(Model.)

R. H. ATWELL.

SPRAY MOTOR.

No. 247,147. Patented Sept. 13, 1881.

Fig. 1.

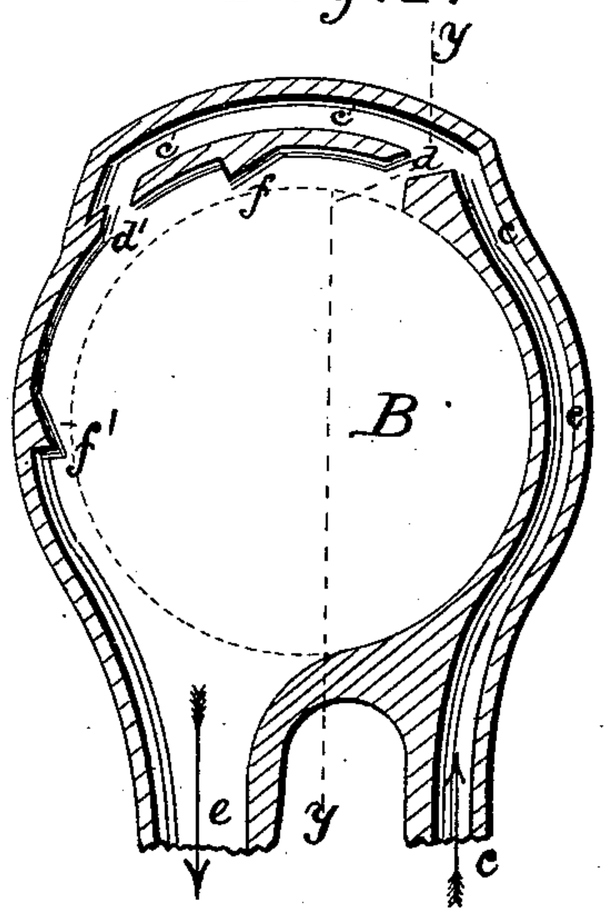


Fig. 2.

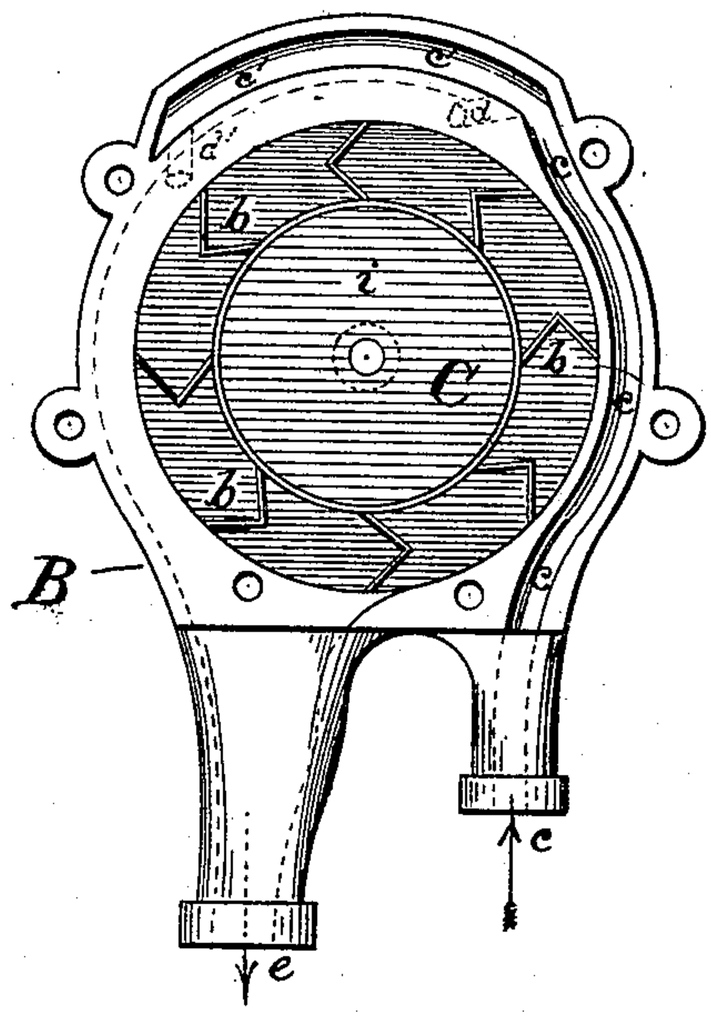


Fig. 3.

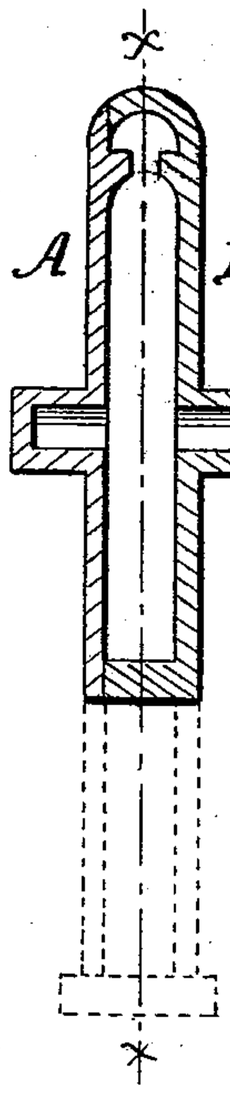


Fig. 5.

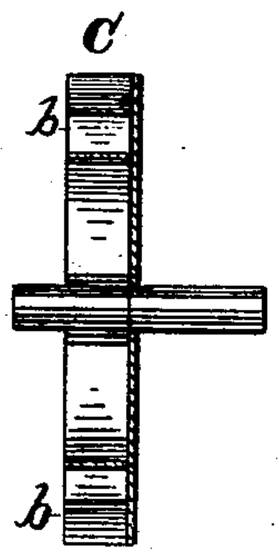
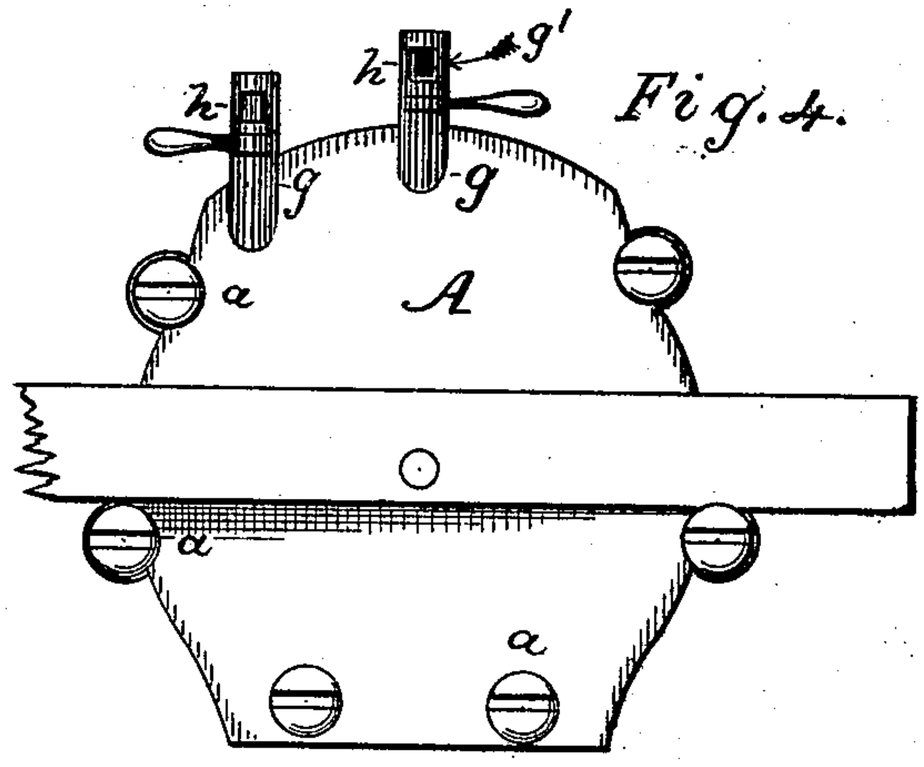


Fig. 4.



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SPRAY-MOTOR.

SPECIFICATION forming part of Letters Patent No. 247,147, dated September 13, 1881.

Application filed May 18, 1881. (Model.)

To all whom it may concern:

Be it known that I, RICHARD HENRY ATWELL, of Baltimore city and State of Maryland, have invented a new and Improved Spray-Motor; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of the wheel-case through line *x x* of Fig. 3. Fig. 2 is a side view of the device with the face-plate removed. Fig. 3 is a vertical cross-section of the case through the line *y y* of Fig. 1. Fig. 4 is an outside view of the case. Fig. 5 is a sectional view of the wheel.

In all rotary pneumatic or rotary hydraulic motors in which a wheel or rotary piston is continuously acted upon by the impingement of a continuously-flowing jet of a gaseous or liquid medium I have discovered that the combined use of a liquid and gaseous medium—such as water and air or their equivalent—in the form of a spray gives a surprising increase of power and speed over and above the use of but one of these fluids used singly, and that this is true even when but one of the fluids is energized by pressure or compression and the other is simply drawn in by the inductive effect of the energized fluid. Thus in rotary water-motors which act from the pressure of water impinging upon a wheel an air-inlet at the point where the jet strikes the wheel causes the effective power and speed to be increased at least one hundred per cent., upon a principle which I will hereinafter explain. The same principle also holds good when the gaseous medium—such as steam, compressed air, carbonic-acid gas, &c.—is the energized medium and the water is simply drawn in by it.

My invention therefore consists in the general method of increasing the effective power of rotary motors by mixing to form a spray the two media—the gas and the liquid—and then directing said spray against the periphery of the motor-wheel, no matter whether the gas be energized and the liquid inert or the gas inert and the liquid energized; and the merit consists in the exchange of compliments, so to speak, of a part of the momentum of the liquid for the elasticity, compressibility, and velocity of the gas, whereby a very greatly increased result is obtained.

My invention also consists in the peculiar structure of a water-motor designed to take advantage of and carry out this method, as will be now more fully described.

In the drawings I show simply a water-motor in which the pressure or head of the water is the initial power. A B are the two parts of the case which inclose a water-wheel, C, and which parts of the case are held together by screws *a*. The part A is simply a face-plate, with a bearing for the shaft of the wheel, as shown in Fig. 3, while B forms the principal inclosure for the wheel, and is constructed to meet the ends of my invention.

Instead of a wheel with arms, this machine uses a rotating disk with blades or buckets *b* in V form cast or placed on one side of the periphery, with the angle pointing forward in direction of the movement, the interior of the angle receiving the water and air. This angle is across the bucket, the latter having only the necessary clearance of metal for this disk to revolve. This disk-plate has its plane side as close to case as it can run. The central wheel-shaft thus needs no stuffing-box, and no arms of a wheel are present to resist motion as against spray or dead water. The induction of water is up through a conduit, *c c'*, cast or formed in the extreme rim of the part B of the case, and extending as far as the last jet, *d'*, or farthest point where the water impinges on the wheel. The first jet, *d*, discharges across the top of the disk into the V form of bucket above named. The second jet, *d'*, is onward so far as not to interfere with the first, (about ninety degrees.) Extending from the first jet onward is a channel in the case arching directly over the periphery of the wheel. This channel reaches from the first jet onward to the discharge *e*, as shown in Fig. 1. In the crown of this channel, between the first and the last jets, is a deflector, *f*, which is a short incline toward the center, to throw the spray which has already passed beyond the influence of the direct jet again upon the buckets, the mixture of the water with the rapidly-passing air adding greatly to the power, and at the same time instantly disposing of what would otherwise be a serious clog as dead water. Another deflector, *f'*, is located between the last jet and the discharge for the same purpose. Over each jet of water, where it opens upon the wheel, a shaft (or hole) is opened through the

case, admitting external air. This hole is surrounded by a hood, *g*, and a movable cover, *h*, is on this hood, which acts to cut off the air when desired, and operates to some extent as a governor. On the disk of the wheel, and touching the inner periphery of the series of buckets, is formed a ring-flange, *i*, extending across, just clearing the face-plate, and to a sufficient extent confining the current of spray introduced through the shafts and jets to the traveling path of the buckets without water-friction.

In regard to the induction of the air or gas to the wheel, I would state that this should take place preferably both above and below the entering water jet or should surround the same, as this gives a better result than where the air simply enters at one side of the jet.

The operation of the machine is thus: The water and air, as spray, passes around the interior of the case in the passage made for it, and delivers one or more jets, as preferred, directly into the center of the bucket. As the movement begins the air is drawn in with such force as to become compressed after having reached the channel above named, rendering its condition highly elastic after the bucket immediately behind it has lost the direct influence of the jets. In the meantime this rapid current of spray has taken up all stray water, carried it into the channel and upon the next forward buckets, not only preventing the friction and clog of the same, but it has given to the said spray the characteristic elastic velocity of compressed air or steam and the momentum belonging to the greater density of water. This, as theory, is surprisingly confirmed by test and practice. This spray, which has actually attained to a speed by its elasticity superior to the water which first moved it, joined to the momentum it has given to a considerable portion of the waste water, continues the forward pressure on the buckets after they have left the direct influence of the jets and makes a notable and gratifying increase of power, amounting to over one hundred per cent. in the number of revolutions per minute. Another effect of this arrangement is to render the air always in the case quiet as regards resistance to the rotating buckets, which otherwise would have it to carry continuously as a load. The result of all this is that by indirect mechanical means we get a transference of velocity from a light to a dense body, saving, with no corresponding loss, velocity, pressure, time, and power.

In carrying out my improved method of increasing the motive power of fluids, I do not restrict myself to any particular gas or any particular liquid. The liquid, moreover, may be energized by pressure and the gas or air inert, as in the case described; or the gas may be energized by compression (as in the case of steam, compressed air, or carbonic-acid gas) and the liquid inert; or both the gas and liquid may be energized.

I am aware of the fact that an air-inlet has been provided for a water-motor which was designed to relieve the vacuum produced at the center of the wheel by centrifugal action, and thereby avoid the tendency of the air to rush in at the water-discharge pipe, which air in its effort to satisfy said vacuum would obstruct the action of the wheel, and I do not claim, broadly, the introduction of an air-current to a water-wheel to relieve the vacuum. My invention, although incidentally involving this principle of action, operates on a much more comprehensive and effective principle—namely, that of a spray impinging against the periphery of a wheel. That the medium which acts upon the wheel is a spray will be evident when it is remembered that a stream of water under high pressure will carry in with it air by induction, and this air is compressed as it passes in to an extent equal to the pressure represented by the water at that point. Now, as soon as this water and compressed air enters the wheel-chamber it instantly bursts into spray, because as the column passes from the limited area of the inlet-duct to the case it has more room to expand, and the compressed air does expand almost explosively, and bursts the column of water into spray the very instant it leaves the limited area of the duct, and just at the time that it impinges against the wheel, and this expansion of air and comminution of water proceeds and increases throughout the entire range of effective action in the wheel, producing, in effect, an increased power upon the wheel by the exchange of properties of the gas and liquid. This is a principle which is not limited to ventilating water-motors, as has been heretofore done, at the center; but, as said before, the gas may be energized and the water comminuted by it, and the two then carried against the wheel in the form of a spray; and for this reason I have called my invention a "spray-motor."

Having thus described my invention, what I claim as new is—

1. In operating rotary jet-motors, the method of increasing the effective power thereof, which consists in commingling a gaseous and liquid medium to form a spray, and directing this spray against the periphery of the wheel of said motor, substantially as and for the purpose described.

2. A rotary jet-motor having an inlet for a liquid medium and an inlet for a gaseous medium, which inlets have a confluence at or before the point of impact against the wheel, as and for the purpose described.

3. A rotary jet-motor consisting of a case and a wheel formed of a disk with angular buckets *b*, projecting from the side of the same, with the angle pointing in the direction of the movement, as shown and described.

4. The case having an inlet-conduit, *c*, one or more air-inlets, *g*, and one or more deflectors, *f*, combined with a wheel, as described.

RICHARD HENRY ATWELL.

Witnesses:
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HARRY W. EVANS.