(No Model.)

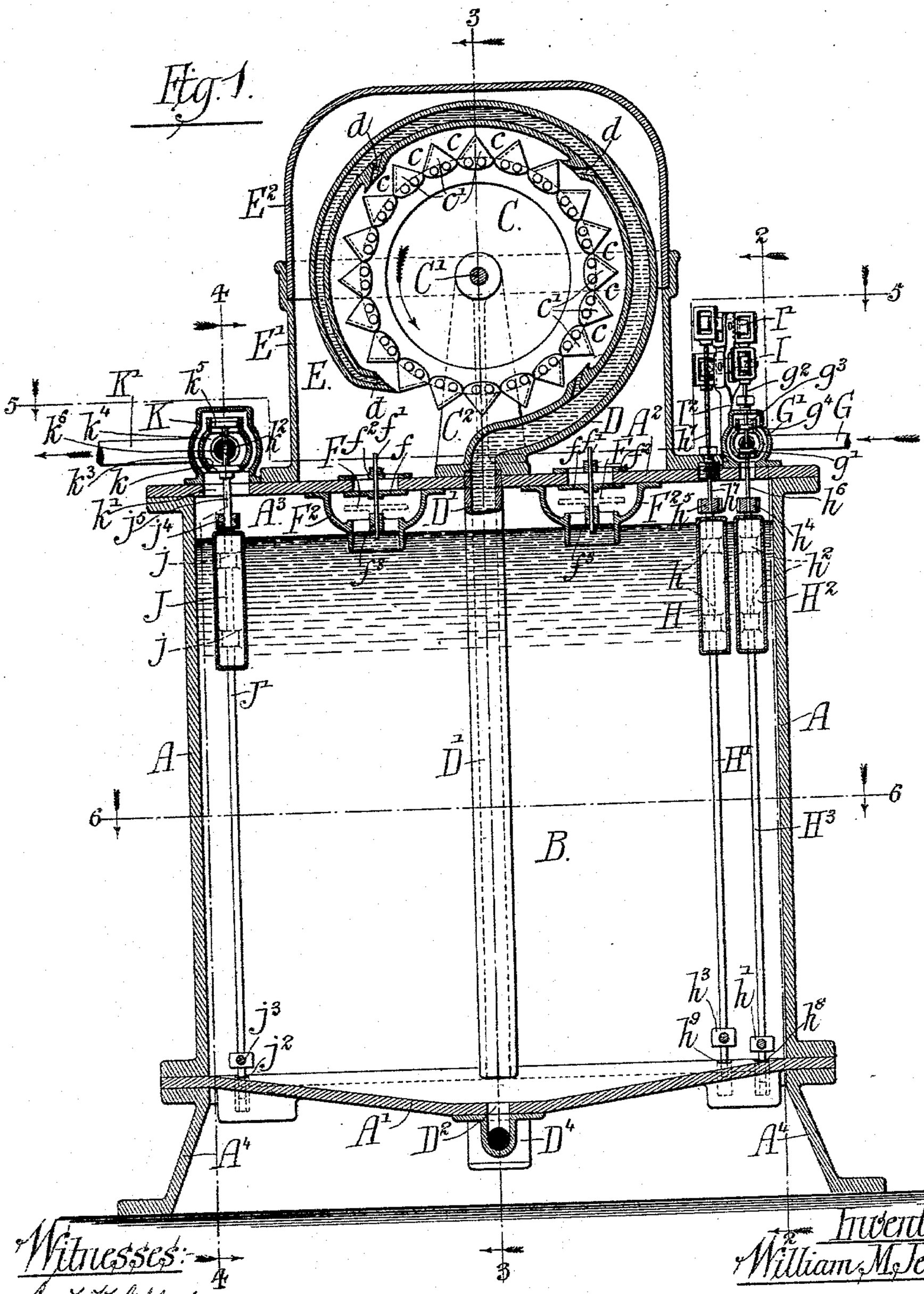
5 Sheets—Sheet 1.

W. M. JEWELL.

PRIME MOVER.

No. 494,782. Patented Apr. 4, 1893.

Fig. 1.



Witnesses:-
Louis M. T. Whitehead.
C. E. Tomlinson.

Inventor:-
William M. Jewell.

By:- Wayton, Poole & Brown
his Attorneys.

(No Model.)

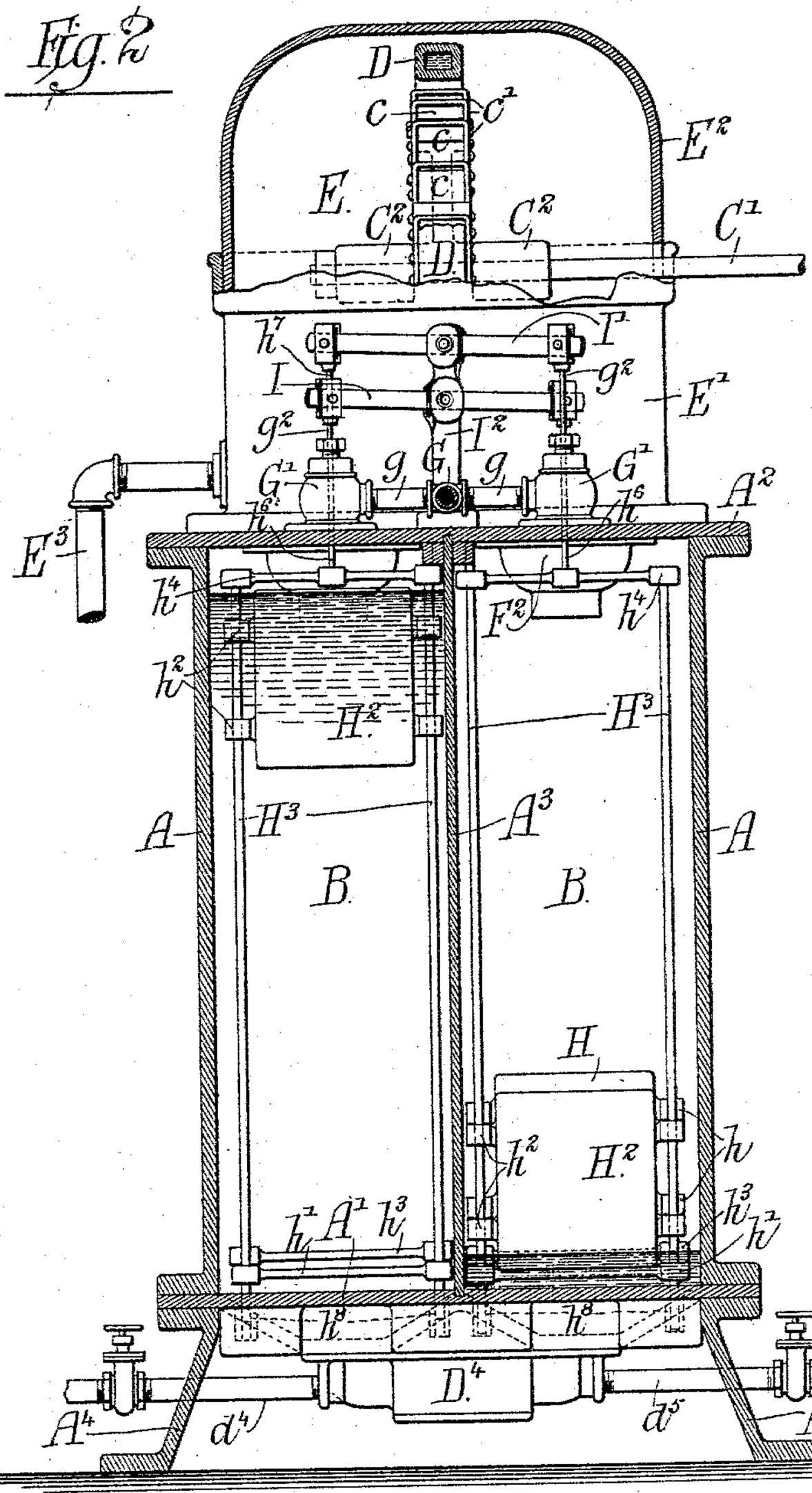
5 Sheets—Sheet 2.

W. M. JEWELL.

PRIME MOVER.

No. 494,782. Patented Apr. 4, 1893.

Fig. 2



Witnesses:-

Louis W. T. Whitehead.

C. E. Tomlinson.

Inventor:

William M. Jewell.

by:- Dayton, Poole & Brown

his Attorneys.

(No Model.)

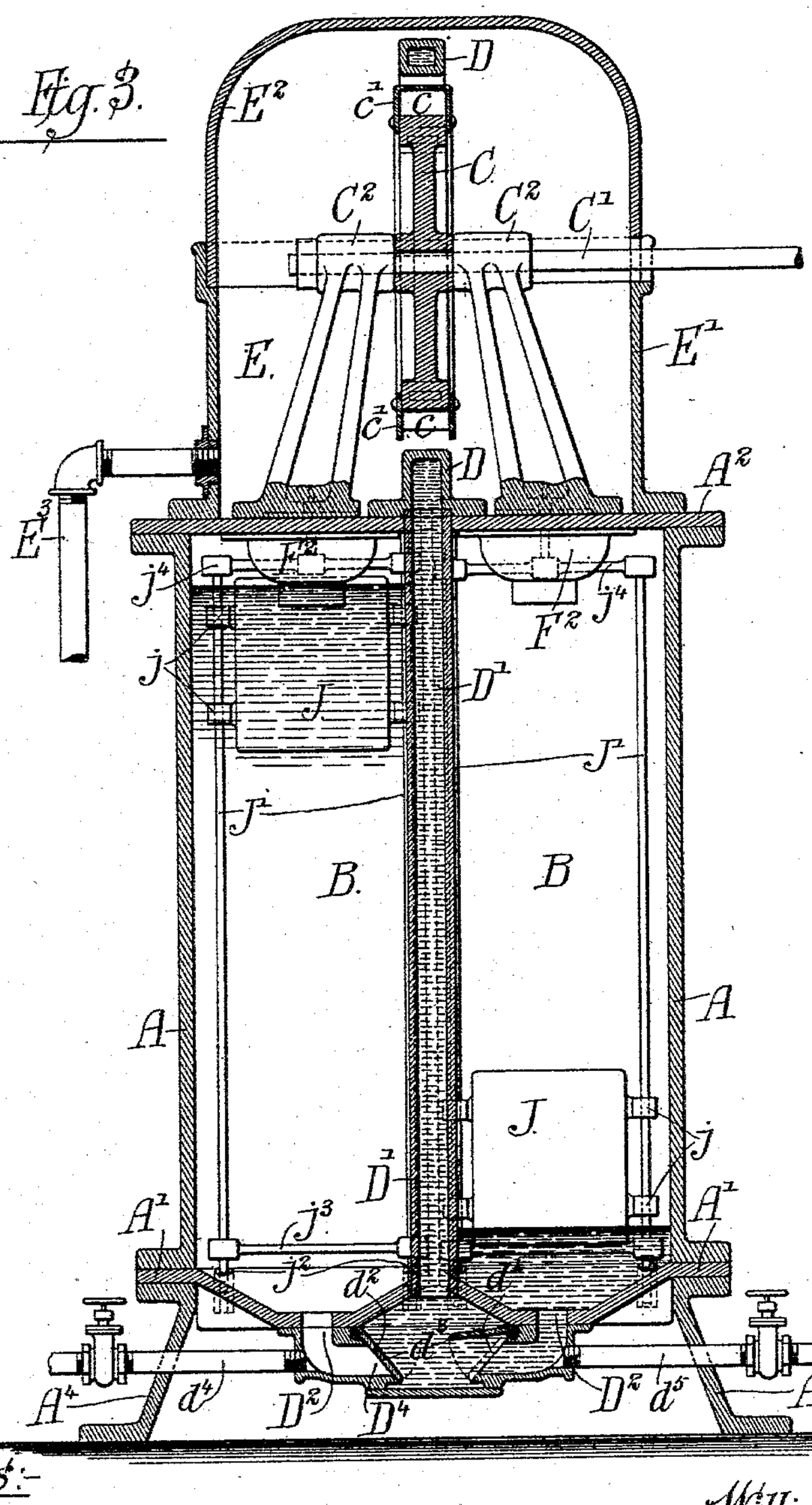
5 Sheets—Sheet 3.

W. M. JEWELL.

PRIME MOVER.

No. 494,782. Patented Apr. 4, 1893.

Fig. 3.



Witnesses:-
Louis M. F. Whitehead.
W. C. Tomlinson.

Inventor:-
William M. Jewell.

by:- Dayton, Poole & Brown
his Attorneys.

(No Model.)

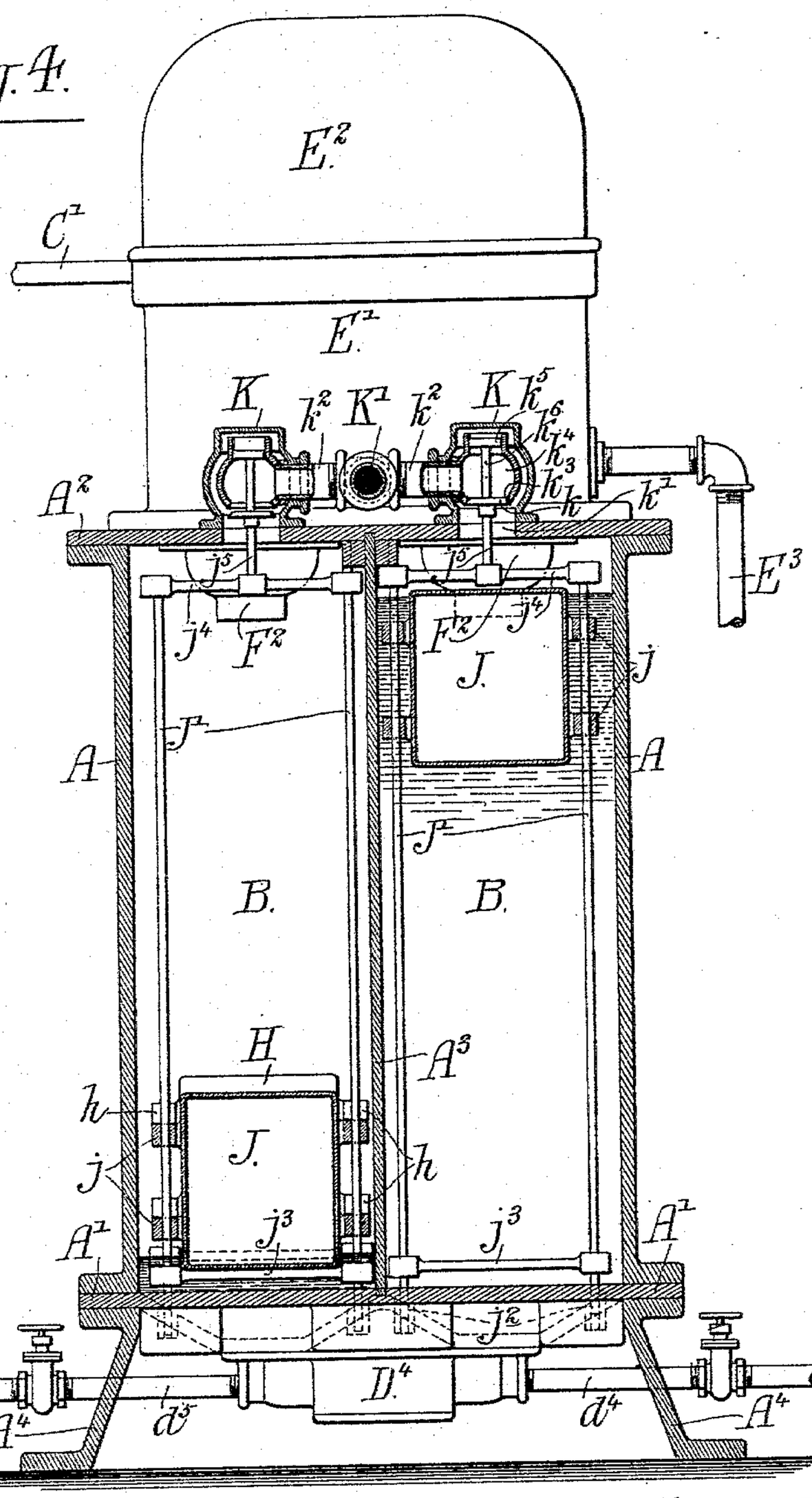
5 Sheets—Sheet 4.

W. M. JEWELL.

PRIME MOVER.

No. 494,782. Patented Apr. 4, 1893.

Fig. 4.



Witnesses:-
Louis M. T. Whitehead.
C. C. Tomlinson.

Inventor:-
William M. Jewell.

By:- Dayton, Poole & Brown
His Attorneys.-

(No Model.) 5 Sheets—Sheet 5.

W. M. JEWELL.

PRIME MOVER.

No. 494,782. Patented Apr. 4, 1893.

Fig. 5.

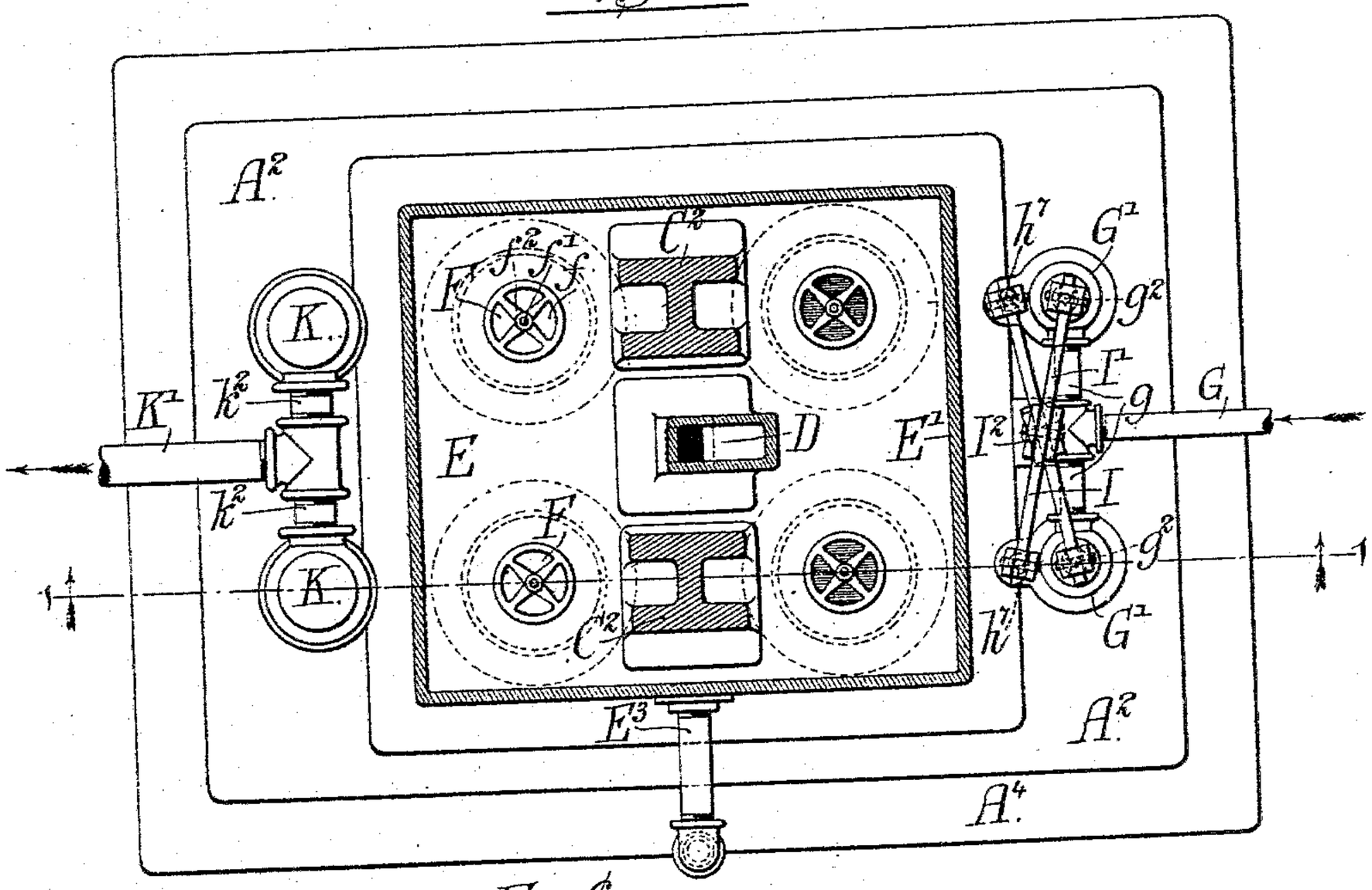
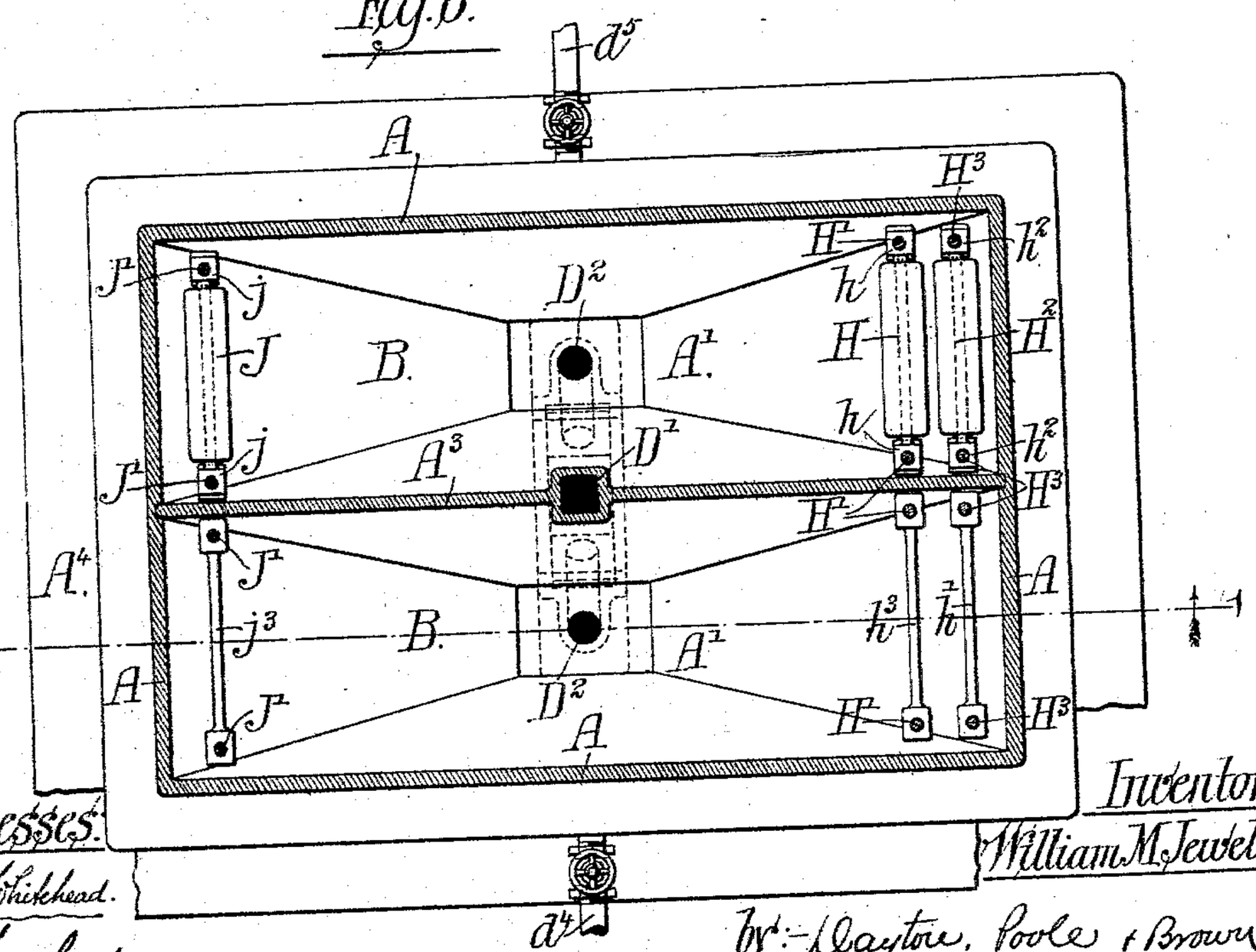


Fig. 6.



Witnesses:
Louis M. F. Whitehead.
C. E. Tomlinson.

Inventor:
William M. Jewell.
by: Clayton, Poole & Brown
his Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM M. JEWELL, OF CHICAGO, ILLINOIS.

PRIME MOVER.

SPECIFICATION forming part of Letters Patent No. 494,782, dated April 4, 1893.

Application filed March 19, 1892. Serial No. 425,510. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. JEWELL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Prime Movers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to a novel motor or prime mover wherein motion is given to a water wheel or other water motor by the action of water which is forced from an inclosure by steam pressure therein and which is returned to such inclosure and used again and again in the operation of the device.

The invention consists in the matters hereinafter described and pointed out in the appended claims.

The apparatus herein shown as embodying my invention embraces as its essential features a plurality of water chambers provided with steam inlet and exhaust passages, a water motor, a supply pipe connected with said several chambers and leading to the said water motor, valve actuating devices whereby steam is admitted to each chamber in alternation so as to secure a constant flow of water through the said pipe which is connected with the said several chambers, and passages through which the water forced from the chambers is returned to the same after having expended its force or energy upon the motor, in order that the heat imparted to the water by the steam may be preserved and loss of energy by the condensation of the steam thereby prevented.

In the accompanying drawings illustrating my invention: Figure 1 is a view in vertical section of an apparatus embodying the same, taken on line 1—1 Figs. 5 and 6. Fig. 2 is a vertical cross-section taken upon line 2—2 of Fig. 1. Fig. 3 is a similar section taken upon line 3—3 of Fig. 1. Fig. 4 is a similar section taken on line 4—4 of Fig. 1. Fig. 5 is a plan section taken on line 5—5 of Fig. 1. Fig. 6 is a plan section taken upon line 6—6 of Fig. 1.

As illustrated in said drawings, A, is a tank or receptacle provided with a bottom, A′, a horizontal top wall, A^2, and a central partition, A^3, arranged vertically and dividing the said tank into two compartments or water chambers B, B. The tank is shown as supported upon a suitable base or foundation by means of a flanged base casting, A^4.

C is the water wheel, which is mounted on a horizontal shaft, C′, supported at its ends in standards, C^2, secured to the top of the tank A, said wheel being provided with peripheral buckets, *c*, *c*. The wheel C belonging to the motor illustrated, is constructed in a simple and desirable manner, the same being formed of a metal disk having a smooth cylindric margin to which is attached a series of plates, G′, which are bent into U form and placed across the face of the wheel with their middle parts obliquely thereto, and have their ends, which are bent at right angles to such middle parts, secured against the side faces of the wheel by screws or otherwise, the bent end portions of the U-shaped plates forming the ends of the buckets, while the middle transverse parts of the plates together with the opposing cylindric surface of the solid wheel form the inner and outer walls thereof.

D is a water pipe or passage, of ring form, extending partially around the periphery of the wheel C and provided with a plurality of obliquely and inwardly directed openings, *d*, *d*, *d*, adapted to discharge jets of water against the buckets, *c*, *c*, for actuating the wheel. Said pipe D is secured at its lower end to the top plate A^2 at a point beneath the wheel C, and is there connected with a supply pipe or passage, D′, leading to the bottom of the tank, and herein shown as formed by a passage cast in the central partition A^3 of said tank. At its lower end the passage D′ is connected with the bottoms of both chambers B B by means of two passages, D^2, D^2, formed in the casting, D^4, which is secured to the bottom A′ of the tank; said passages D^2 D^2 communicating with the interior of the tank by means of openings in said bottoms A′, in the manner shown (Fig. 3). Said passages D^2 D^2 are provided with check valves, d', d^2, which open outwardly from the chambers or toward the passage D. Said check valves d' d^2 are shown as having the form of flap valves having valve plates, d^3, d^3, hinged at their upper ends and adapted to close by gravity against the inclined valve seats. Valve blow-off pipes, d^4, d^5, are shown as connected with the passages

D^2 D^2 outside of the valves d', d^2 for permitting the discharge of sediment from the bottoms of the chambers B B.

E is a tank or receptacle, located above the tank A and adapted to receive water discharged from the water wheel, said tank or receptacle being formed, in the particular construction shown, by means of a vertical inclosing wall, E', secured at its lower edge to the top plate A^2 of the tank A, so that said wall A^2 forms the bottom of the tank E. Said receptacle E is for the purpose of receiving the discharge water from the water wheel and connected with the chambers B B by means of valved openings or passages, F, F, two of which are shown as provided for each chamber.

In the particular construction shown the passages F F are formed by means of apertures in the top plate A^2 of the tank A and tubular castings, F^2, F^2, secured to the said top plate and depending therefrom, and check valves are provided in said passages, consisting of valve disks, f, f, mounted on vertically sliding stems, f', f', and arranged to rest upwardly against the valve-seats formed upon the lower surface of said plate A^2. Said valve stems are supported above the valve disks by means of central guide apertures formed in apertured plates or spiders, f^2, secured to the top plate A^2, and the lower ends of said stems are guided by engagement with the central hubs, f^3, supported by radial arms in the lower parts of the tubular castings F^2. Said tubular castings are enlarged in diameter in their parts adjacent to the top plate, as clearly shown in Fig. 1, to form chambers for the valve disks, f, f.

The valved passages F F afford means for the escape of water from the tank E downwardly into the chambers B B, while preventing the escape of steam from the said chambers; the pressure of the water on the top of the valve disks f f serving to depress the same and allowing the water in the tank E to escape into one of said chambers when the steam pressure is removed therefrom, while such steam pressure, when present, acts on the lower surface of said valve-disks to hold the same closed and prevent the outward escape of steam.

A cover, E^2, is shown as extending over the water wheel and fitted at its lower margin to the wall E' of the tank E so as to form with said tank an inclosure completely surrounding the water wheel, thereby preventing the access of dust and dirt to the water wheel, while preventing the escape of steam or loss of heat by radiation.

Devices for supplying steam to the chambers B B are provided as follows: G is a steam supply pipe leading from an adjacent steam generator or other source or means of steam supply, and connected by branch pipes, g, g, with the valves, G', G', the casings of which are secured to the top plate A^2 and communicate through the same with the chambers B B. Said valve casings contain valve disks, g', g', to which are attached valve stems, g^2, g^2, leading upwardly through the valve casings. In each of the chambers B B are located two vertically movable floats, H, H^2, which are adapted by suitable connections to actuate the valve disks g' g' which control the admission of steam to both chambers, the parts being so arranged that when the pair of floats in one chamber reach the lower limit of their movement by the lowering of water in that chamber, the steam supply passage leading to the other chamber, which is then full of water, will be open to admit steam thereto, and steam will be cut off from the empty chamber. In the device shown for thus actuating the valves controlling the admission of steam to the said chambers, the float H of each pair is engaged by means of lugs, h, h, at its sides with vertical guide rods, H', H', and the other float H^2 of the pair is similarly engaged by lugs, h^2, with guide rods, H^3, H^3. Said guide rods are vertically movable in the chamber B, and are shown as connected at their lower ends by cross-bars, h', h^3, and at their upper ends by similar cross-bars, h^4, h^5, which latter are attached at their centers to rods, h^6, h^7. The rod h^6 is attached to the disk g' of the valve G' and the rod h^7 extends upwardly through the top of the chamber. The lower ends of the guide rods H' H^3 are arranged to slide in guide apertures, h^8, h^9, formed in the bottom wall of the tank, so that said guide rods are held in place and adapted to move vertically by the sliding of said lower ends in the said guide apertures h^8 h^9. The valve stems g^2 g^2 which extend upwardly through the casings of the valves G' G' are connected with the ends of two horizontally arranged levers, I, I', which are pivoted one above the other upon a centrally arranged standard, I^2, and to the opposite ends of which the rods h^3 h^5 are attached at their upper ends. The levers I I' are crossed, as shown (Fig. 5) and serve to connect the guide rods H' of each chamber with the valve G' of the other chamber, the rods H^3 of each chamber being connected directly with the valve of the chamber in which it is located by the rod h^6.

Provision is made for balancing the valves G' G' consisting of passages, g^3, g^3, in the valve casings leading to the upper ends thereof, and acting on the upper faces of balancing disks, g^4, g^4, which are attached to the valve stems g^2 g^2 and slide in cylindric seats, which open at their lower ends into the central space of the valve, which is subject to the steam pressure from the generator or source of supply.

In the operation of the controlling device described, the floats H H^2 shift or move the guide rods H' H^3 downwardly by contact with the cross bars h' h^3 when the floats reach the bottom of the chamber; this movement of the guide rods depressing the ends of the levers with which they are connected through the medium

of the rods h^6 h^7 and thereby lifting the valve disk g' belonging to the valve of the opposite chamber so as to admit steam to the latter, while at the same time depressing the valve disk g' of the same chamber and cutting off the steam supply from the latter. The floats act upon the rods H' H^3 by shifting the cross-bars h' h^3, but the same result will be produced by other stops on the said rods. The cross-bar h^3 of the rods H' H' which are connected with the valve of the opposite chamber, are so set that said rods will be moved by the float H before the other rods H^3 H^3 are actuated by the float H^2, thus securing the admission of steam to the opposite or filled chamber before the steam is cut off from the chamber which is being emptied, and thereby preventing any interruption in the flow of water from the two chambers.

Provision is made for the discharge of exhaust steam from the chambers B B as follows: In said chambers, preferably at the side thereof opposite that in which the floats H H are placed, are located similar floats, J, J, (Fig. 4,) said floats being provided with lateral lugs or ears, j, j, engaging vertical guide rods, J', J'. Said guide rods slide at their lower ends in guide apertures, j^2 j^2, formed at the bottom of the tank and are connected there by a cross-bar j^3. At their upper ends the rods in each chamber are connected to another cross-bar, j^4, to which is attached a rod, j^5, attached at its upper end to a valve disk, k, located within the valve-casing, K, which is secured to the top plate A^2 and communicates with the chamber B by means of an opening, k', which forms the exhaust opening of the chamber B. The valve casings K K belonging to the two chambers B B are connected by branches, k^2, k^2, with a common discharge or exhaust pipe, K', (Figs. 1 and 4.) The valve disk k is arranged to open the valve by a downward movement from its seat, k^3, said valve disk being preferably balanced in the same manner as described in connection with the steam inlet valve, to wit, by means of a steam passage, k^4, leading through the valve casing to the top of the same and acting on the outer surface of the balancing piston, k^5, which is connected with the valve disk k by a stem k^6. The exhaust valve belonging to each chamber is intended to be opened at the time the water is entirely discharged from the chamber, and for this purpose the float J is adapted to accomplish the opening of the same when the float reaches the lower limit of its movement. For this purpose the parts are so arranged that the said float will strike the cross-bar j^3 and thereby shift the guide rods J' J' downwardly at the time referred to, thereby opening the exhaust valve and allowing the escape of steam as soon as the steam supply is cut off therefrom preparatory to the refilling of the chamber with water. The closing of the said exhaust valve preparatory to the subsequent admission of steam to the chamber is effected by the contact of the float with the upper cross-bar j^4 whereby the guide rods J' J' are lifted and the valve disk k brought into contact with the seat. Inasmuch as the valve disk will be held against the seat by the action of the float until steam is again admitted to the chamber there will be no possibility of the exhaust valve again opening when the float again descends because the valve will be held against its seat by the steam pressure, the parts being so proportioned that the pressure of the steam against the lower surface of the valve disk will be sufficient to sustain the weight of the guide rods J' J' and connected parts, while the weight of the float J acting on said guide rods when said float reaches the bottom of the chamber will be sufficient to overcome the upward pressure of the steam on the said valve disk and thus secure the opening of the valve at the proper time.

In the operation of the apparatus as a whole, assuming one of the chambers B to be empty, as seen at the right hand of Fig. 2, and the other to be full of water, as seen at the left hand of Fig. 2, steam is first admitted to the left hand chamber and then cut off from the right hand chamber when the floats H and H^2 in the right hand chamber reach the bottom thereof, as above described, and the steam pressure acting on the top of the water in the left hand chamber forces the same outwardly through the passages D^2 D^2 and supply pipe D' to the water wheel. While the steam is thus acting on the left hand chamber B, steam already within the right had chamber escapes therefrom through the exhaust valve and the steam pessure having been taken from the lower surface of the valves F F water passes by gravity from the tank E through said valves F F into the said right hand chamber. When the right hand chamber has been filled with water thus entering the same, the exhaust valve thereof is closed by the action of the float J, but the float H^2 in the same chamber, although it has risen to the top thereof, has no effect upon the steam inlet valve, as it does not act to lift the rods H^3 H^3 at the upward limit of its movement, but the said inlet valve remains closed and water continues to fill the chamber and may overflow the same and accumulate in the receptacle E, until most of the water has been forced from said right hand chamber. As soon, however, as the water has been forced out of the said left hand chamber the descent of the float H therein will open the steam valve leading to the other or right hand chamber, and the steam pressure acting on the top of the water in said right hand chamber will immediately lift and close the water inlet valves, and thereafter force the water in the chamber outwardly through the discharge pipe to the water wheel. As soon as the inlet valve of the right hand chamber is thus opened, the other float in the left hand chamber will close the steam valve to that chamber and water will again fill the same. In the manner described

a continuous supply of water to the water wheel is afforded, the steam being admitted alternately to the right and left hand chambers and the water forced therefrom in alternation the flow of water from one chamber beginning before or at the instant it ceases to flow from the opposite chamber, so that there is practically no intermission in the operation of the turbine.

It is obvious that two floats are used in the construction described in each chamber, as a means of securing the opening of one valve before the other is closed, but other means may be employed for causing the actuation of one valve before the other, and in that case one float in each chamber only may be necessary.

The receptacle E is preferably provided with an overflow pipe, E^3, through which any surplus water may escape, it being obvious that the quantity of water within the chambers and said receptacle will gradually increase by addition of water condensed from the steam, and that such overflow pipe prevents the accumulated water rising so high in the receptacle as to intefere with the operation of the motor. It is obvious that the water employed, being used over and over again, will soon become heated to a temperature approximately that of the steam, so that a relatively small part of the steam will be condensed, and there will be but little loss of energy from such condensation. The parts of the apparatus may desirably be jacketed or surrounded by a non-conducting covering to prevent escape of heat therefrom.

The guide rods H′ H^3 and J′ J′ provided with cross-bars h' h^3 and j^3 forming stops against which the floats strike in their descent, and connected with the steam inlet and exhaust valves in the manner described, obviously constitute one of many forms of mechanism by which the valves may be actuated by the action of floats in the rising or descent of the same; it being obvious that a mechanism embracing the features of movable stops located in the chambers, connected with the valves, and adapted for actuation by contact of the floats therewith when the said floats approach one or both limits of their movement, may be arranged in any one of a great variety of different ways. Certain of the particular features of construction shown, have, however, the advantage of affording a simple and practical way of carrying out this part of my invention, and are therefore claimed as separate improvements.

The term "water motor" as herein used is not intended to be limited to a water wheel such as is illustrated, but to include any device operated by the pressure or weight of water and adapted to give motion to a part to be moved or driven. As, for instance, the water instead of acting by its direct pressure may be lifted by the forcing devices described to a considerable height and its weight, or the pressure due to its head, may be used to actuate the motor. Furthermore, the water motor may be one which acts periodically or intermittingly, instead of continuously; any device by which the force, pressure or weight of water is converted into mechanical motion falling equally with the water wheel shown within the term "motor" as the same is used in defining the present invention. The water motor employed, when of either of the kinds included in the term, may be located in any desired position with relation to the water chambers, near to or at a distance from, and either above or below the level of the same, provided proper provision is made for the return of the water to the water chambers from the motor after it has been used in the same, the invention including as an essential feature, the continued use of the same water in order that there may be no great loss of heat by condensation of steam. When, therefore, the motor is located at a distance from the water chambers, it is desirable to cover or protect the connecting pipes or passages in order to avoid loss of heat by radiation therefrom.

The construction illustrated, in which a motor is used in connection with water chambers located below the same, so that water descends by gravity from the water wheel into the chambers, is of especial utility as affording a simple, compact and portable prime mover for use in cases where a continuous rotary motion is desired, as for driving a dynamo or electric generator.

By the employment of two floats in each chamber I am not only able to secure the actuation of the steam inlet valve of one chamber before steam is cut off from the other chamber in the manner described, but where desired I am enabled to employ the expansive force of steam to accomplish a part of the work of expelling water from the chambers instead of depending entirely upon the direct pressure of steam for this purpose. As, for instance, steam may be admitted to the chamber during a time sufficient to expel one half of the water therefrom and the admission of steam may then be cut off by the action of the float H^2 so as to prevent further admission of steam and allow the steam within the chamber to act expansively on the water therein until all of the water has been forced from the chamber; the float H being in such case arranged to actuate the valve of the other chamber than that in which it is located, when the water is exhausted from the latter chamber in the same manner as when working under ordinary conditions.

When the apparatus is arranged for cutting off the steam before the water is entirely expelled from the chamber, a stop will be arranged for actuation by the float H^2 in the descent of the latter at a point before the float reaches the bottom of the chamber, and when a cross-bar h' is used to form the stop it will be secured upon the rods H^3 H^3 at such elevation as to be acted on by the float at a desired point in its descent. When the floats

are thus arranged to cut off steam from the chamber from which water is being forced before it is admitted to the other chamber, little or no interruption of the continuous flow of water will take place, because the expansive action of the steam will continue to force the water from the chamber, after the downward movement of the float H^2 has been arrested, until the float H strikes the cross-bar h^3, when steam will be admitted to the other chamber and the outflow of water from one chamber will thus practically begin before that from the other chamber is discontinued.

I claim as my invention—

1. A prime mover, comprising a water motor, two water chambers having water exit passages leading to said water motor and provided with steam inlet and exhaust passages, means for opening the said steam inlet passages, means for closing the said steam inlet passages operating independently of the mechanism for opening the same, and means for opening and closing the exhaust passages, substantially as described.

2. A prime mover comprising a water motor, two water chambers having water exit passages leading to said water motor and provided with valved steam-inlet and exhaust passages, and means for controlling said steam-inlet and exhaust passages comprising a float in each chamber controlling the exhaust passage of that chamber, and other floats in each chamber arranged to control the admission of steam to the other of said two chambers and to also control the time at which steam is cut off from the chamber in which said float is located, substantially as described.

3. A prime mover, comprising a water motor, two water chambers having water-exit passages leading to said water motor, and provided with valved steam-inlet and exhaust passages, floats in said chambers, actuating devices for the valves which control the steam inlet passages embracing movable stops located within the chambers in position to be acted upon by the said floats in the descent of the latter, and actuating devices for the valves which control the exhaust passages embracing movable stops located in the chambers in position to be acted upon by the floats at both the upper and lower limits of the movement of the latter, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

WILLIAM M. JEWELL.

Witnesses:
C. CLARENCE POOLE,
GEORGE W. HIGGINS, Jr.