equilibrium. At this juncture other valves connecting the chamber with pipes leading to the top of the tank are opened, and the water in the chamber, which would be detrimental to the further rise of the entering float is withdrawn through these pipes, which I will call return pipes, by suction, and allowed to flow back into the tank above the water level; this suction is effected through the following arrangement:—That portion of the top of the tank where the floats leave the water is open, but the other portion of it is covered, and a partition dividing it from the open portion is made to dip into the water to some depth, thereby rendering it a hermetically closed chamber, and the above-mentioned return pipes open at a certain hight above the water-line into it. This chamber I call the vacuum chamber, because previous to starting the machine a vacuum or a partial vacuum must be formed in it, and afterwards maintained as long as the machine is to continue in operation. The air is exhausted from the chamber by means of an air pump driven by the machine, but arranged for driving by hand for the purpose of starting the machine. By forming this vacuum the original water level in the tank will be disturbed, the water level being raised in the vacuum chamber and lowered to a corresponding extent in the open part of the tank. Supposing the tank to be of a hight to hold six floats 1, 2, 3, 4, 5, and 6, 1 being the one above described, as entering the admission chamber, it is clear that as 6 leaves the water, the water level in the open part of the tank will be lowered in proportion to the displacement previously caused by 6, and the water level in the vacuum chamber being thereby likewise lowered, it will cause a suction or drawing up of water in the return pipes, equal in quantity to the amount of water displaced in the entrance chamber by the entering float, 1. The water sucked up through the return pipes will flow over into the vacuum chamber and distribute itself in the water of the tank. The ingress and egress slides of the entrance chamber are furnished with linings or packing of felt previously boiled in oil for insuring a water-tight fit against the floats without much friction, and the flat ends of the floats likewise pass between sheets of felt previously boiled in oil and pressed against the flat ends by fluted rollers. The air pump is maintained in operation in order to remove the trifling quantity of atmospheric air adhering to and introduced into the tank by the entering floats. The motion communicated by the rising floats to the float pulleys or disks and shafts, is further transmitted by means of belts or other gearing, in the manner usual with other motive-power engines.

FIG. 13.





"The details of arrangement and construction of my new motive-power engine may be altered or varied, but the main features of my invention consist in relieving the floats, when entering the tank, of the pressure of the water column by means of a vacuum chamber and parts connected therewith, as described, or their equivalents."

Only about a year since the *London Mining Journal* described a machine, patented in England, the essential features of which did not differ from those of Leonhardt; and what is more, expressed a favorable opinion of it.

We have received several letters with diagrams of "perpetual-motion machines" from correspondents, one of which we will herewith present, and defer others for future articles.

Fig. 14 is a diagram sent us by F. G. Woodward, whose address was not given in his letter.

The writer says: "It consists of a stand, A, two idler pulleys, C, between which a hollow cylindrical ring, suspended in the manner shown, is expected to revolve in the direction indicated by the arrows." The only difficulty about it is, that it will not work, though it looks plausible enough.

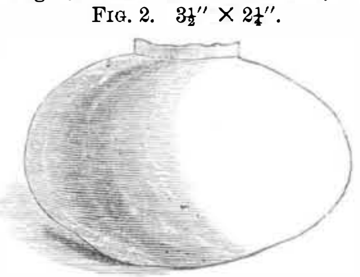
THE HAIL-STORM OF JUNE 20, 1870.

This remarkable storm swept along a path about thirty miles wide, and extending from Troy, N. Y., to Bangor, Me., though it was not everywhere accompanied by hail.

My point of observation was in Northampton, Mass., which was in the central line of the storm.

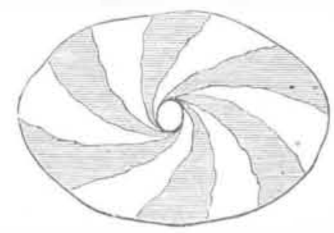
At sunrise the atmosphere was obscured by fog, which was partially dispersed at a later hour. The day was sultry. At noon the thermometer indicated 88° in the shade. At 3 P. M. a vast mass of dark-green cloud rolled up from the N. W., while lateral currents seemed to set in, forcing the clouds at first into confusion, but afterwards into a well-defined vortex, or spout. The electrical detonations were frequent and sharp. No rain preceded the hail, though it fell copiously after a few minutes. The first hail-stones were about one inch in diameter, and seemed to fall from a greater hight, and with more force, than those that fell subsequently. The latter were probably nearer the center of the vortex, and so had their downward motion restrained by that which was lateral. The first that fell were, most of them, on striking the ground, instantly buried out of sight. If they struck on a rocky surface they were dashed in pieces, or else rebounded to a considerable hight in the air. Had their larger successors been driven by a corresponding force, nothing could have survived their assault. The smaller hail-stones were generally flattened spheres, though sometimes in rude stellar forms, Fig. 1. But the largest ones were symmetrical ovoids; each being surmounted, however, by a roughened crown, Fig. 2. The dimensions and weight of three specimens are given, with such accuracy as could be secured by the means at hand. These are but samples of thousands that fell till the earth was covered with ice. The first was, in long diameter, $3\frac{3}{8}$ inches; short diameter, $2\frac{1}{8}$ inches; weight, 7 ounces. The second was $3\frac{1}{2}$ inches by $2\frac{1}{4}$; weight, 8 ounces. The third was 4 inches by $2\frac{3}{8}$; weight, 10 ounces. This monster, a foot

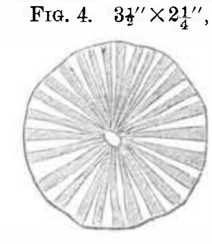
FIG. 1. FIG. 2. $3\frac{1}{4}'' \times 2\frac{1}{4}''$.



in circumference, did not entirely melt away for six hours after it fell! The ice in all the hail-stones was peculiarly hard and compact. Interesting structural peculiarities were noted. Hail-stones of stellar form were always transparent and homogeneous. The spheroids were covered with an opaque coating, and had likewise an opaque center. On being bisected some of them showed a radiated structure, the alternate rays being white and clear, Fig. 3. The largest hail-stones had an axis of white ice, half an inch in diameter,

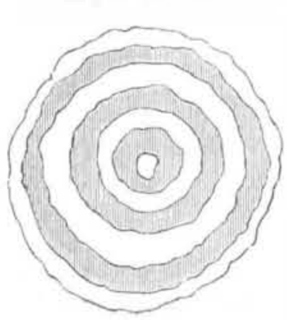
FIG. 3. 2″ diam. FIG. 4. $3\frac{1}{2}'' \times 2\frac{1}{4}''$,





around which the alternate layers were arranged in spiral convolutions, Fig. 4. The most common form was in concentric layers, like the coats of an onion, still alternating opaque and transparent; but the edges were finely serrated, like the stripes in some species of agate, Fig. 5. In one hail-stone I counted thirteen of these layers, indicating that it had passed through as many strata of snowy and vaporous cloud.

FIG. 5. 3″ diam.

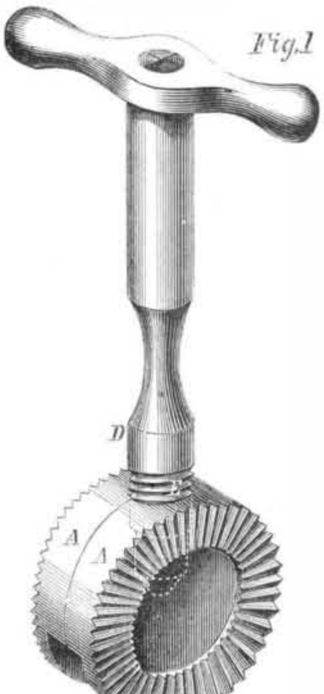


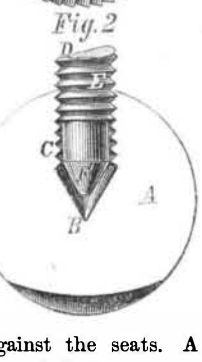
After a lull in the storm, for half an hour, there was a second fall of hail, but much lighter than the first.

The damage done by such a war of the elements cannot easily be ascertained. Vegetation suffered greatly. In some cases men and animals were wounded. The icy missiles not only broke thousands of panes of glass, but also in many instances the window-blinds and sash. In a few cases weather-worn house roofs were pierced.—*Rev. Horace C. Hovey, M. A., in the American Journal of Science.*

IMPLEMENT FOR GRINDING VALVES.

This device was invented to supply an easy method of regrinding the Peet valve. The valve is an extremely efficient one, and has achieved, we are glad to say, great popularity. It is now extensively used both in this country and in Europe. The great durability of the valve renders regrinding seldom necessary, but when this operation is required the instrument under consideration supplies a very simple and ready means for accomplishing the desired object.





It consists of a pair of steel disks, A, made parallel like the valve disks, provided with serrated cutters upon their outer surfaces. Their interior surfaces are provided with wedge-shaped cavities, B, and the thread, C. The stem, D, is made with a screw, E, corresponding to the thread, C, in the disks. The conical wedge, F, is fitted to the cavities, B.

By removing the bonnet from the valve body, and placing the stem in its position in the disks, the grinder may be slipped into the valve body. A slight turn of the stem drives the wedge forward and forces the cutters firmly against the seats. A rocking motion of the stem will then polish down the valve seats to a perfect joint.

The valve disks are readily ground by placing a piece of fine emery cloth on a piece of planed iron and rubbing the disk face on it until it is perfect. The "Peet" valve is not