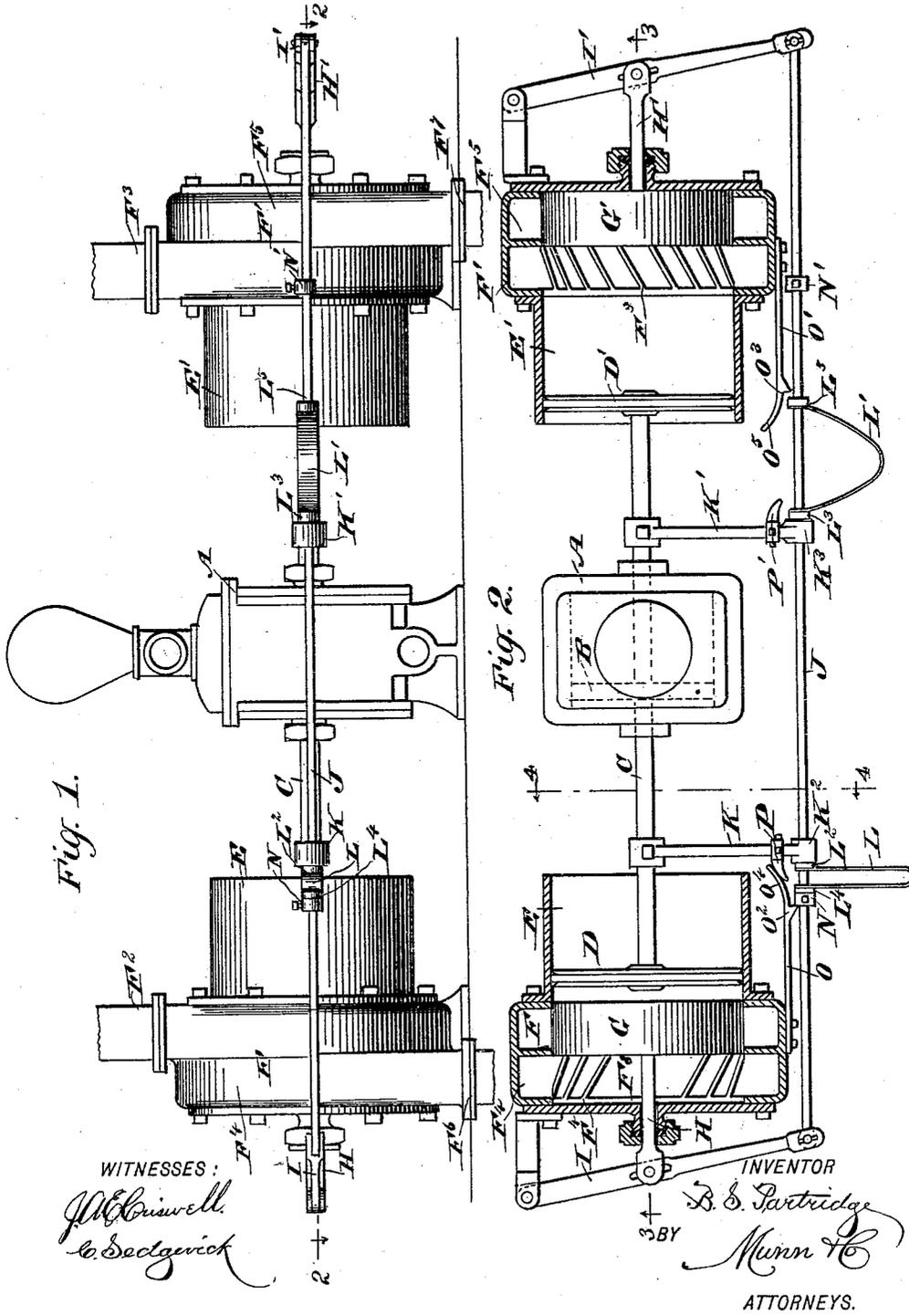


B. S. PARTRIDGE.  
MOTOR.

No. 487,584.

Patented Dec. 6, 1892.



(No Model.)

2 Sheets—Sheet 2.

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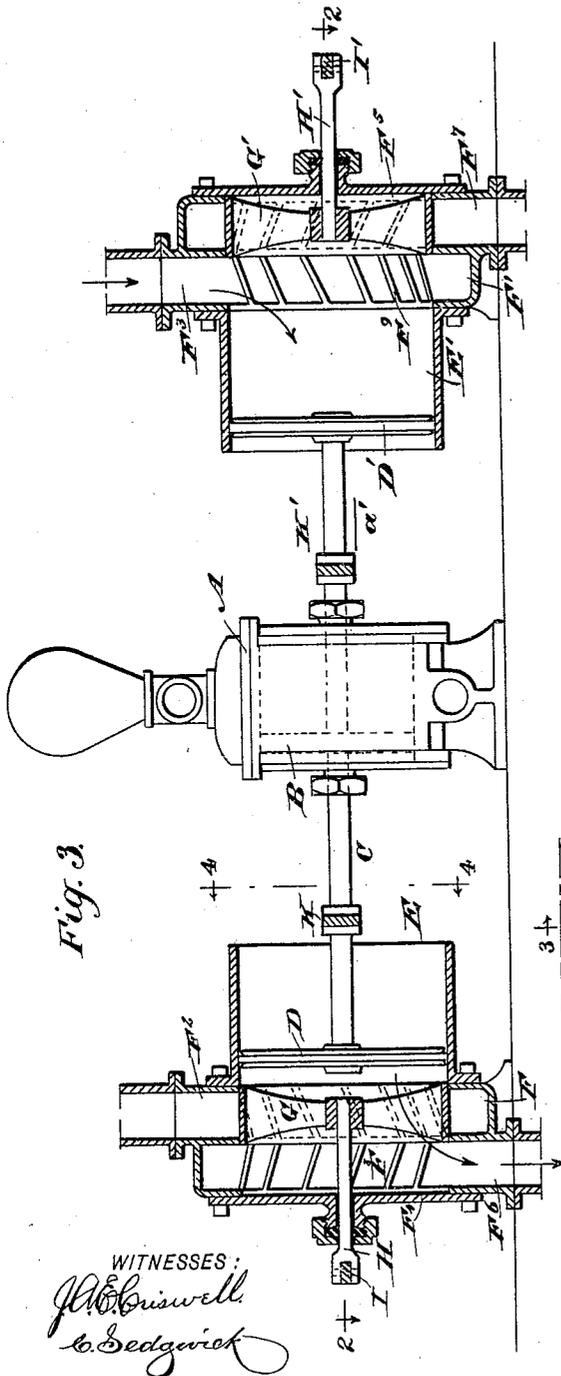


Fig. 3.

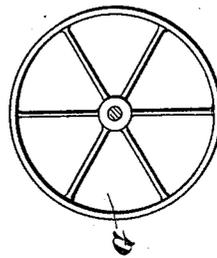


Fig. 5.

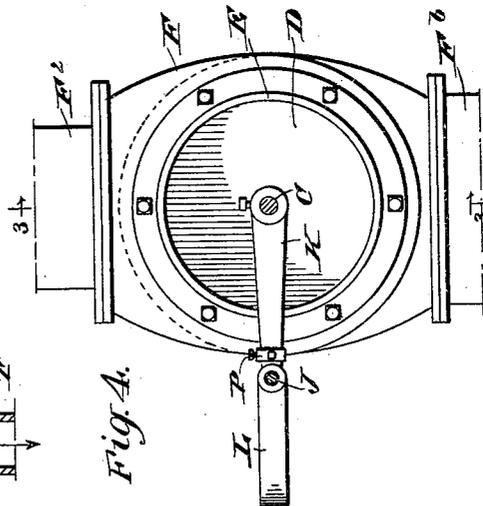


Fig. 4.

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# UNITED STATES PATENT OFFICE.

BENJAMIN S. PARTRIDGE, OF JACKSONVILLE, FLORIDA.

## MOTOR.

SPECIFICATION forming part of Letters Patent No. 487,584, dated December 6, 1892.

Application filed April 4, 1892. Serial No. 427,675. (No model.)

*To all whom it may concern:*

Be it known that I, BENJAMIN S. PARTRIDGE, of Jacksonville, in the county of Duval and State of Florida, have invented a new and Improved Motor, of which the following is a full, clear, and exact description.

The invention relates to motors such as shown and described in the application for Letters Patent of the United States, Serial No. 399,511, filed by me July 14, 1891, and allowed January 4, 1892.

The object of the invention is to provide a new and improved motor which is simple and durable in construction, very effective in operation, and more especially designed for use on Artesian wells or other devices to obtain, with a low pressure of water as a driving medium, a large amount of power for actuating other machinery.

The invention consists of certain parts and details and combinations of the same, as will be hereinafter described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement. Fig. 2 is a sectional plan view of the same on the line 2 2 of Figs. 1 and 3. Fig. 3 is a sectional side elevation of the same on the line 3 3 of Figs. 2 and 4. Fig. 4 is a transverse section of the same on the line 4 4 of Figs. 2 and 4, and Fig. 5 is a face view of one of the valves.

The machinery to be actuated by the improved motor may be of any desired construction; but for the purpose of illustration the drawings represent a double-acting pump A of any approved construction, the piston B of which is secured to a power or piston rod C, extending longitudinally and fitted to slide in suitable stuffing-boxes in the heads of the pump A. The ends of the power-rod C carry the pistons D and D', mounted to slide, respectively, in the cylinders E and E', open at their inner ends and connected, respectively, at their outer ends with the valve-chests F and F', comprised, respectively, of inlet-chambers F<sup>2</sup> and F<sup>3</sup>, through which the motor agent enters; of outlet-chambers F<sup>4</sup> and F<sup>5</sup>, through which the motive agent exhausts and

escapes through the discharge-pipes F<sup>6</sup> and F<sup>7</sup>, and of cylindrical valve-seats F<sup>8</sup> and F<sup>9</sup>, surrounded by said chambers and provided, respectively, with a circular series of inlet-ports opposite the inlet-chambers and opening into the same, and a circular series of outlet-ports opposite the outlet-chamber and opening into the same, as hereinafter more fully described.

In the chests F and F' are fitted to slide longitudinally the cylindrical valves G and G', respectively, the rims of which are adapted to open and close the inlet-ports and the outlet-ports alternately, as will be readily understood by reference to the drawings. The cylindrical valves G and G' are formed with a central hub and radial spokes, so as to make a discharge-opening for the cylinders E and E' at the time said valves are seated over the inlet-ports of the inlet-chambers F<sup>2</sup> and F<sup>3</sup>, respectively, and said valves being at all times either entirely surrounded or entirely filled with the motive agent and having outlet-ports or inlet-ports entirely around their perimeters at all times are constantly and perfectly balanced. It is understood that the chests F and F' are somewhat larger in diameter than the valve-seats F<sup>8</sup> and F<sup>9</sup>, so that the incoming motive agent can circulate all around the chest and pass into the cylinder from all sides at the time the valve is in an outermost position in the respective chest.

The valves G and G' are provided with outwardly-extending valve-stems H and H', respectively, passing through suitable stuffing-boxes in the heads attached to the chambers F<sup>4</sup> and F<sup>5</sup>. The outer ends of the valve-stems H and H' are pivotally connected with transversely-extending arms I and I', respectively, pivoted at their rear ends to brackets attached to the heads of the chambers F<sup>4</sup> and F<sup>5</sup>. The free ends of the arms I and I' are pivotally connected with each other by a rod J, as plainly illustrated in Fig. 2, the said rod sliding in bearings K<sup>2</sup> and K<sup>3</sup>, formed on the arms of K and K', respectively, secured to the power-rod C at opposite sides of the pump A. The bearings K<sup>2</sup> and K<sup>3</sup> of the arms K and K', respectively, are adapted to engage collars L<sup>2</sup> and L<sup>3</sup>, respectively, formed on the ends of the springs L and L', respectively, preferably made V-shaped, as shown in Fig.

2, and carrying on their outer ends collars L<sup>4</sup> and L<sup>5</sup>, fitted to slide loosely on the rod J. It is understood that the collars L<sup>2</sup> and L<sup>3</sup> are also fitted to slide loosely on the rod J. The collars L<sup>4</sup> and L<sup>5</sup> are adapted to abut against collars N and N', respectively, secured by set-screws or other means to the rod J. The collars N and N' are adapted to abut against shoulders O<sup>2</sup> and O<sup>3</sup>, respectively, of spring-arms O and O', respectively, secured to the chests F and F', respectively, as plainly shown in Fig. 2. The spring-arms O and O' have their free ends O<sup>4</sup> and O<sup>5</sup> curved to be readily engaged by lugs P and P', respectively, secured to the arms K and K', respectively, above described.

The operation is as follows: When the several parts are in the position as illustrated in the drawings, then the valve G is seated over and closes the inlet-ports of the chest F, while the outlet-ports of said chest F are left open to exhaust the cylinder E. Meanwhile the valve G' is seated over and closes the outlet-ports of the chest F', while the inlet-ports of said chest F' are left open, so that the motive agent can pass through the chamber F<sup>3</sup> into the cylinder E', forcing the piston D' in the direction of the arrow a', and thereby moving the power-rod C, the piston B, and the piston D in the same direction, as will be readily understood by reference to Fig. 3. The movement of the power-rod C to the left, as described, causes the arm K to engage the collar L<sup>2</sup> of the spring L, the other end of which abuts with its collar L<sup>4</sup> onto the collar N of the rod J; but as the said collar N abuts against the shoulder O<sup>2</sup> of the spring-arm O the rod J is held in a locked position and the spring L is compressed on the further motion of the arm K to the left. When the piston D' is near the end of its stroke outwardly, then the lug P on the arm K comes in contact with the curved end O<sup>4</sup> of the spring-arm O, so as to move the said spring-arm rearwardly, disconnecting the shoulder O<sup>2</sup> from the collar N, whereby the spring L is released, and the latter exerts its pressure on the said collar N and forces the rod J to the left. By doing so the positions of the valves G and G' are changed as the rod J is swung outwardly and carries the valve G from the chamber F<sup>2</sup> into the chamber F<sup>4</sup>, while the arm I' is swung inwardly and moves the valve G' from the chamber F<sup>5</sup> into the chamber F<sup>3</sup>. By this movement the inflow of the motive agent is cut off from the cylinder E', while the motive agent entering the chamber F<sup>2</sup> can flow into the cylinder E, the outlet of the latter being closed by the valve G being seated in the chamber F<sup>4</sup> over the outlet-pipe F<sup>6</sup>. The motive agent flowing into the cylinder E now exerts its pressure against the piston D, forcing the latter in the inverse direction of the arrow a', thus carrying the power-rod C, the piston B, and the piston D' in the same direction, the motive agent in the cylinder E' being discharged through the valve G' into the chamber F<sup>5</sup>, and

from the latter (passes) to the outlet F<sup>7</sup>. When the rod J was shifted to the left, as previously explained, the collar N' was passed beyond the shoulder O<sup>3</sup> of the spring-arm O' toward the collar L<sup>3</sup>. Now when the power-rod C moves in the inverse direction of the arrow a' the arm K' compresses the spring L' and finally releases the same at the time the lug P' engages the end O<sup>5</sup> and moves the spring-arm O' rearwardly to disengage the lug O<sup>3</sup> from the collar N'. This takes place at the time the piston D is at or near the end of its outward stroke. As soon as the spring L' is released it forces the rod J to the right, thus changing the relative positions of the valves G and G', moving the same back into the original position shown in Figs. 2 and 3. The above-described operation is then repeated.

It will be seen that this motor is very simple and durable in construction, is completely automatic in operation, and develops considerable power, it being understood that the stroke of the piston B is equal to that of each of the pistons D and D'. It will further be seen that the motor is not liable to get out of order, and as the most of the parts are located on the outside of the cylinders and chests they can be readily examined and inspected at all times to insure their proper workings.

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

1. In a motor-engine, the combination, with a balanced valve, valve-stem, and valve-operating mechanism, of a hollow cylindrical valve-seat fitting closely about said valve, a circular series of inlet-ports occupying the inner half of said valve-seat and extending entirely around the same, an inlet-chamber passing entirely around and inclosing said series of inlet-ports and provided with supply-pipe connections, a circular series of outlet-ports occupying the outer half of said valve-seat and extending entirely around the same, an outlet-chamber adjacent to and separated by a common partition from said inlet-chamber and passing entirely around said series of outlet-ports, so as to inclose the same, and provided with discharge-pipe connections, and a circular head bolted to said outlet-chamber, provided with a stuffing-box to receive said valve-stem at its center and closing the outer end of said valve-seat, substantially as specified.

2. In a motor-engine, the combination, with a single-acting piston and cylinder, of a hollow cylindrical valve-seat, a circular series of supply-ports occupying the inner half of said valve-seat and extending entirely around the same, a circular series of exhaust-ports occupying the outer half of said valve-seat and extending entirely around the same, a hollow cylindrical balanced valve adjusted to operate piston-like within said valve-seat and to open and close the aforesaid two se-

ries of ports alternately, a valve-stem fastened axially to said valve, a supply-chamber extending entirely around and inclosing said series of supply-ports and provided with supply-pipe connections, an exhaust-chamber extending entirely around and inclosing said series of exhaust-ports and provided with exhaust-pipe connections, and a circular head bolted to said exhaust-chamber so as to close the outer end of said valve-seat and provided with a stuffing-box to receive said valve-stem, substantially as specified.

3. In a motor and with each of a pair of oppositely-arranged cylinders, the combination of a valve-chest provided with a hollow cylindrical valve-seat having a series of inlet-ports around its inner half, a series of outlet-ports around its outer half, an inlet-chamber inclosing said inlet-ports and provided with a supply-pipe and connections, an outlet-chamber inclosing said outlet-ports and provided with a discharge-pipe and connections, and a hollow cylindrical balanced valve provided with an axial stem and adjusted to slide in said valve-seat, substantially as shown and described.

4. In a motor and with each of a pair of oppositely-arranged cylinders containing connected pistons, the combination of a valve-chest comprising a hollow cylindrical valve-seat having a series of inlet-ports around its inner half and a series of outlet-ports around its outer half, an inlet-chamber inclosing said series of inlet-ports and provided with a supply-pipe and connections, an outlet-chamber inclosing said series of outlet-ports and provided with an exhaust-pipe and connections, and a head bolted to said outlet-chamber and provided with a stuffing-box, a hollow cylindrical balanced valve fixed rigidly to an axial stem and adapted to open and close the aforesaid two series of ports alternately, and means for operating said valve by the action of said pistons, substantially as specified.

5. In a motor and with each of a pair of oppositely-arranged cylinders having pistons connected by a power-rod, the combination of a valve-chest comprising a hollow cylindrical valve-seat having a series of inlet-ports around its inner half and a series of outlet-ports around its outer half, an inlet-chamber inclosing said series of inlet-ports and provided with supply-pipe connections, an outlet-chamber inclosing said series of outlet-ports and provided with exhaust-pipe connections, a circular head bolted to said outlet-chamber and provided with a central stuffing-box, a hollow cylindrical balanced valve provided with a central hub and radial spokes and adapted to open and close said two series of ports alternately, and a valve-stem fixed axially to said hub and adapted to slide in said stuffing-box, substantially as specified.

6. In a motor and with two valves mounted to slide and two power pistons connected by

a power-rod, the combination of a pair of pivoted levers of the second class connected one with each stem of said valves, a shifting rod connecting the said levers with each other, springs held on the said shifting rod and adapted to abut against collars on the same, spring-catches having curved ends and adapted to lock said shifting rod in place, and arms projecting from said power-rod and adapted by sliding on said shifting rod to compress said springs, and curved lugs on said arms adapted by tripping said spring-catches to unlock said shifting rod, substantially as specified.

7. In a motor, the combination, with two valves mounted to slide, of pivoted arms connected with the stems of the said valves, a rod connecting the said arms with each other, springs held on the said rod and adapted to abut against collars on the same, sliding arms for compressing the said springs, and spring-arms having shoulders for locking the said rod in place and adapted to be tripped by lugs on the said sliding arms, substantially as shown and described.

8. In a motor, the combination, with a balanced valve and a forcing-rod, of a hollow cylindrical valve-seat, a circular series of inlet-ports and a circular series of outlet-ports extending, respectively, around said valve-seat, an inlet-chamber and an outlet-chamber respectively inclosing said inlet-ports and outlet-ports, a circular head-plate covering the outer end of said valve-seat and provided with a stuffing-box, and mechanism for opening and closing said ports alternately, substantially as specified.

9. In a motor and with each of a pair of oppositely-arranged cylinders having pistons connected by a power-rod, the combination of a valve-chest comprising a hollow cylindrical valve-seat having a series of inlet-ports around its inner half and a series of outlet-ports around its outer half, an inlet-chamber inclosing said series of inlet-ports and provided with supply-pipe connections, an outlet-chamber inclosing said series of outlet-ports and provided with exhaust-pipe connections, a circular head bolted to said outlet-chamber and provided with a central stuffing-box, a hollow cylindrical balanced valve provided with a central hub and radial spokes and adapted to open and close said two series of ports alternately, a valve-stem fixed axially to said hub and adapted to slide in said stuffing-box, a lever of the second class attached to said stem by a pivot and slot and secured to said chest by a pivot and bracket, and an actuating mechanism intermediate between said levers and said power-rod, substantially as specified.

BENJAMIN S. PARTRIDGE.

Witnesses:

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W. M. GARNER.