F. W. TUERK, Jr.
Water-Motor.

No. 197,954. Patented Dec. 11, 1877

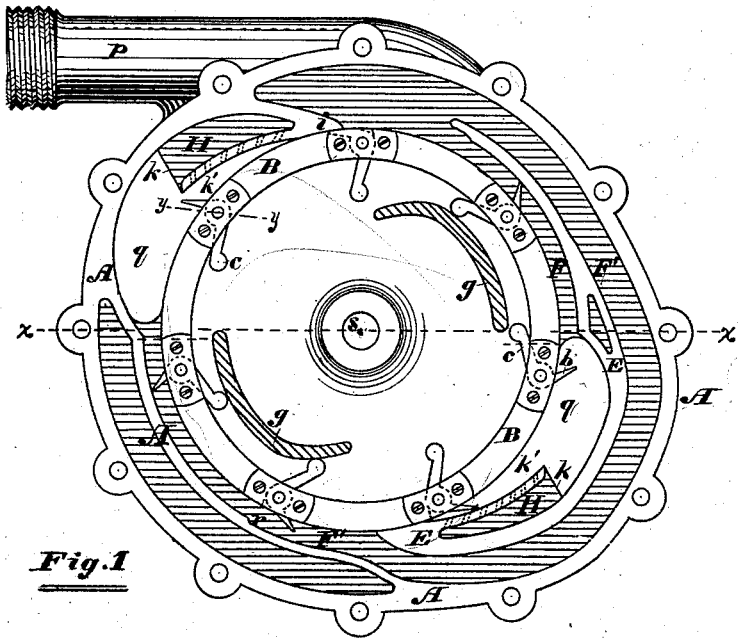

Fig. 1

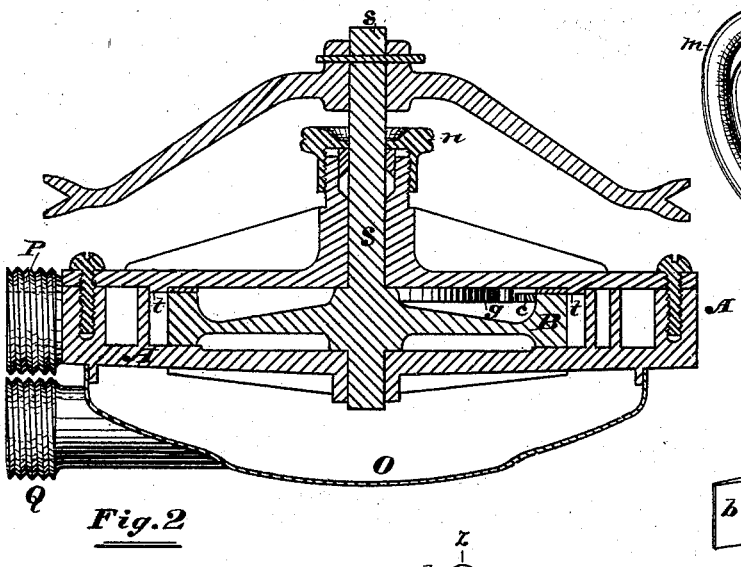

Fig. 2

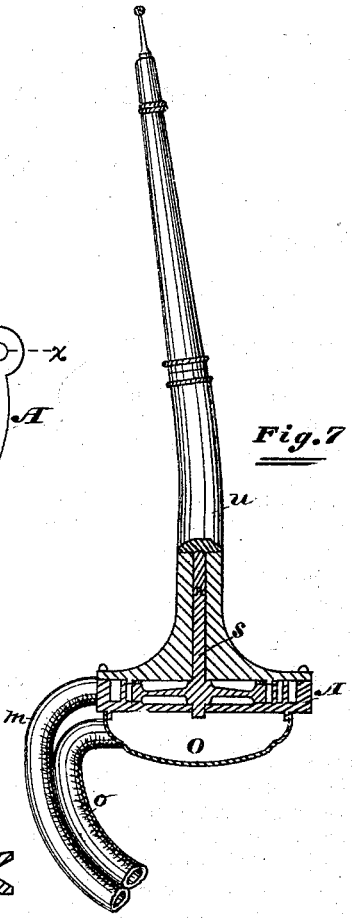

Fig. 7

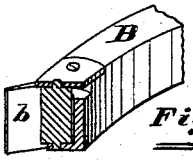

Fig. 6

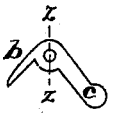

Fig. 3

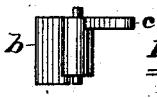

Fig. 4

Fig. 5

Attest
W. T. Baker
M. C. Baker

INVENTOR
Frederick W. Tuerk, Jr.,
By P. C. Dyrenforth
Attorney

UNITED STATES PATENT OFFICE.

FREDERICK W. TUERK, JR., OF CHICAGO, ILLINOIS.

IMPROVEMENT IN WATER-MOTORS.

Specification forming part of Letters Patent No. **197,954**, dated December 11, 1877; application filed April 17, 1877.

To all whom it may concern:

Be it known that I, FREDERICK W. TUERK, Jr., of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Water-Motors; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, of which—

Figure 1 is a view, in elevation, with the lid of the case removed, showing, in section, the flanges which are cast upon the inside of the lid; Fig. 2, a section, taken on the line *x x* of Fig. 1; Figs. 3, 4, 5 and 6, detail views; and Fig. 7, a view, partly in section, showing the manner in which I apply my motor in certain cases.

The object of my invention is to produce a water-motor capable of operating upon any desired scale, whereby it may be used to run machinery of all descriptions, from the lightest to the heaviest, according only to the size of the motor employed, which shall operate perfectly under the lowest, as well as the highest, ordinary hydrant pressure, and thus be exempt from the objections commonly made to motors of this description, in which there shall be no back pressure, with the consequent waste of power, but, on the contrary, in which almost the entire force of the water shall be brought to bear upon the machinery to be driven; and I seek to embody all this in the smallest practicable amount of mechanism, and this of the simplest and most durable character, in order that my motor shall be easy and cheap of construction, and not liable to get out of repair.

My invention consists, first, in the arrangement within the case of the partition which divides and directs the water; secondly, in the passages which conduct the water to the opposite sides of the wheel; thirdly, in having the buckets pivoted into recesses in the rim of the wheel, and provided with arms projecting inward from their outer edges, by means of which they are opened; fourthly, in having flanges project inward from the lid, with which the arms come in contact as the wheel revolves, and are thus pressed outward, opening the buckets; fifthly, in the curved projections, arranged gradually to close the buckets at the proper time as the wheel revolves; sixthly, in having the buckets closed by the escaping water, if preferred, instead of by the projections themselves, the said water entering chambers, suitably placed, and perforated or slotted on their sides toward the buckets; seventhly, in the combination of parts by which the pressure of the water is brought to bear upon the wheel and then allowed to escape; eighthly, in the combination of parts by which the pressure of the water upon the wheel is transmitted to the machinery to be driven; and, ninthly, in the general combination of parts by which nearly the entire power of the water is transmitted to the machinery to be driven, all as hereinafter more fully set forth.

Referring to the drawings, A is the case, in the bottom or back of which and opposite each other are openings *q q* for the escape of the water after it has performed its office. B is the wheel, which revolves on a shaft, *s*, the latter passing through the center of the case, a screw-collar, *n*, properly packed, serving to prevent leakage. In recesses suitably formed in the rim of this wheel are fitted pivoted buckets *b*, each having an arm, *c*, cast upon it at one side, nearly at right angles, and of such length that, when the buckets are closed against the wheel, they will project beyond the inside of the rim. The side of the rim (see Fig. 6) is recessed to permit this arm to work freely back and forth, these recesses being covered by cap-plates, which serve to hold the buckets in place. At the pivoted ends of the buckets *b* are formed cylindrical ribs, to receive which the recesses in the rim of the wheel are correspondingly deepened. The buckets, when open, are supported against the pressure of the water by resting against the front and rear sides of the recesses in which the cylindrical ribs rest, the rim of the wheel thus supporting the entire strain. Short pivots in the ends of these ribs enter holes in the cap-plates on the one side, and the rim of the wheel on the other, the cylindrical ribs falling short of the width of the buckets on this latter side to the extent of the length of the pivot, in order to give a bearing. (See Fig. 4.) Thus, on this side, the edge of the bucket is flush

with that of the rim, while on the former side it falls short to the extent of the thickness of the cap-plates; and just to this extent the wheel sinks into a low ring-flange, *t*, on the lid, the height thereof being just equal to the thickness of the cap-plates, and the breadth just equal to that of the passage F at its narrower part. The lid is fastened in place by means of screws entering cylindrical ribs about the edge of the case.

The partition E extends, as shown in the drawings, nearly or quite half-way around the interior of the case, beginning near the chute P, diverging about the outside of the first opening *q*, and at its terminus approaching close upon the rim of the wheel; and it must here be recessed, of course, for the reception of the ring-flange *t*.

k is a flange at right angles with the partition E, at its inner edge and near its terminus extending out partly over the opening *q;* and *k'* is a perforated flange-plate at right angles with the flange *k*, and of equal length with it, extending backward in a curve from near the end of the partition E, for the purpose of closing the buckets. These, with the lid and partition, form a small curved and wedge-shaped chamber, H.

At about the point where the partition E terminates the passage F' narrows down to a breadth equal to that of the passage F at its beginning; and at the point *r* it narrows still further, becoming equal in width to the narrower part of the said passage F. The reason for this construction will hereinafter appear.

Up to a point a little beyond the terminus of the partition E the passage F' is but a continuation, so to speak, of the chute P; but from this point its office is precisely the same as that of the passage F, as is also its construction, the rim or side of the case A taking the place of the partition E, and diverging in like manner about the opening *p*, to which the passage F' leads.

A flanged projection, *i*, approaches close to the rim of the wheel, just beyond this opening *q*, in the same manner and for the same purpose as does the terminus of the partition E, and must be similarly recessed to receive the ring-flange *t;* and here a second curved and wedge-shaped chamber, H, is formed, in the same manner as the first. The ring-flange *t* fitting, as it does, close to the wheel all around, serves effectually to prevent leakage.

The outline of the case may follow that of the passage F', or, if preferred, as more ornamental, it may be made more nearly circular, and recessed to diminish the weight, as shown in the drawing. The partition E also may be recessed, as shown, where it incidentally broadens.

Cast upon the inner surface of the lid are the curved flanges *g g*, in such position and of such depth and length that they will engage the arms *c* and raise the buckets *b* just as the latter enter the passage F or arrive at the corresponding part of the passage F', and hold them until they leave the same.

In order that the action may not be spasmodic, but may be gradual, the curves approach the rim for a short distance, after which they run parallel with it.

The operation is as follows: The water passes into the case under pressure through the chute P, being controlled by a stop-cock or any suitable valve with means attached for governing the same, and enters the passages. The construction is such that at least one bucket must at all times be within the passage F, and another within the corresponding part of the passage F', and each, moveover, open, owing to the flanges *g g*. Against these the water presses, (reaching first, of course, that in the passage F,) and thus starts the wheel. By the time the first pair of buckets have reached the openings *q q* through which the water escapes, others have entered the passages to take their places, and have been similarly opened by the flanges *g g*, and so on indefinitely, rendering the rotation of the wheel steady and continuous, so long as the pressure exists.

The water being still under a considerable head at the time it reaches the outlets *q q*, especially if the wheel is in rapid motion, shoots forward in a tangent and fills the chambers H, whence it escapes through the perforations or slots in the walls *k'* with sufficient force to close the buckets without allowing them to come in contact with the metal. This naturally gives less friction, though otherwise the effect would be the same—that is, the buckets would be gradually closed—without the perforations; and in the event of their being dispensed with, the flange *k* also may be omitted.

O is a shell of thin metal, covering the back of the case, for the purpose of catching the waste water, which is thence carried off by a waste-pipe.

It will be seen that the passage F is somewhat broader at the beginning than farther on. This is in order that no bucket shall block up the passage before the preceding one has arrived at the opening *q*, the distance being gaged accordingly. The narrowing of the passage F' at the point *r* just opposite corresponds to this arrangement in every particular.

The action of my motor is so simple, the friction so slight, and the pressure of the water so direct and full, with so little waste, that it may be successfully used even in places where the hydraulic pressure is extremely low; and the same force as exists at the ground may be obtained at any height to which the water will flow, by simply making a tight connection between the discharge-opening and the sewer-pipe, or any other pipe leading to the ground, when the suction created by the fall will counteract the loss sustained through the rise, as in a siphon.

For different places, having different pressures, I equalize the effect by varying the size

of the driving-wheel in proportion. Thus, if in one city the hydraulic pressure is sixty pounds to the square inch, and in another only twenty pounds, a uniform effect will be produced with the same sized motor by having the circumference of the driver three times as great in the first case as in the second, and so on.

The motor may be run either in a vertical, a horizontal, or any other position, but I generally prefer the first, particularly with large wheels, as giving the least friction. It will act perfectly with a wheel of any diameter, from less than an inch upward to many feet, and is therefore applicable to a great variety of purposes.

For sewing-machines and all other machinery requiring about the same power as these, a motor of about four inches in diameter answers every requirement.

One of the many valuable applications of my invention is that to dental apparatus, as shown in Fig. 7. For this purpose the wheel should be as small as practicable, in order that the whole may be light enough to be conveniently held in the hand. A barrel, *u*, for the hand to grasp is secured to the lid, and incases the shaft *s*, into the end of which latter the burr or other instrument is fitted. *m* and *o* are flexible tubes for the inlet and outlet of water, and these may be bound together for convenience. Thus the action of the wheel which turns the instrument is direct instead of mediate, as it would be if the motor were fixed and the motion transmitted through a belt or equivalent device.

It is obvious that there are many similar purposes to which my invention may be applied in this way.

My motor, when constructed upon a proper scale and provided with the necessary attachments for measurement, serves also as a water-meter, and as such its operation, for reasons hereinbefore given, is much more satisfactory than that of any other to my knowledge hitherto devised.

What I claim as new, and desire to secure by Letters Patent, is—

1. The partition E, between the edge of the case and the wheel, diverging about the opening *p*, and at its terminus approaching close to the rim of the wheel, substantially as and for the purposes described.

2. The passages F and F′, constructed substantially as described, whereby the pressure of the water acts at the same time and in the same manner upon opposite sides of the wheel, as specified.

3. The passage F and that part of the passage F′ corresponding to the same, each made larger at its beginning than farther on, the length of the narrower or shallower part being equal to the distance between two consecutive buckets, whereby the pressure of the water acts continuously upon each bucket in its turn until the said bucket reaches the opening *q*, substantially as specified.

4. In combination with the buckets *b*, working in recesses in the rim of the wheel, and held in place by pivots, which, on one side, pass through the said rim, and on the other through cap-plates, the said buckets being less in breadth than the rim of the wheel to the extent of the thickness of the said cap-plates, the ring-flange *t*, constructed and arranged substantially as and for the purpose specified.

5. In combination with the buckets *b*, constructed and arranged substantially as described, the arms *c* projecting inward from the outer edges of the said buckets, and working in recesses formed in the side of the wheel-rim, for the purpose set forth.

6. The combination of the arms *c* and flanges *g*, for opening the buckets gradually as the wheel revolves, substantially as described.

7. The curved projections *k′*, arranged as described, to close the buckets *b* gradually at the proper time as the wheel revolves, as set forth.

8. The method herein described of reclosing the buckets, which consists in causing the water, after it has done its work in impelling a bucket forward, so to change its course as to strike against the back of the same bucket, substantially as specified.

9. The curved and wedge-shaped chambers H, perforated or slotted on their sides next the wheel, and placed, as described, relatively to the openings *p*, whereby the buckets are closed by the escaping water, as set forth.

10. The combination of the chute P, case A, partition E, flanged projection *i*, and openings *p*, constructed as described, for the purpose set forth.

11. The combination of the buckets *b*, arms *c*, flanges *g*, flanges *k′*, wheel B, and shaft *s*, substantially as described.

12. The combination of the chute P, passages F and F′, openings *p*, buckets *b*, arms *c*, flanges *g*, flanges *k′*, wheel B, and shaft *s*, substantially as described.

FREDERICK W. TUERK, JR.

In presence of—

CHARLES L. BLISS,
GEO. C. MERRILL.