W. J. LANE.

HYDRAULIC MOTORS FOR DRIVING LIGHT MACHINERY.

No. 186,683. Patented Jan. 30, 1877.

Fig. 1.

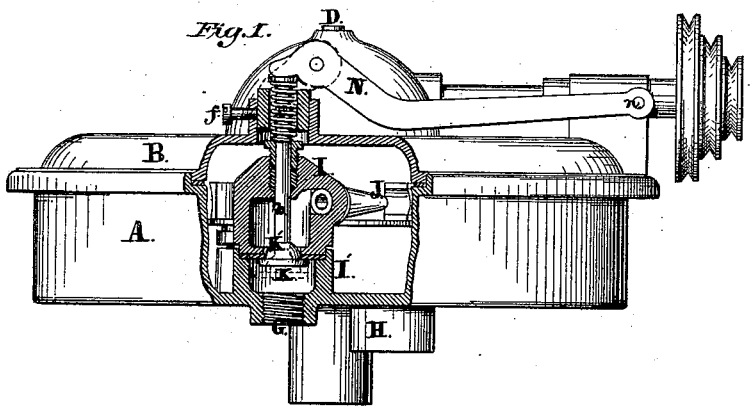


Fig. 2.

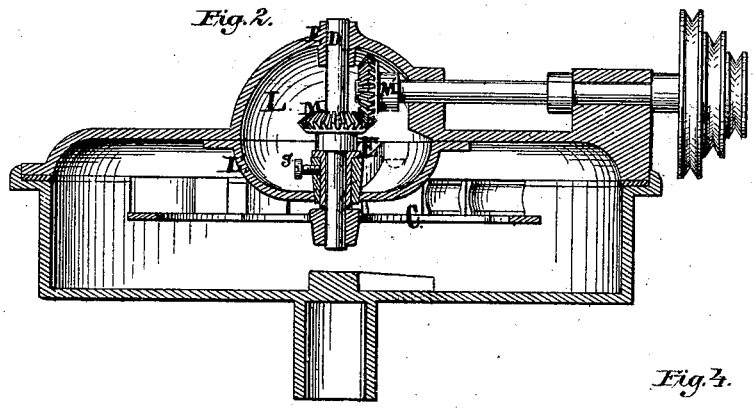
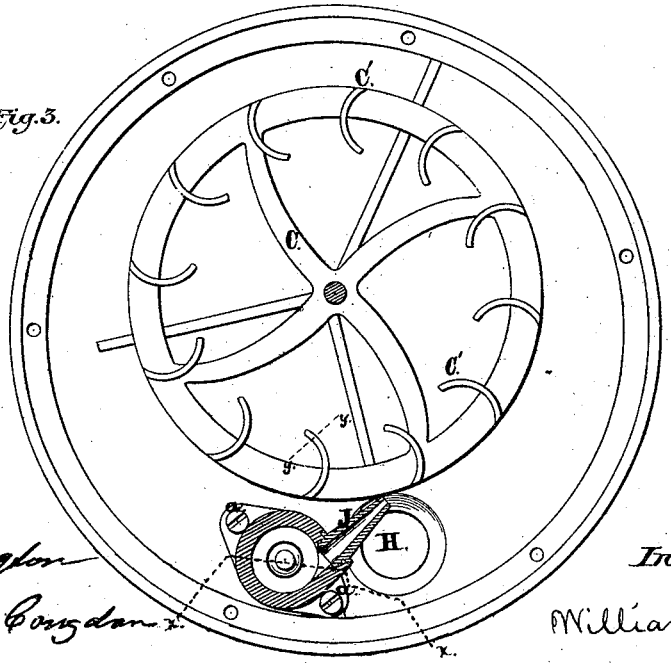


Fig. 4.

Fig. 3.



Attest:

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UNITED STATES PATENT OFFICE.

WILLIAM J. LANE, OF MILLBROOK, NEW YORK, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO JOHN G. LANE, OF SAME PLACE.

IMPROVEMENT IN HYDRAULIC MOTORS FOR DRIVING LIGHT MACHINERY.

Specification forming part of Letters Patent No. **186,683**, dated January 30, 1877; application filed October 25, 1876.

To all whom it may concern:

Be it known that I, WILLIAM J. LANE, of Millbrook, county of Dutchess, and State of New York, have invented certain new and useful Improvements in Hydraulic Motors for Driving Sewing-Machines, Dental Engines, Jewelers' Lathes, and other Light Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, making part of this specification, in which—

Figure 1 is a view showing the motor partly in its vertical section and partly in its side elevation as used in a horizontal position. This section is taken in the line *x x*, Fig. 3, and shows the cock and some parts connected therewith. Fig. 2 is a view showing the motor in its vertical section. This section is taken in a straight line through the centers of the vertical and horizontal shafts. Fig. 3 is a top view of the motor with the top plate and its attachments removed, except the wheel, and also a horizontal sectional view of the cock, the line being taken through the center of the nozzle. Fig. 4 is a vertical section, showing the form of bucket. This section is taken in the line *y y*, Fig. 3.

The nature of my invention consists, first, in the combination of a reaction water-wheel, having buckets of a peculiar form, and a nozzle and an inclosing-case, the latter being so constructed as not to interfere with the free entrance, passage through, and discharge of water from said buckets.

It consists, second, in having the valve of the self-closing cock constructed with a hemispherical or other suitable projection at its center, in combination with a nozzle, for the purpose of regulating with greater perfection the force of the water issuing from the nozzle, and thus controlling and regulating the speed of the sewing or other machine being driven.

It consists, third, in a water-wheel case constructed with an air-space, separating the chamber in which the wheel revolves from the external bearing or bearings of its rotating shaft or shafts, for the purpose of keeping such external bearings from contact with the water, and thus preventing the water from issuing through such bearings to the exterior of the motor.

It consists, fourth, in the combination of a water-wheel case and a water-wheel, with its shaft and counter-shaft supported in bearings on said case, having the gears constructed entirely within the case, for the purpose of preventing noise while running.

It consists, fifth, in a lever and its connections for opening the cocks, so arranged that it may rotate about the valve-spindle as a center, and may thus be placed and secured in convenient position for use by connecting with a treadle or other device.

It consists, sixth, in a wheel suspended within a case, so that it may rotate free from influence of proximity of the latter, and constructed with one or both the bearings of its shaft within the air space or chamber between the compartment in which the wheel revolves and the exterior of the case, for the purpose of preventing injury to the bearings by sand and other foreign matters from the water.

It consists, seventh, in an adjustable sleeve, forming a bearing for the wheel-shaft within the case, whereby the gears may be placed and maintained in proper working position, and wear compensated for.

In the accompanying drawings, A B represent a circular case, formed of two parts, inclosing a reaction water-wheel, C, having a vertical shaft, D, which is supported by bearings E F. G is an inlet water-passage communicating with the interior of the cock I. H is a water-passage for the discharge of water from the case A B after having done its work.

J is a nozzle, which is screwed into the cock I, and through which the water is directed against the interior of the curved bucket C′. These buckets are constructed in the form of an arc of a circle, in both vertical and horizontal cross-section, on the side against which the water is directed, as shown in Figs. 3 and 4, and are so situated on the wheel C, with reference to the nozzle J, that the water issuing from the latter, upon striking against the interior curved surface of the buckets C′, is deflected from its course, and the current of water, without being broken, traverses the

smooth interior surface of the bucket, and issues from its opposite end in a direction nearly opposite and parallel to that from which it entered.

The bucket is constructed of such a portion of the arc of a circle that the water, in issuing from it, is directed as closely as possible toward the end of the next succeeding bucket without coming in contact with it; and as the direction of the nozzle J is nearly that of a tangent to the periphery of the wheel C, it follows that the direction of the water is nearly reversed in acting upon the buckets; and as the proper speed of the periphery of the wheel for depositing the largest percentage of power is one-half that of the jet of water from the nozzle, it is obvious that the water, when leaving the buckets, is receding from them at a speed nearly equal to that at which it entered; but as the buckets are moving at one-half the original velocity of the water, the latter, on leaving them, is nearly free from lateral movement as regards the case, and falls to the bottom, and passes off through the opening H.

I am aware that the principle of reversing the direction of water while acting upon a turbine water-wheel is well known; but such wheels are run in contact with or close proximity to a controlling-case, which method, while giving excellent results with large quantities of water and comparatively low heads, is almost worthless when applied to the exceedingly high heads and small amounts of water desired to be used in applying this invention. For this reason, that in using a small jet of water issuing under a pressure of from sixty to one hundred pounds per square inch, as is often the case, it is necessary to have the periphery of the wheel move very rapidly; and if the wheel under these circumstances be placed in contact with water at rest, or if it be placed so near any stationary surface that the wheel and such surface may have water connecting them, the friction at once becomes out of all proper proportion to the power developed. I therefore suspend a wheel within a case, so as to revolve freely therein, and at a sufficient distance from its interior surface, so that the action of the water and wheel is not influenced by its proximity.

I use buckets of the form described to preserve an unbroken current of water, and a nozzle throwing a round jet, so as to produce the least possible friction in the passage of water through it.

The lower portion I′ of the self-closing cock I is formed as a part of the same casting with the case A, to which the upper portion I is secured by two screws, *a a*. Between the two parts of the cock is secured a rubber or leather packing-ring, which also serves as a seat for the valve K. The valve K is secured to a spindle, *b*, which passes through packing secured by a nut or gland, in the usual manner. About the upper portion of the spindle *b* is secured a spiral brass spring, *c*, the office of which is to aid in closing the valve. About the center of the valve K is constructed a hemispherical projection, K′, of such diameter as to nearly or quite fill the opening through the valve-seat. It will be seen that when the valve K is slightly removed from its seat the hemisphere K′ still nearly fills the opening through the valve-seat, and will allow a small amount of water only to pass through, and that a free passage can be obtained by depressing the valve further, as shown in dotted outline in Fig. 1, the purpose served by the hemisphere being to regulate with greater precision the flow of water through the nozzle J, and thus to regulate the speed of the wheel C.

It has been found in practice that if the inner end of the exterior bearing of the motor-shaft is allowed to become wet, the changes of atmospheric pressure within the case A B, consequent upon the sudden opening and closing of the cock, together with capillary attraction, will cause the water to issue through to the outside of the case; in order to prevent which the compartment or air-space L is separated from the balance of the interior of the case A B by the partition L′, whereby the inner ends of the exterior bearings are kept dry, and water is prevented from getting outside the case A B.

The gears M M′ are also constructed within this compartment, whereby several advantages are gained, viz: freedom from noise while running, freedom from foreign matter of any kind in the gears, either that which may be deposited by water or that from outside the case, and freedom from the danger of using such gears when exposed.

The cock I is opened and allowed to close by means of a lever, N, the vertical movement of which is effected ordinarily by a rod connecting the screw *n* in the end of the lever with a treadle at the floor. The lever *n* is pivoted to a sleeve, N′, which surrounds the spindle of the valve I, and is secured rigidly by the set-screw *f*. By this arrangement of parts the lever N may be placed on either side of the spindle *b* and secured, and thus be in a convenient position for connection with the treadle.

The water-wheel C is suspended by bearings E F, which are out of and protected from the water, whereby the bearings are kept free from sand and other injurious substances. The lower bearing E of the water-wheel shaft D is a composition sleeve, upon the top of which the gear M rests and supports the weight of the wheel C. This sleeve may be adjusted vertically to compensate for wear, or to cause the gears to mesh properly, and is secured in position by a set-screw, *g*.

I sometimes attach the buckets C′ to the wheel C beyond its periphery, in a vertical instead of horizontal position, as shown in the drawings, and place the nozzle above them, directed slightly downward, in which case the action is the same in every respect, the difference being that the water is bent out of its

course vertically (if the wheel be used with its axis vertical) instead of horizontally, as shown in the drawings. I prefer to use the bucket attached to the wheel C, as shown in the drawings, when the wheel is to be used with its axis vertical; and when the wheel is to be used with its axis horizontal, I prefer to attach the buckets in the position last described.

What I claim is—

1. A water-wheel, *e*, provided with concave buckets, arranged thereon in the manner shown, and in the described relation to a nozzle, for the introduction of the water to the buckets, the said wheel being also suspended within a case, with free space between the wheel and the walls of the said case, whereby the water falls away from the wheel, as and for the purpose set forth.

2. In combination with the passage leading to the nozzle, the valve formed with a hemispherical projection made to fit within the orifice opening to the said nozzle, as and for the purpose set forth.

3. The combination of a water-wheel suspended in a closed chamber, and acted upon by water from a nozzle, with a partition separating the said chamber from the outer bearing of the shaft of the said wheel, as set forth.

4. The combination of the spindle of the valve, the lever by which said valve is operated, and the lever-connections, whereby the lever may be rotated around the spindle, as set forth.

5. The adjustable sleeve E, in combination with the shaft of the water-wheel and the case, as set forth.

WILLIAM J. LANE.

Witnesses:

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LYDIA W. CONGDON.