(No Model.) 3 Sheets—Sheet 1.

M. W. HALL.

PUMP.

No. 528,161. Patented Oct. 30, 1894.

Fig. 1.

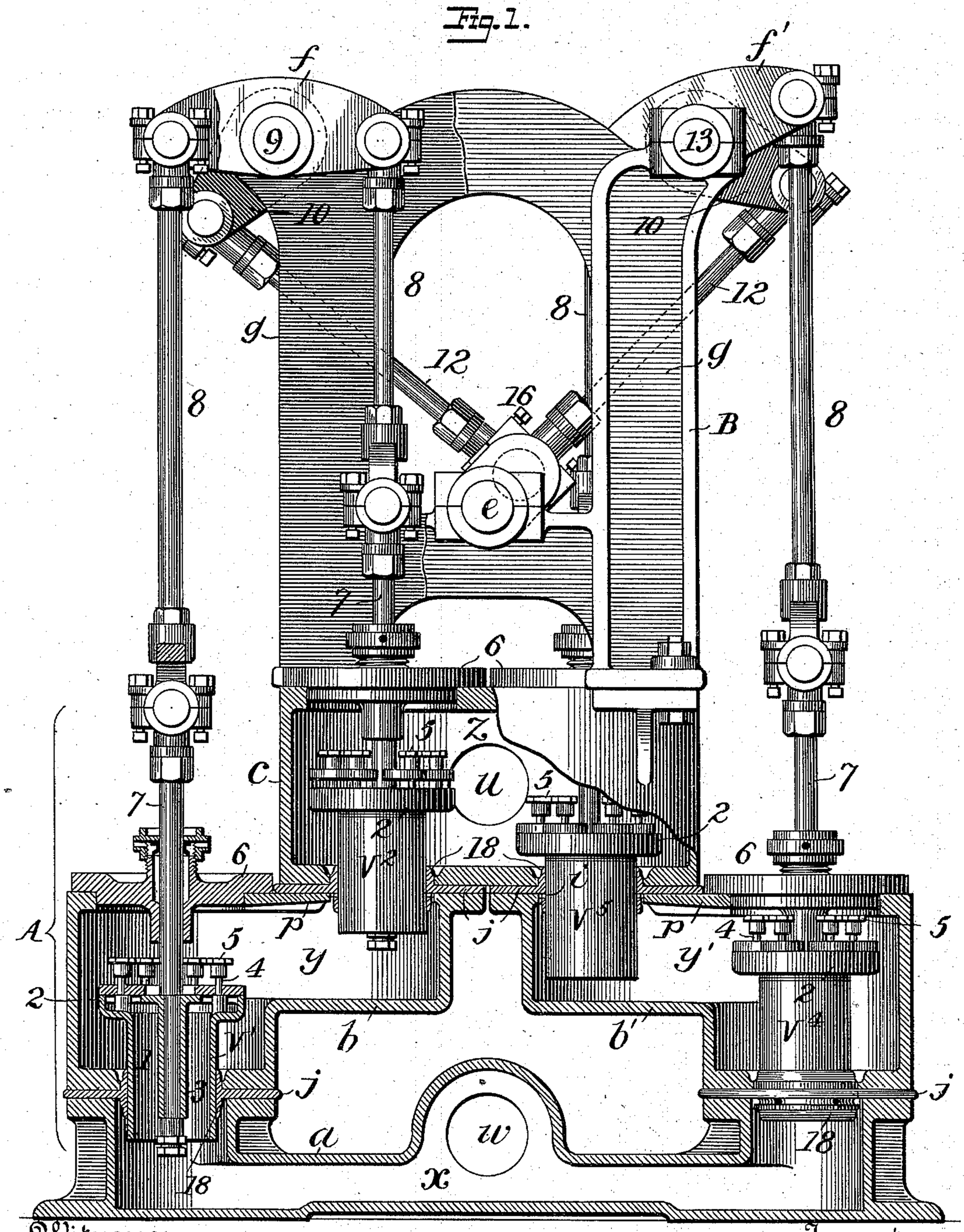

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Fig. 2.

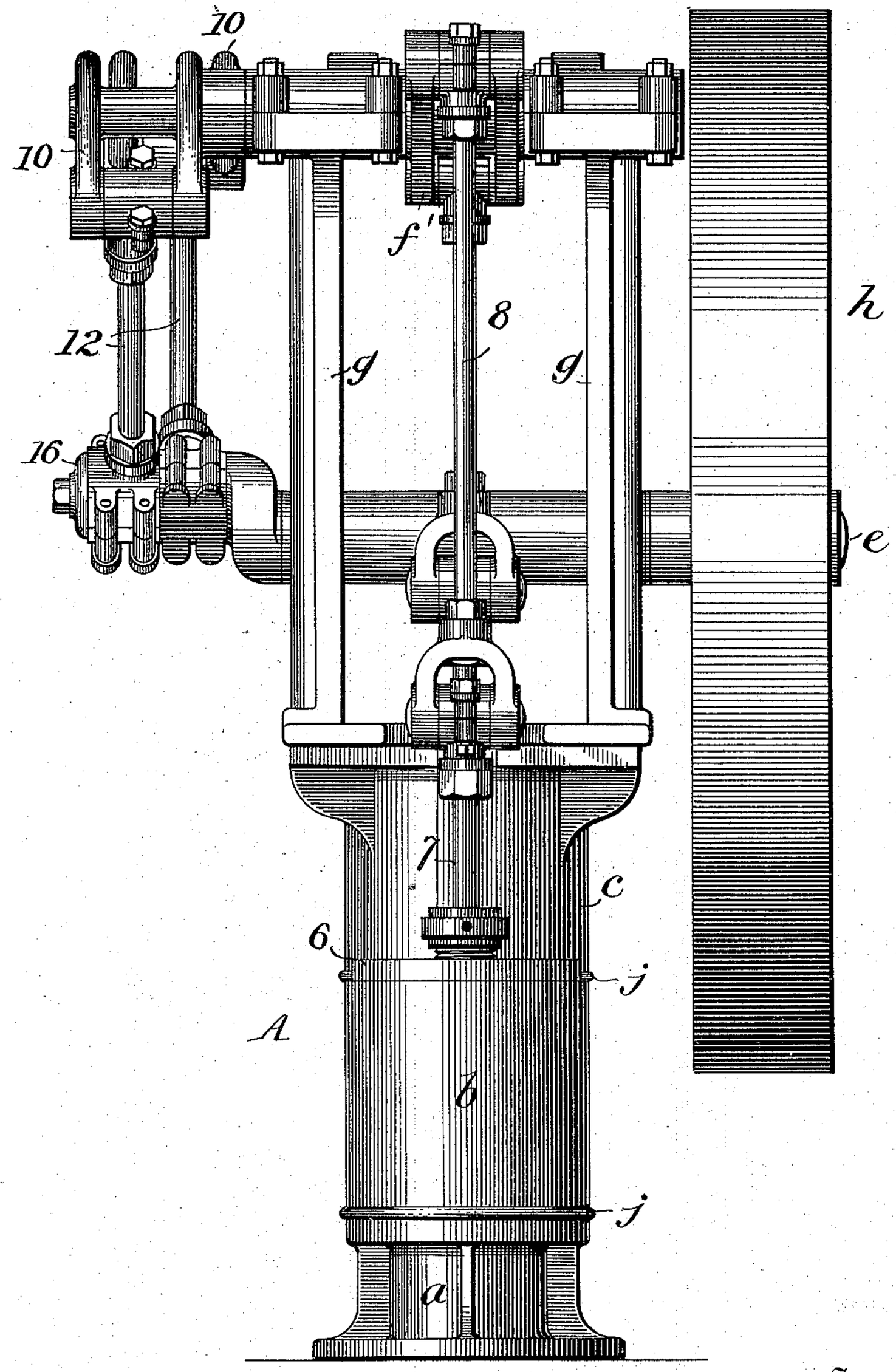

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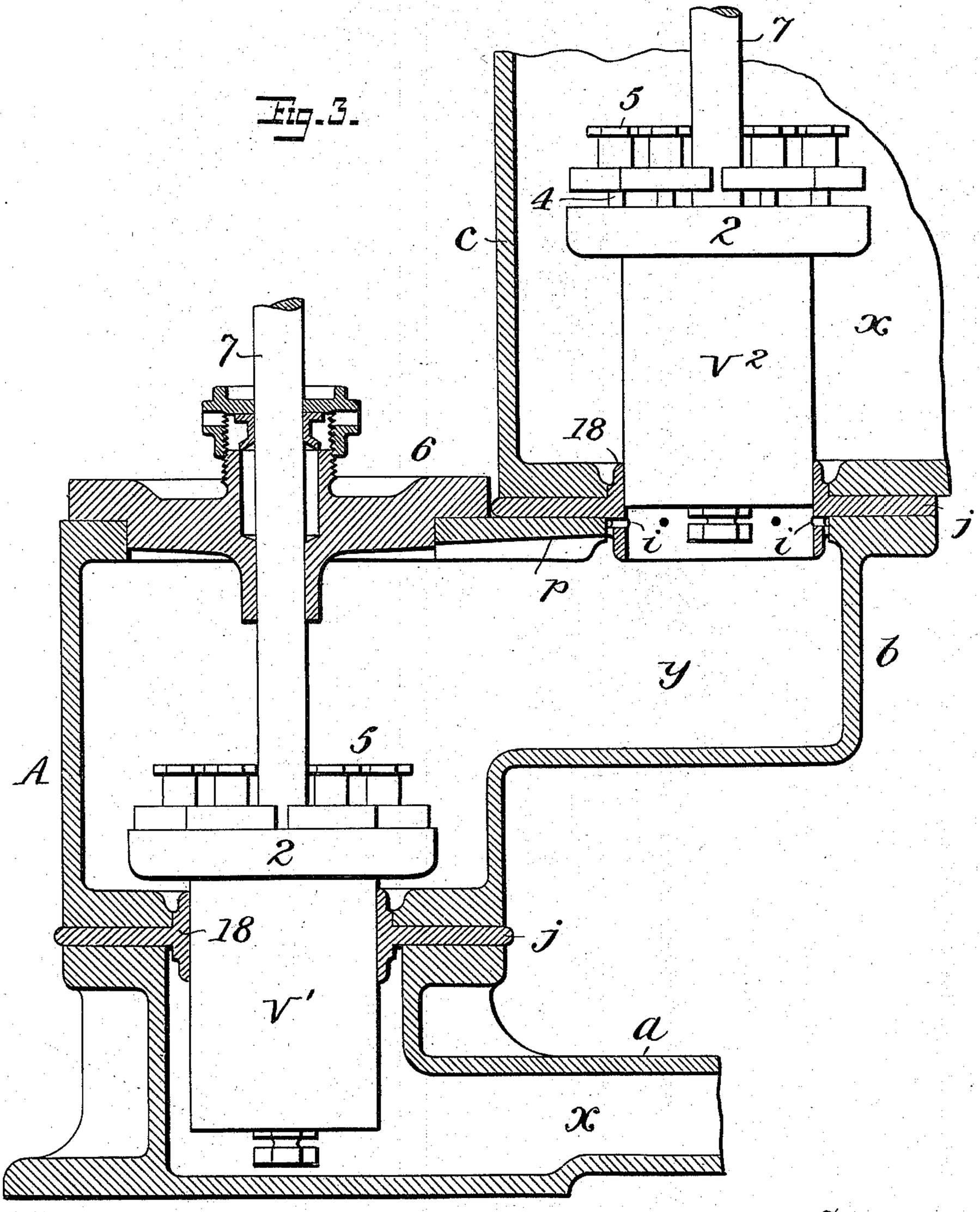
Fig. 3.



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UNITED STATES PATENT OFFICE.

MILAN W. HALL, OF PLAINFIELD, NEW JERSEY.

PUMP.

SPECIFICATION forming part of Letters Patent No. 528,161, dated October 30, 1894.

Application filed October 20, 1893. Serial No. 488,708. (No model.)

To all whom it may concern:

Be it known that I, MILAN W. HALL, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My invention is a pump constructed as fully set forth hereinafter, and as illustrated in the accompanying drawings, so as to avoid shocks and noise in operations, distribute the work evenly throughout each revolution, prevent alternating currents or movements in the water columns and the collecting of air in the casing, and otherwise constructed to simplify and reduce the cost of manufacture and secure increased efficiency of operation.

In said drawings: Figure 1, is a sectional elevation of said pump constructed in accordance with my invention. Fig. 2, is an end elevation. Fig. 3, is an enlarged detached sectional view.

The hollow base A, of the pump consists of an inlet casing *a*, having an opening *w*, communicating with the inlet pipe, a discharge casing *c*, having an opening *u*, communicating with a discharge pipe and an intermediate casing or casings *b*, *b'*, the casing *a*, inclosing a chamber *x*, the casing *b*, *b'*, inclosing chambers *y*, *y'*, and the casing *c*, inclosing a chamber *z*. Above the hollow base is the main frame B, consisting of side pieces *g*, *g*, having bearings for the driving shaft *e*, carrying a pulley *h*, at one end, and having at the opposite end a crank, the pin 16, of which receives the ends of two connecting rods 12, extending to pins upon arms 10, one of said arms extending from a rock-shaft 9, and the other from a rock-shaft 13, turning in bearings upon the frame.

The rock-shafts 9, 13, carry beams *f*, *f'*, and each of said beams is connected by a rod 8, with a piston rod 7, and with each of the said piston rods is connected a piston, the four pistons being lettered V', V^2, V^4, V^5, and constituting the pistons of a double acting pump. Each piston is hollow and has upper ports closed by suitable valves, as for instance disk valves 5, and each piston slides in a short sleeve or collar 18, midway between the ends of which and at right angles thereto, is a plate or flange *j*, which may be clamped between flanges upon the casing and the collar extending into openings in said casing. By this means the only nice machining or fitting necessary is that required to dress the outer sides of the pistons and inner faces of the collars, thereby avoiding much manipulation of the heavy castings otherwise necessary.

The location of the crank 16, from which motion is imparted to the beams *f*, *f'*, is such that one division of the pump operated by one beam is half a stroke in advance of the other. Thus one division of the pump is in full action while the other is reversing at the end of the stroke. By thus having one division in full action at the time that the plungers of the other division are each at the end of its stroke, the work of the pump is more evenly distributed throughout the revolution than would otherwise be the case and there is a more uniform resistance to the motor, adapting the pump more especially to the use of the electric motors where it is especially desired to avoid irregular resistance. Owing further to this action of the two divisions of the pump there is no time when the water is not being acted upon by one of said divisions in such manner as to force it through the discharge, and by operating the pistons of two divisions by two beams, as described, this discharge of the water is maintained not only constant but practically uniform, while there is no alternating movement of the water which flows continuously in one direction from the inlet to the discharge through first one division and then the other.

Each piston consists of a hollow cylindrical portion 1 expanded at one end in which end are the ports for the valves 5, so that said ports may equal in area the full area of the opening through the cylindrical portion 1, or exceed that area thus affording a free passage which prevents throttling the water. The valves 5, may be of any suitable character. As shown, each valve is a disk sliding upon a bolt 4, to and from the valve face upon the expanded portion 2, of the piston. A tubular core 3, extends centrally downward from the head of each piston to receive the contracted end of the piston rod 7, which passes through a stuffing box in a removable

cylinder head 6, fitted to an opening in the casing of such diameter that the piston can readily be inserted and withdrawn through the said opening.

By constructing the pistons as above set forth they may be made of cast metal and with but little labor may be readily and accurately fitted to their bearings, while access may be readily had to all the parts when required. The latter end is further secured by extending the casings *b*, *b'*, or the single casing when the same is formed in a continuous structure beyond the ends of the casing *c*, so that the openings through which the caps 6, are fitted may be in the top of each section of the casing, and access may be had to any piston without disturbing the positions of the other parts of the machine, and all of the caps open upward and any one of the casings may be lifted directly from the other. It will further be seen that the construction described permits the passages to be made of such extended area in proportion to the size of the pump as prevents the throttling of the water columns and the liability of the passages becoming clogged.

It is essential to the effective operation of the pump that any air which may find its way to the chamber *y*, *y'*, shall be readily and quickly removed when the pump starts in operation. To this end I provide a passage for the air beneath the lower ends of each of the pistons V^2, V^5, when the latter are at their highest points by forming a chamber or receptacle for the air in such position that it will flow into the same and upward therefrom below the piston. As shown, the top of each chamber *y*, *y'*, has an inclined lower face *p*, from the highest point of which channels *i*, extend through the adjacent collar 18, at a point above the face *p*, and below the edge of the piston when the latter is at the top of its stroke. By this means any air in the chamber will flow to the top and thence be directed into the piston as soon as the latter reaches its upper position and will pass outward from the position into the chamber *z*, when the piston next descends. Any accumulation of air in the chamber *z*, simply serves as a cushion and no provision is required for its removal.

By the construction of the pump above described I have secured one that is practically noiseless in operation, the work is equally distributed throughout the revolution so as to offer a practically uniform resistance to the motor, and the motor currents have no varying movement and there is a continuous practically uniform discharge, and in which the pump may be operated at a high rate of speed without re-action or pounding, while the collection of air in the water passages is prevented.

While I have described a particular construction of hollow base it will be evident that this and other features may be varied from the construction shown without departing from the main features of my invention.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. A pump having a casing with inlet, discharge and intermediate chambers and two sets of hollow valved pistons sliding in openings between said chambers, devices for reciprocating the two pistons of each set, and driving mechanism connected to actuate said devices to bring the pistons of one set at the ends of their respective strokes when those of the other set are in their mid-positions, substantially as set forth.

2. The combination in a pump, of a casing having an inlet chamber and discharge chamber and two intermediate chambers, two pistons sliding in openings between each intermediate chamber and the inlet and discharge chamber, and having water passages and valves and means for reciprocating said pistons in opposite directions arranged to bring one set of pistons to the limits of their strokes when those of the other set are in mid-position, substantially as set forth.

3. The combination with the chambers, and inlet and discharge passages of a pump, of two sets of hollow valved pistons, a beam to each set of pistons, to the opposite ends of which said pistons are connected, and means for rocking the beams arranged to bring each beam to a central position as the other beam is carried to its extreme position in one direction or the other, substantially as set forth.

4. A pump having a hollow base consisting of casings having inlet, discharge and intermediate chambers, the casing for the intermediate chambers projecting beyond the discharge casing, and vertically reciprocating pistons in said casings with openings in the top of the casings provided with cylinder-caps, substantially as set forth.

5. The combination in a pump of a hollow inlet casing *a*, discharge casing *c*, intermediate casings *b*, *b'*, projecting beyond the discharge casing, said casings being detachably connected to form the hollow base of the pump, and hollow valved pistons sliding in openings connecting the different casings, substantially as set forth.

6. The combination with a pump of hollow valved pistons each consisting of a hollow cylinder 1, closed at one end, which end is greater in diameter than the cylinder, and provided with ports, and valves fitted to the ports at the expanded end of the piston, substantially as set forth.

7. The combination with the casings of a pump, of sleeves extending between said casings, hollow valved pistons sliding in said sleeves with perforations in the sleeves ex-

tending from points adjacent to the top of the chambers in the casing through the sleeves to points below the ends of the pistons when the latter are in their highest position, substantially as set forth.

8. The combination of the casings having chambers with inclined faces at the tops, sleeves extending through said tops, and perforations extending through the sleeves and hollow valved pistons sliding in the sleeves combined to operate substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MILAN W. HALL.

Witnesses:
HENRY L. BRANT,
CHARLES W. EGGERT.