

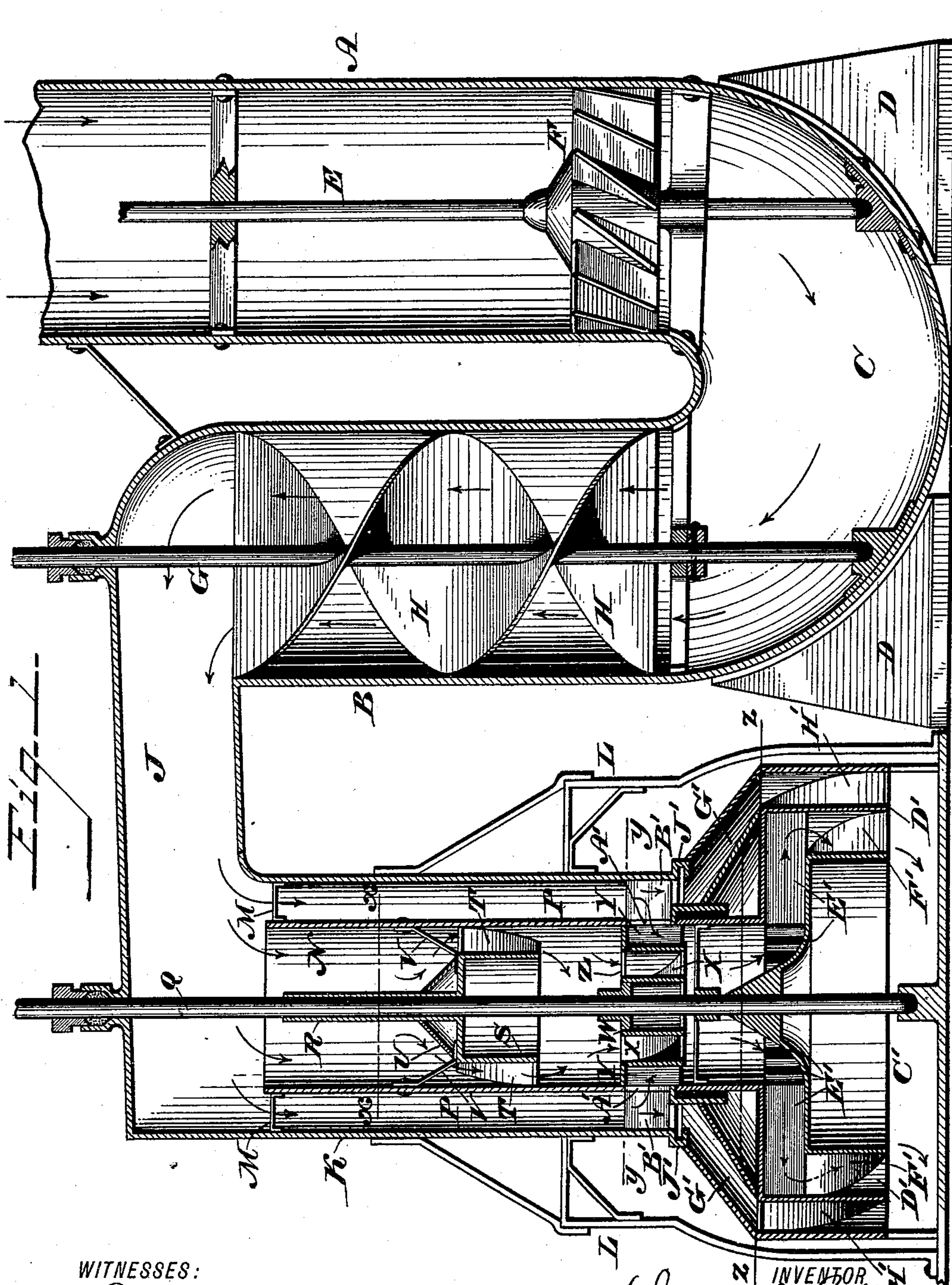
(No Model.)

2 Sheets—Sheet 1.

S. B. GOFF.
WATER MOTOR.

No. 470,190.

Patented Mar. 8. 1892.



WITNESSES:

L. Dowville,
P. H. Hagler

INVENTOR
Samuel B. Goff.
BY *John D. Underhill*
ATTORNEY.

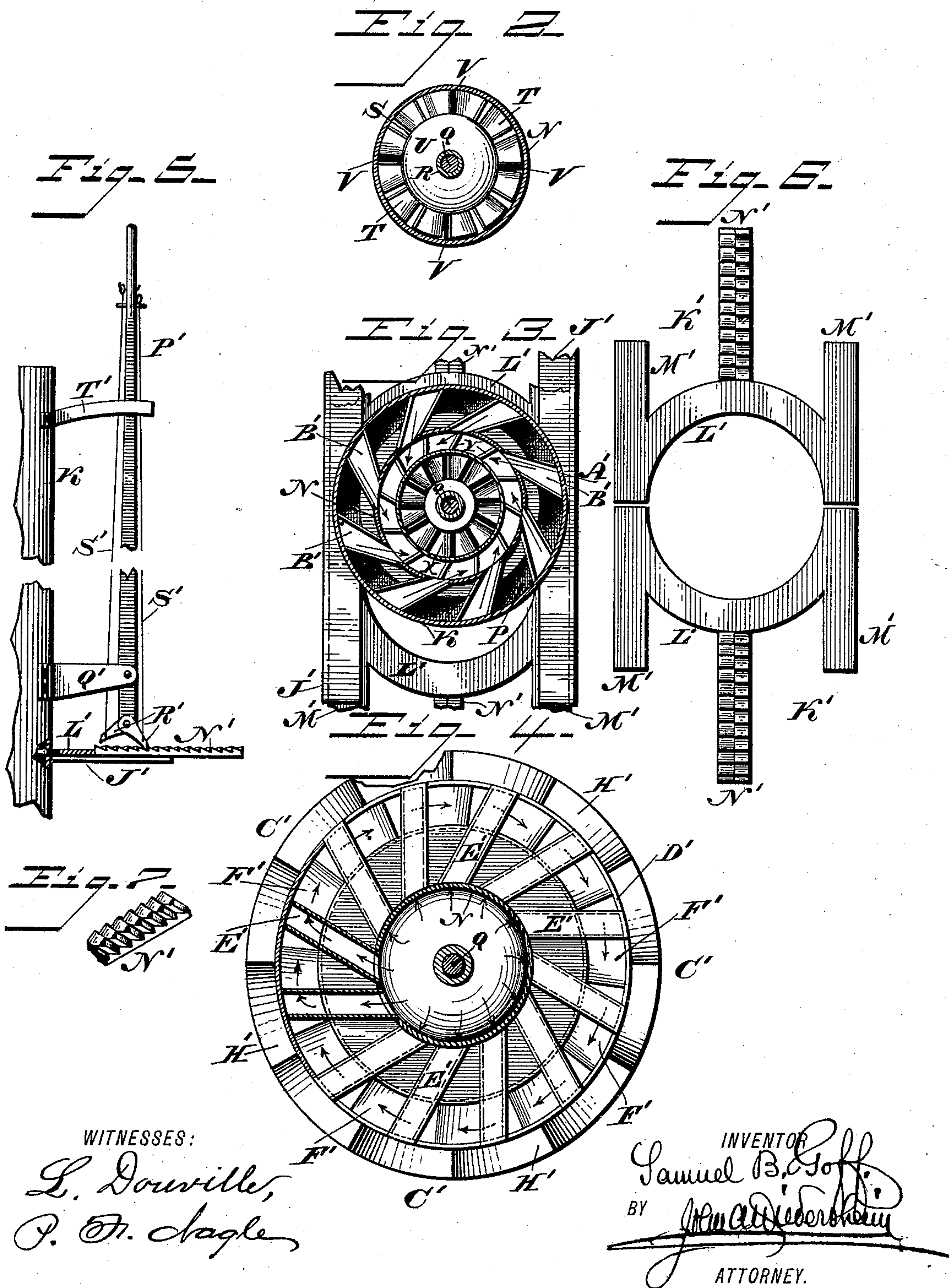
(No Model.)

2 Sheets—Sheet 2.

S. B. GOFF.
WATER MOTOR.

No. 470,190.

Patented Mar. 8, 1892.



UNITED STATES PATENT OFFICE.

SAMUEL B. GOFF, OF CAMDEN, NEW JERSEY.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 470,190, dated March 8, 1892.

Application filed February 26, 1891. Serial No. 382,934. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL B. GOFF, a citizen of the United States, residing in the city and county of Camden, State of New Jersey, have invented a new and useful Improvement in Water-Motors, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to improvements in water-motors; and it consists of the combination of parts hereinafter set forth.

Figure 1 represents a vertical longitudinal section of a motor embodying my invention. Fig. 2 represents a horizontal section on line *xx*, Fig. 1. Fig. 3 represents a horizontal section on line *yy*, Fig. 1. Fig. 4 represents a horizontal section on line *zz*, Fig. 1. Fig. 5 represents a side view of a detail portion of the device. Fig. 6 represents a plan view of novel gates with racks embodied in my invention. Fig. 7 represents a perspective view of a portion of a gate-rack, showing the double ratchet-teeth.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A and B designate, respectively, two vertical cylindrical tubes connected at their lower ends by a passage-way or pipe C, preferably of circular form. Said tubes and pipe are provided with suitable supports D for maintaining the same in proper position. Within the tube A is a vertical shaft E, suitably journaled and having thereon a water-wheel F, adapted to rotate the shaft by the falling of the water thereon which is admitted into the upper end of the said tube. Within the tube B is a vertical shaft G, suitably journaled and carrying the spiral blades H, whereby a current of water through said tube causes the rotation of the shaft. Leading from the upper end of the tube B, below the upper end of the tube A, is a tube J, slightly inclined, so as to give a fall to the water in its passage from the tube B. Connected with the tube J at its lower end is a vertical tube K, having suitable supports L for maintaining it in position. Within the tube K and connected therewith by arms or braces M is an open cylinder N, so located as to form an annular channel or passage P between it and the said tube. A shaft Q is located with said tube K and cylinder N, hav-

ing bearings in the upper wall of the tube J and in the base of the motor.

Surrounding the shaft Q, within the cylinder N, is a sleeve R, having an enlarged portion S, to which are secured the inclined blades or deflectors T, and on the sleeve is a hood U, which directs a portion of the falling water to said blades. The sleeve R is connected to the cylinder by the braces V, so as to be stationary. Mounted on the shaft Q below the said sleeve is a turbine wheel W, having the inner blades X and the outer blades Y, the water reaching the said inner blades by the openings Z in the top of the wheel and the outer blades by the openings A' in the sides thereof, the said openings Z communicating with the inside of the cylinder N and the openings A' communicating with the channel P by means of the connecting passage-ways B'.

Below the turbine wheel W and on the shaft Q is secured a wheel C', composed of an inner and an outer shell, each of which is fastened to the said shaft. The outer shell D' is open at its top and incloses the lower ends of the blades Y of the wheel W, so as to receive the water from both sets of the blades of the said wheel. Leading from the inside of the upper portion of said shell D' are horizontal passage-ways E', with openings through which the water passes to the blades F' of the wheel. Connected with the lower end of the tube K are channels G', leading from the annular passage or channel P to openings in the wheel above the outer set of blades H'. Movable in guide J', connected with the lower end of the tube K, are the gates K', formed of semicircular body portions L', adapted to cover the upper ends of the channels G', so as to shut off the water falling from the channel P, side pieces M', working in the guides J', and racks N', attached to said body portions. The said racks are provided with two rows of ratchet-teeth, inclined in opposite directions, so that each of the gates may be moved in either direction by means of a lever P', pivoted to an arm Q' of the tube K and provided at its lower end with the two pawls R', which are either engaged with or disengaged from the ratchet-teeth by means of a string or cord S', attached thereto. An arm T', secured to the tube K,

serves to keep the lever P' in place, preventing further movement than is proper of the same.

The operation of the motor is as follows:

5 The current of water passing in the upper end of the tube A will cause the wheel F to rotate, thus imparting rotary motion to the shaft E. As the water rises in the tube B, the spiral blades H will rotate, thus operating
10 the shaft G. When the water has risen to the top of the tube B, it will flow through the tube J to the tube K, and as the walls of the tube J are inclined the flow will be accelerated, thus giving increased power to the current which enters the upper end of the tube
15 K and cylinder N, the portion that passes through the said cylinder N being deflected by the blades T, so that it strikes at a greater angle the blades X of the turbine W than it
20 would if it would fall directly thereon, and the water which passes through the channel P being directed by the channels B' so as to strike the walls A' at nearly a right angle. A portion of the water from the channel P
25 passes through the channels G' to the outer blades H' of the wheel C', and the water escaping from the wheel W passes to the inner blades F' of the said wheel C', so that the latter is rotated. Owing to the rotation of
30 the two wheels on the same shaft, increased power is given to the same. If it is desired to shut off the water-supply from the outer blades H', the gates K' are closed by means of the levers P', the proper pawl R' being en-
35 gaged with its ratchet-teeth.

It is evident that either or all of the shafts can be connected with any suitable device by means of gearing, so as to operate the same, or that the shafts may be connected together
40 so that the power or momentum of all can be combined.

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

45 1. In a water-motor, the combination of a vertical tube, a rotary vertical shaft, a cylinder secured to said tube within the same and surrounding the shaft, a sleeve surrounding the shaft and secured to the cylinder, in-
50 clined blades on said sleeve, and a wheel on said shaft below said sleeve with blades receiving the water from said inclined blades on the sleeve, substantially as described.

2. In a water-motor, a vertical tube, a ro-
55 tary shaft therein, a cylinder secured to said tube within the same and forming an annular channel between the walls of the said tube and cylinder, a sleeve surrounding the shaft

and secured to the cylinder, inclined blades on said sleeve, a wheel on the shaft below
60 the sleeve provided with inner and outer blades, and channels leading from the annular passage to openings in the sides of the wheel, said parts being combined substantially as described.

3. In a water-motor, a vertical tube, a ro-
tary shaft therein, a stationary cylinder forming an annular passage or channel within the
said tube, stationary deflectors within said
cylinder, a wheel on said shaft below said de-
flectors having inner and outer blades, a sec-
70 ond wheel provided with inner and outer blades and mounted on said shaft below said
first wheel, and channels or passage-ways
leading direct from said annular channel to
75 the outer blades of the said second wheel, said parts being combined substantially as de-
scribed.

4. In a water-motor, a shaft having the
wheel W, with the blades Y thereon, and the
80 wheel C', consisting of an inner and an outer shell, the latter being open at the top and in-
closing the lower ends of the blades Y and
having in its upper portion horizontal pas-
sage-ways with openings, said parts being
85 combined substantially as described.

5. In a water-motor, a tube with an annular
passage therein adjacent to its wall, a wheel
in said tube with openings therein, communi-
cating passages leading from said annular
90 passage to said openings, and gates having
semicircular bodies provided with racks hav-
ing two rows of oppositely-inclined ratchet-
teeth and side pieces, and a pivoted lever
carrying two pawls, said parts being combined
95 substantially as described.

6. In a water-motor, the combination of a
tube, a rotary shaft, a cylinder within the
said tube forming an annular passage or chan-
nel, a wheel on said shaft below said cylinder,
100 and a second wheel on said shaft below said
first wheel, said wheels having inner and outer
blades, the inner blades of the upper wheel
being adapted to receive the impact of the
water falling within the cylinder, the outer
105 wheel to receive the water from the annular
channel, and the inner blades of the lower
wheel to receive the water escaping from both
blades of the upper wheel and its outer blades
to receive water direct from said annular
110 channel, substantially as described.

SAMUEL B. GOFF.

Witnesses:

JOHN A. WIEDERSHEIM,
A. P. JENNINGS.