No. 627,117. Patented June 20, 1899.

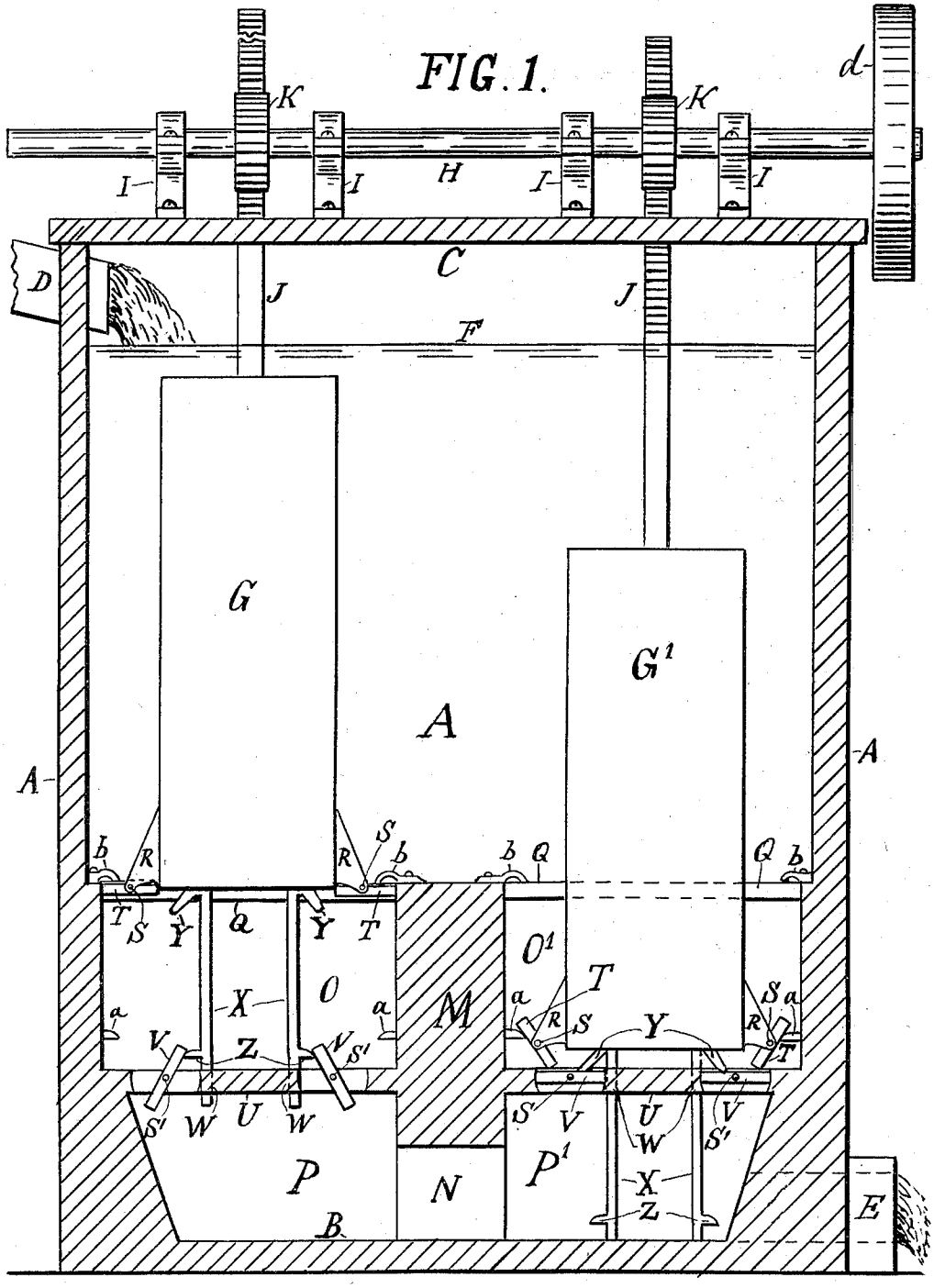
G. O. HEEN.

WATER MOTOR.

(Application filed Nov. 19, 1898.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.




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FIG. 2.

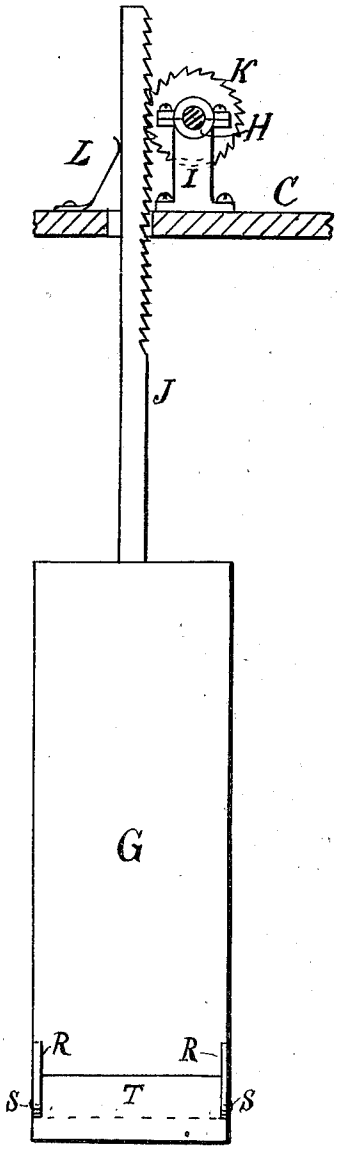



FIG. 3.

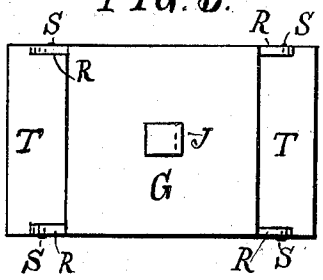
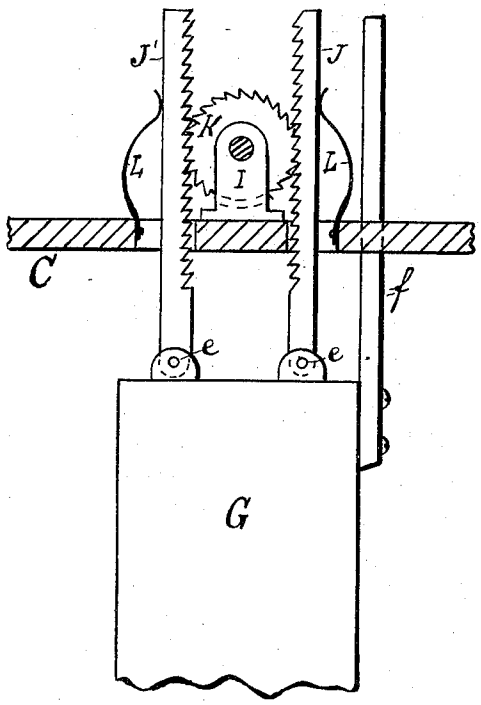



FIG. 4.




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# UNITED STATES PATENT OFFICE.

GUSTAV O. HEEN, OF MAYNARD, MINNESOTA.

## WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 627,117, dated June 20, 1899.

Application filed November 19, 1898. Serial No. 696,950. (No model.)

*To all whom it may concern:*

Be it known that I, GUSTAV O. HEEN, a citizen of the United States, residing at Maynard, in the county of Chippewa and State of Minnesota, have invented certain new and useful Improvements in Water-Motors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in motors operated by water falling or moving from a higher to a lower position or elevation; and the object of my invention is to provide a simple, cheap, but powerful water-motor adapted for use in any falling water, but especially where the fall of the water is so limited in height that water-wheels and turbines are undesirable. This and other minor objects I attain by the novel construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section through my water-motor. Fig. 2 is a left-hand detail side view of one of the plungers G in Fig. 1 and the wheel it operates on. Fig. 3 is a top view of one of the plungers. Fig. 4 is a side view of a modification of the working mechanism of the motor.

Referring to the drawings by letters of reference, A designates a large vessel, dam, or inclosure, which may be built of cemented masonry or of iron or any desired material.

B is the bottom proper.

C is the top platform or floor covering the vessel.

D is the inlet and E the outlet for the water passing through the vessel. The top of the water in the vessel is supposed to be kept up to the line F, from which it may, however, vary considerably.

G and G′ are two preferably square solid pieces of timber which I will call the "plungers." These plungers one at a time alternately float up and sink down in the water, as will presently be more fully described, and in so doing they revolve continuously the working shaft H, journaled in the bearings I, secured upon the cover C by means of the ratchet-toothed bars J extending from the plungers up through the cover C and engaging the ratchet-wheels K, secured on the shaft H.

L is a spring holding the rod J yieldingly against the wheel K, so that the teeth of the rod may play over the face of the wheel when the rod ascends and take hold when it descends. The rods J are suitably guided in the cover C.

The lower portion of the vessel A is divided by a vertical wall M into two compartments O P and O′ P′, which are united by the opening N in said wall near the real bottom B, so that the water from both compartments may flow out through the outlet E. Two opposite walls of each one of said compartments fit the two sides of the plunger not occupied by the valves T, and the other two walls fit the outer edges of the valves T, pivoted in the lips R of the plunger, when said valves stand horizontal. These valves T fit between the lips S and fill up water-tight the spaces between the plunger and the adjacent side walls of the chamber O. Each compartment O P is further provided about half-way down its walls with a false bottom U, dividing the compartment into an upper chamber O and a lower chamber P. In this false bottom I provide the tilting valves V and the guiding-notches W for the rods X to slide up and down in and guide the plunger. Said rods X are provided with the arms Y for closing the valves V when the plunger is down, as to the right in Fig. 1, and the arms Z for opening said valves when the plunger is up, as to the left in Fig. 1. Lugs *a*, secured in the walls of the vessel, open the valves T when the plunger is down, (see plunger G′,) and the arms *b* close said valves *t* when the plunger is up, as shown by plunger G to the left in Fig. 1.

In operation the plungers are guided by the rods J and X, so as to move plumb up and down. The weight of the water upon the valves T, when these assume a horizontal position, acts upon them as on pistons, driving the plunger downward into the empty chamber O. The weight of the plunger and the water covering the top of it also assists in forcing it downward till it reaches the position shown to the right in Fig. 1. The valves T are then tilted open by the arms *a*, so that the water flows in under the plunger, which

at once floats up to the position shown to the left in Fig. 1, which closes the valves T by the arms *b* and opens the valves V by the arms Z, so that the water in the chamber O may run down into the lower chamber P and out at E, while the plunger is again forced down into the space thus being vacated in the chamber O, and so on. The plungers, which may be one, two, or three in number, keep the shaft H constantly revolving.

*d* is a fly-wheel secured on the shaft H to make its rotation more even.

Spring-catches (not shown) are employed to hold by frictional contact each and all of the valves in their closed and open positions, and all the valves are mounted on pivots or journals S and S′, so as to be balanced and tilt with great ease when touched by the arms Z and Y, the latter of which may project either from the rods X or from the lower end of the plunger.

In the modification illustrated in Fig. 4 I employ on one plunger two ratchet-toothed bars J and J′, playing one upon each side of the ratchet-wheel K, and having their teeth turned in opposite directions they rotate the wheel continuously. This arrangement may enable the machine to run with only one plunger and the fly-wheel, or if several plungers are employed the use of two rack-bars to each wheel will insure a still more constant and even rotation of the shaft. When two rack-bars are thus used, one of them may be pivoted to the plunger, as at *e*, and the other is rigidly secured to it, so as to guide its upper end, or, as shown in the present instance in Fig. 4, the two rack-bars may be pivoted at *e* and an extra guiding-rod *f* secured to the plunger and guided in a hole in the platform C.

It is obvious that the valves T and V may be of any desired number connected to operate simultaneously, as may also the valves V be under the spirit of this invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a water-motor the combination of the dam or vessel A, having a water-inlet at its top and outlet at its bottom, and adapted to be kept almost full of water, a rotatory shaft journaled horizontally across the top of the vessel and having secured upon it ratchet-toothed wheels, spring-pressed, upright ratchet-bars engaging said ratchet-wheels, guided plungers secured to the lower ends of the ratchet-bars and carrying the tilting side valves or pistons T, said vessel having in its bottom for each plunger a chamber as deep as the stroke of the plunger, two opposite side walls of said chamber fitting the plunger; the other two side walls fitting the side valves T, when those stand horizontal; said chambers having the tilting valves V, in their bottoms for emptying them; arms on each plunger for opening and closing alternately the valves V, and arms secured to the walls of the chamber for closing and opening the valves T, substantially as set forth.

2. In a water-motor the combination of the dam or vessel A, having a water-inlet at its top and outlet at its bottom, and adapted to be kept almost full of water, a rotatory shaft journaled horizontally across the top of the vessel and having secured upon it ratchet-toothed wheels, and a fly-wheel, spring-pressed upright ratchet-bars engaging said ratchet-wheels, guided plungers secured to the lower ends of the ratchet-bars and carrying the tilting side valves or pistons T, said vessel having in its bottom for each plunger a chamber as deep as the stroke of the plunger and with parallel side walls fitting the plungers, and its side valves T, when those stand horizontal, said chambers having the tilting valves V, in their bottoms for emptying them, and means whereby each plunger opens and closes alternately the valves V, and means for opening and closing the valves T, substantially as and for the purpose set forth.

3. In a water-motor the combination of the dam or vessel A, having a water-inlet at its top and outlet at its bottom, and adapted to be kept almost full of water, a rotatory shaft journaled horizontally across the top of the vessel and having secured upon it ratchet-toothed wheels, spring-pressed upright ratchet-bars engaging said ratchet-wheels, guided plungers secured to the lower ends of the ratchet-bars and carrying the tilting side valves or pistons T, said vessel having in its bottom for each plunger a chamber as deep as the stroke of the plunger and with parallel side walls fitting the sides of the plunger not occupied by the valves, and two side walls fitting the side valves T, when those stand horizontal; said chambers having the tilting valves V, in their bottoms for emptying them, the guiding-rods X, extending downward from each plunger and having the arms Z, engaging the valves V, to open them and the arms Y, closing said valves, the rigid fingers *a*, and *b*, secured to the vessel and tilting the valves pivoted on the plunger, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GUSTAV O. HEEN.

Witnesses:
IVER I. LALIM,
J. H. LEE.