J. A. Letellier,

Centrifugal Pump,

No. 5,653. Patented June 27, 1848.

Fig. 2.

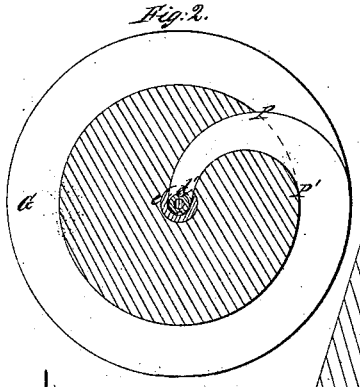

Fig. 1.

Fig. 3.

UNITED STATES PATENT OFFICE.

J. A. LETELLIER, OF PARIS, FRANCE.

SCREW FOR RAISING WATER.

Specification of Letters Patent No. 5,653, dated June 27, 1848.

To all whom it may concern:

Be it known that I, J. A. LETELLIER, a citizen of the French Republic, residing in Paris, France, have invented a certain new and useful Machine for Raising Water, and that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known and of the usual manner of making, modifying, and using the same, reference being had to the accompanying drawing, to which reference is had in the accompanying description.

The nature of my invention consists in a modified form and application of the well known Archimedean screw, by which a portion of air is introduced with the column of water, so as to render it elastic and cause it to ascend to a much greater height than by the ordinary method employed for that purpose and in the construction of the screw so proportioning the parts as to cause the best effect in elevating water, and thus reduce the power used to turn the machine to its minimum.

Figure 1, represents a vertical section of the whole apparatus cut through the axis. A, is the shaft near the extremities of which are affixed two disks or cylinder heads B, B′, either of galvanized iron castings, or in other suitable metal. The pivot, or lower end of the shaft rests in a cup *c* on a cross bar L, of the frame. At the other end, the shaft, above the disk B′, is tubular at *e*, and to this is coupled the tube *e′*, made of copper or galvanized iron, and forms a prolongation of the tube in the shaft; the end of this upper tube is connected with a stuffing box *c′*, in which the end of the shaft turns lightly, so as not to allow the escape of water at the joint; this stuffing box is fixed in a cross bar *b* of the frame, and from it extends up the tube, the upper end of which is bent into a siphon form. On the tube *e′*, a bevel wheel D, is fixed, that gears into a vertical bevel wheel D′, which is mounted on an axle E, in the frame, and is turned by a hand crank F, or other motive power.

The disks B, B′, are rabbeted at their outer circumference, and to them is fitted a cylinder of sheet metal *f f*, which is soldered thereto. For a very long screw, several additional disks may be placed inside, to support the cylinder, on the outside of which the threads G, G, of the screw are soldered. The size of the cylinder is not limited, either in diameter or length.

The machine is not inclined, according to the number of its helices, but is on an inclination of from 75° to 80° or more; at that inclination the motive force necessary to turn it will be decreased, because the more the screw is raised toward a perpendicular the less the water tends to rise in it.

G, G, are the threads of the helix that are soldered to the cylinder. To form the first turn at the bottom, I cut a piece of zinc at a proper angle for the gain of the thread, as shown in Fig. 3, and long enough to extend once around the cylinder at the base, by means of which I trace on the cylinder the place of the first turn of the helix; the other turns are traced by similar bands, or the sheet metal of which the cylinder is made is spread out, and marked before it is formed, which can be done with greater facility. After the second turn of the helix, from the base, the grain of the thread gradually diminishes about $\frac{1}{12}$ of an inch at each turn, until they are reduced to about $8\frac{1}{2}$ inches, and then they continue regular 15 or 18 times around, after which, the last turns of the screw are reduced $\frac{1}{25}$ of an inch at each turn, down to about 7 inches gain, or one half that of the first turn of the screw, and having arrived at the top of the cylinder, the canal passes over the plate B′, and curves inward to the center, as seen in Fig. 2, where it joins the tube *e*, to which it is firmly connected. The exterior edges of the helices are joined by bands around the exterior, and thus forms that portion of the tubular helical canal that constitutes this screw.

The pieces H, H, J, J, K, L, and *b*, form together the frame work on which the machine is supported.

The line O O marks about the constant height of the level of the water, which it is necessary to establish at the foot of the screw, and which should cover about half of the first turn of the screw; but if the screw is submerged so as not to take in the necessary quantity of air during its revolution, the water will not rise in the tube, but the alternate reception successively of air and water being established, then the water which is taken in being on an inclined plane of 18° or more to the horizon keeps on the lower side of the screw, or that side which the screw is inclined to, and in falling back

as the end of the screw rises from the water, permits the air immediately to follow and fill that portion of the lower turn of the tube, which rises above the water; when the end of the tube again dips below the surface of the water, the air is inclosed between two portions of water, and follows the first layer; after being carried round several turns, and being followed at each successive turn by other layers of air, divided from each other by layers of water, the air is compressed more and more as the water becomes elevated, and produces the desired elasticity in the column, so that the first portion of water, before arriving at the twelfth turn, is forced to spread from the lower side of the screw, run around its whole circumference, and to rise in several of the upper turns of the screw, where it encounters less resistance, until it reaches the part of the tube where it passes the 15 or 18 regular turns, and there gains a (*point d' appui*) fulcrum tolerably firm, from which the elastic column of air and water continues to mount in the tube to a great height.

To know what are the useful limits of the elastic force of the air, I have carried the reduction of the tubular canal by successive gradations to the most effective point, which is found to be one half the size of the first turn; I continue the reduction of the screw during 8 or 10 turns, with a core sufficiently long, and then narrow it anew to about one half; thus on the large turns of the helices I collect the current of water and increase its volume and decrease its friction, reducing it in the shape of a cone by 2 or 4 millimeters to each turn, and when the reduction is made, I continue the reduced turns of the screw during 8 or 10 turns more before it arrives at the tube. Again if we reduce the machine for experiment, and observe that the effect is not diminished, we shall carry the reduction a third time to one half, then a fourth time if it is possible, prolonging always the reduced part of the screw for 8 or 10 turns or more.

These contractions may appear extraordinary, but in observing for an instant that, when the water is pressed upon by the confined air, is spread around the whole circumference of the screw, we perceive that it can extend or spread itself in many turns of the screw, and it will be thrown out above by the air compressed to several atmospheres.

To be certain that the contraction is not carried too far, or the useful effect of the screw impaired, it is sufficient to know that the product of each turn is equal, or very nearly so, to the water that enters the first turn of the screw. With this basis for a guide, we proceed to make the contraction of the canal to the most proper point; when we determine what the contraction shall be, we reduce the diameter of the tube to the proper dimensions in the proportion required.

This screw can be made to a great length and diameter.

Having thus fully described my improvements, what I claim therein as new, and for which I desire to secure Letters Patent, is—

1. The construction and arrangement of the Archimedean screw substantially in the manner set forth, viz, by gradually contracting the same, substantially in the manner set forth, and so placing it as to receive a portion of air at each revolution, for the purpose of rendering the column elastic, as described, and in conjunction therewith.

2. I also claim the axial tube e, e', through which the water is made to ascend from the screw to the desired height for the purpose intended.

J. A. LETELLIER.

Witnesses:

JOHN BARTLY,

T. SALLES.