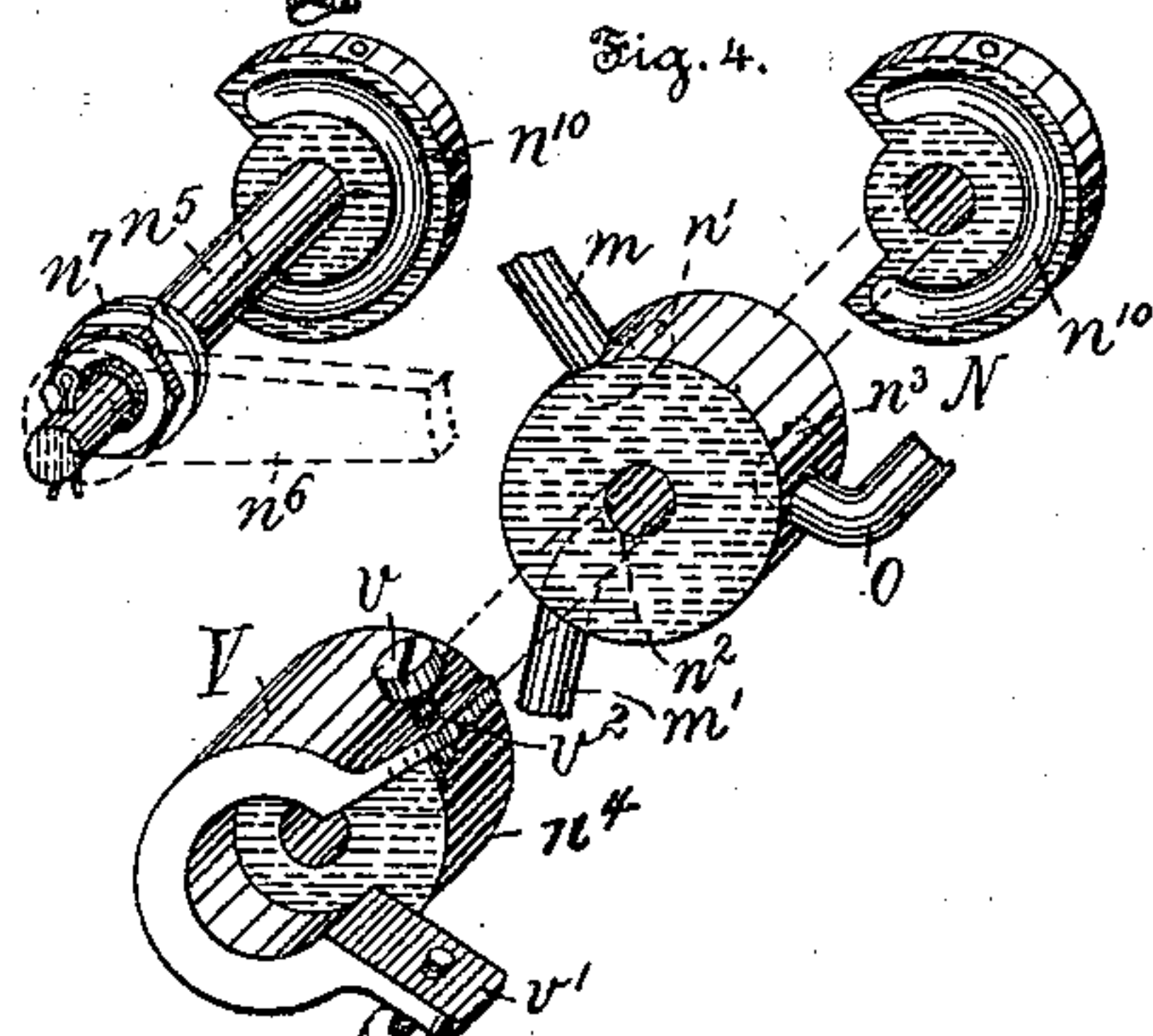
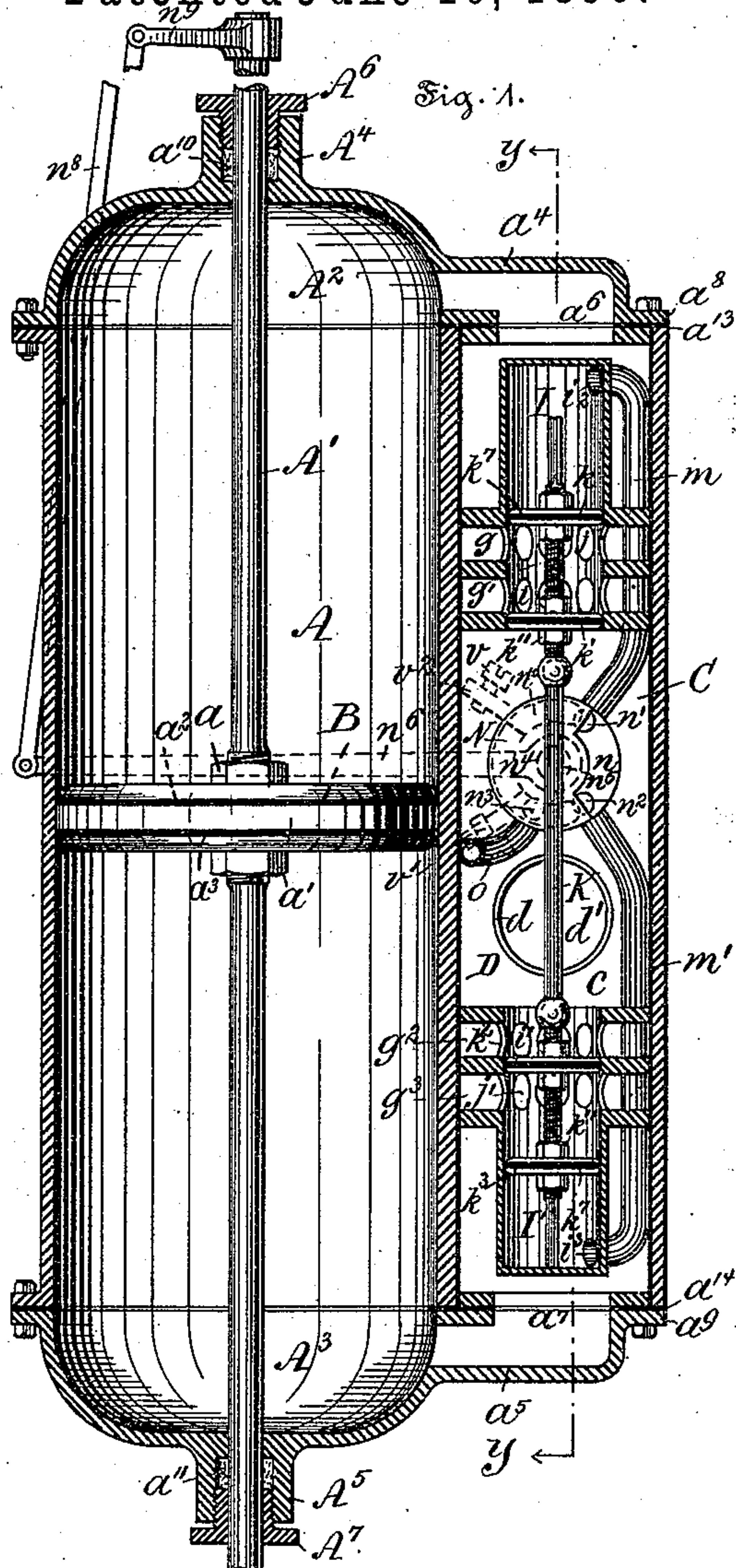
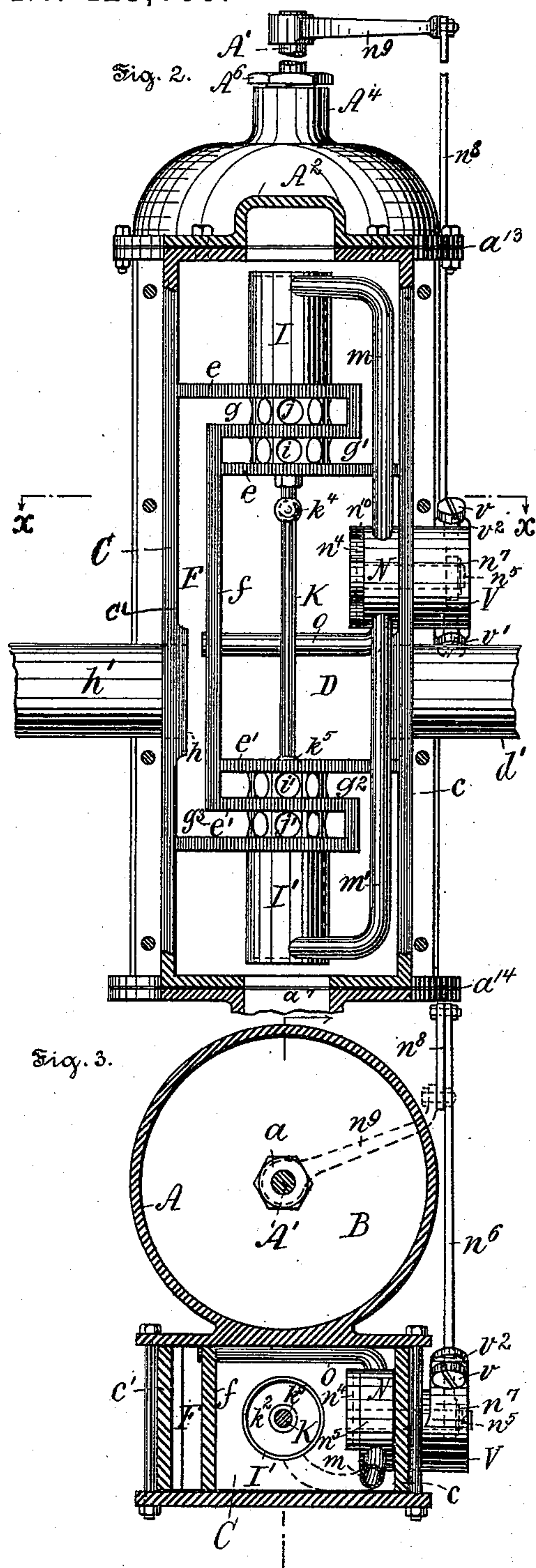


(No Model.)

J. W. BLAKEMORE.  
HYDRAULIC MOTOR.

No. 429,600.

Patented <sup>219</sup>June 10, 1890.



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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 429,600, dated June 10, 1890.

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*To all whom it may concern:*

Be it known that I, JAMES W. BLAKEMORE, a citizen of the United States, residing at Germantown, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hydraulic Motors, of which the following is a specification.

My invention relates to a hydraulic motor more particularly designed for actuating the blowers of organs, while at the same time applicable to various other purposes.

The principal objects of my invention are to provide a hydraulic motor, simple, compact, durable, and effective in action and of such type as to offer little internal resistance and having the following characteristic features: first, a uniform and positive action; second, a capacity for a gradual admission and cut-off of the water to the main cylinder so that shock incident thereto may be obviated and the action of the motor thereby rendered comparatively noiseless; third, arranged so that water under pressure actuates the valves thereof before entering the main cylinder and capable of being stopped and started without the overcoming of a neutral point; and, fourth, a motor in which its capacity may be readily increased in the event of the failure of water-pressure.

The nature and characteristic features of my invention will be more fully understood taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a vertical central section of a hydraulic motor embodying the characteristic features of my invention. Fig. 2 is a vertical section on the line *y y* of Fig. 1, showing the chambers in the combined valve-box and water-chest and the eduction and induction pipes thereof. Fig. 3 is a horizontal section on the line *x x* of Fig. 2, showing the mechanism for operating the valve-cock of said box; and Fig. 4 is a view in perspective of my improved valve-cock with the parts thereof detached, and showing also portions of the induction and eduction pipes connected with the respective cylinders of the combined valve and chest.

Referring to the drawings, A is the main cylinder of suitable construction.

A' is a vertical rod to which is centrally secured a piston B, held in position on said rod by means of nuts *a* and *a'*. The piston-rod A' extends through the respective cylinder-heads A<sup>2</sup> and A<sup>3</sup>, which are secured in any preferred manner to the cylinder A. The piston B is provided with suitable packing-rings *a*<sup>2</sup> and *a*<sup>3</sup>, which are held snugly between the respective faces of the piston B by means of the nuts *a* and *a'*. The cylinder-heads A<sup>2</sup> and A<sup>3</sup> are provided with annular vertical projections A<sup>4</sup> and A<sup>5</sup>, forming chambers into which are introduced stuffing-boxes A<sup>6</sup> and A<sup>7</sup>, with gaskets *a*<sup>10</sup> and *a*<sup>11</sup>, interposed between the inner faces of the stuffing-boxes A<sup>6</sup> and A<sup>7</sup>, and the annular chambers A<sup>4</sup> and A<sup>5</sup>, for affording tight joints between them. These cylinder-heads A<sup>2</sup> and A<sup>3</sup> are also provided with annular curved shaped extensions *a*<sup>4</sup> and *a*<sup>5</sup>, having interior ports *a*<sup>6</sup> and *a*<sup>7</sup>, and with inner and outer annular rims *a*<sup>8</sup> and *a*<sup>9</sup>, to which the combined valve-box and water-chest C is secured. Gaskets *a*<sup>13</sup> and *a*<sup>14</sup>, made of rubber or other material, are interposed between the rims *a*<sup>8</sup> and *a*<sup>9</sup> and the ends of the box or chest C, in order that tight joints may be insured thereat.

The combined valve-box and water-chest C is preferably constructed rectangular in shape with an induction-chamber D, and in the wall *c* of the box is formed an orifice *d* for the reception of the inlet-pipe *d'*. Formed, preferably, integral with the valve-box C are two or more horizontal partition-walls *e* and *e'* and a vertical partition-wall *f*. Between the horizontal partition-walls *e* and *e'*, cast, preferably, with the box C, are formed passages *g*, *g'*, *g*<sup>2</sup>, and *g*<sup>3</sup>, and between the vertical partition-wall *f* and the inner wall *c'* of the box C is formed an eduction-chamber F, and in the wall *c'* of the rectangular-shaped box C is provided an orifice *h* for the reception of the waste-pipe *h'*. Formed, preferably, integral with the upper and lower horizontal partition-walls *e* and *e'* are valve-cylinders I and I', which project downward and upward, respectively, through the partition-walls of the horizontal passages *g*, *g'*, *g*<sup>2</sup>, and *g*<sup>3</sup>. These cylinders are provided with annular rows of small ports or openings *i*, *i'*, *j*, and *j'*. With in the cylinders I and I' play freely up and



down double pistons  $k, k', k^2$ , and  $k^3$ , suitably mounted on a vertical rod K, provided with universal connections  $k^4$  and  $k^5$ , in order to avoid jamming and sticking of the said pistons. The respective pistons  $k, k', k^2$  and  $k^3$  are each provided with interposed packing-rings  $k^7$ , held in position between the respective faces of the pistons by means of nuts  $k^{11}$ .

In the upper part of the valve-cylinders I and I' are provided ports  $i^2$  and  $i^3$ , communicating with curved pipes  $m$  and  $m'$  in communication with the seat  $n$  of a three-way cock N. This seat  $n$  is located in the induction-chamber D, near the outer wall  $c$  of the rectangular-shaped box C. The seat  $n$  of the valve-cock N is provided with three ports  $n', n^2$ , and  $n^3$ , two of which  $n'$  and  $n^2$  communicate with the curved pipes  $m$  and  $m'$ , leading directly into the respective cylinders I and I'. The port  $n^3$  of the seat of the valve-cock N communicates with a waste-pipe  $o$ , extending through the inner vertical wall  $f$  of the eduction-chamber F. The plug  $n^4$  of the cock N is cut away for a portion of its surface, as shown in Figs. 1 and 4, and to this plug is attached the valve-stem  $n^5$ , extending through the seat  $n$ . On the outer extremity thereof is loosely mounted an arm  $n^6$ , which is held to place on said stem by means of a collar  $n^7$ . To the arm  $n^6$  is pivoted a vertical lever-arm  $n^8$ , which is pivotally connected with a horizontal arm  $n^9$ , mounted in any preferred manner on the upper extremity of the piston-rod A' of the main cylinder A, whereby said three-way cock N is automatically operated by the presence of the water introduced into the induction-chamber D through the inlet-pipe  $d'$ . In the inner surface of the seat  $n$  is preferably formed a circular groove  $n^{10}$ , which communicates with the pipe  $o$ , forming an exit-channel for the waste water of the valve-cylinders I and I'. It is, however, obvious that the valve-seat  $n$  may be provided with an annular recess and the plug  $n^4$  of the three-way cock smoothly faced, and, moreover, that the valve-cock N and the piston-rod A' could be connected with each other by means of tappets mounted on the oscillating lever-arms  $n^8$  and  $n^9$  for permitting of the actuation of the piston B of the main cylinder A; but, however, I prefer to avail myself of the means and mechanism arranged substantially in the manner illustrated in the drawings, and as hereinbefore fully described.

The manner of operating the motor may be explained as follows: Water is introduced under pressure from a service-pipe through the inlet-pipe  $d'$  into the induction-chamber D, and thence through the ports  $n'$  or  $n^2$  and the pipes  $m$  and  $m'$  to the valve-cylinder I or I', as shown in Fig. 1. The water having entered the valve-cylinder I through the port  $n'$  and pipe  $m$ , the pistons  $k'$  and  $k^2$  are brought into the position as shown in Fig. 1, and the water under pressure in the induction-chamber D is conducted through the ports  $i'$  of the valve-cylinder I', the chamber

$g^2$ , and thence through the port  $a^7$  of the main cylinder-head A<sup>3</sup> into the main cylinder A, actuating the piston B and its rod A' in an upward direction. By this movement of the piston B and the rod A' the arm  $n^6$  of the three-way cock N is caused to tip the set-screw  $v$  of the collar V, having projections  $v^2$  rigid with the plug  $n^4$ , and thereby revolving the plug  $n^4$  sufficiently to cover the port  $n'$  in the valve-seat and to open the port  $n^2$ . By this operation of the apparatus the water assumes a reverse movement and flows through the port  $n^2$  and pipe  $m'$  into the valve-cylinder I', driving the pistons  $k'$  and  $k^2$  in an upward direction, and the waste water in the cylinder I is driven backward through the pipe  $m$ , port  $n'$ , groove  $n^{10}$ , and waste-pipe  $o$  into the eduction-chamber F, and through the waste-pipe  $h'$  into any suitable receptacle or underground pipe. The pistons  $k'$  and  $k^2$  being in a reversed position, as shown, for instance, in Fig. 1, the water contained in the induction-chamber D is allowed to enter the main cylinder A through the ports  $i$ , passage  $g'$ , port  $a^6$  of the main cylinder-head A<sup>2</sup>, and thereby causing the piston B to be driven in a downward direction to its full stroke. The waste water on the other side of the piston is caused to escape through the port  $a^7$  of the main cylinder-head A<sup>3</sup>, the passage  $g^2$ , ports  $i'$ , and a part of cylinder I', ports  $j'$ , chamber  $g^3$ , into the eduction-chamber E and waste-pipe  $h'$ . By the downward stroke of the piston B and of its rod A' the arm  $n^6$  is caused to tip the set-screw  $v'$  of the collar V, thereby actuating the plug  $n^4$  to cause it to close the port  $n^2$  and open the port  $n'$ , again reversing the direction of movement of the water operating the respective pistons, as in the former instance, and the operations are thus repeated in regular succession.

The length of the stroke of the piston B is regulated by the set-screw  $v$  and  $v'$  of the collar V, as will be readily understood by reference to Figs. 1 and 4 of the drawings.

It is manifestly obvious as to minor details of mechanical construction of the parts of the apparatus that modifications or changes may be made without departing from the real spirit of the invention.

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

1. The combination, in a hydraulic motor, of a main cylinder provided with a piston and a rod and with extensions forming direct communications with a rectangular-shaped valve-box and water-chest provided with induction and eduction chambers, two cylinders and two valves in said box, two pistons connected with a rod having universal joints, a three-way cock, and means, substantially as described, for causing motion to be imparted to the pistons of said main and valve cylinders, substantially as and for the purposes set forth.

2. The combination, in a hydraulic motor,



of a main cylinder having a piston mounted on a rod, a valve-box and water-chest provided with an induction-chamber, an education-chamber and end ports to the main cylinder, two valve-cylinders communicating at one end thereof with said induction-chamber and provided with annular rows of perforations leading to said end ports and to said education-chamber, two pistons and two valves mounted on a piston-rod having universal joints and caused to play up and down in said valve-cylinders, a waste-pipe from said cock to said education-chamber, and mechanism, substantially as described, for connecting said cock with the piston-rod of said main cylinder, substantially as and for the purposes set forth.

3. The combination, in a hydraulic motor, of a main cylinder provided with a piston and a rod, and the extensions of said cylinder forming communications with a valve-box

and water-chest provided with induction and education chambers, two cylinders and two valves in said box, two pistons connected with a rod provided with a universal connection, a valve-seat having three ports located in said induction-chamber, pipes from two of said ports to said cylinders and from the other of said ports to said education-chamber, a plug having a portion of the surface cut away, an annular recess between said plug and seat, and means for imparting motion to the pistons of said main and valve cylinders, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JAS. W. BLAKEMORE.

Witnesses:

GEO. W. REED,  
THOMAS M. SMITH.