No. 697,143. Patented Apr. 8, 1902.

J. HARDING, JR.

FLUID POWER TRANSMISSION MECHANISM.

(Application filed May 9, 1901.)

(No Model.) 4 Sheets—Sheet 1.

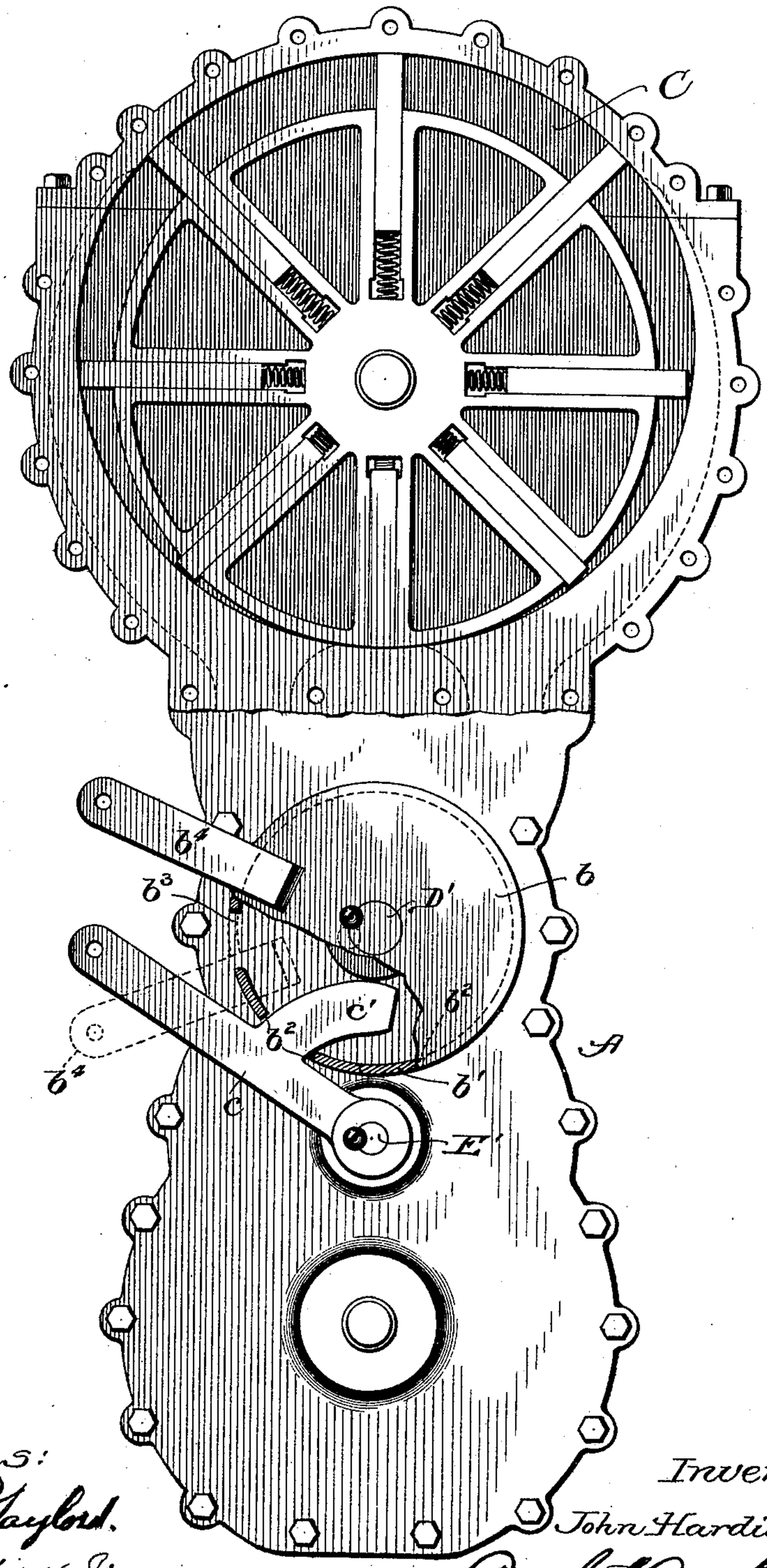

Fig. 1.

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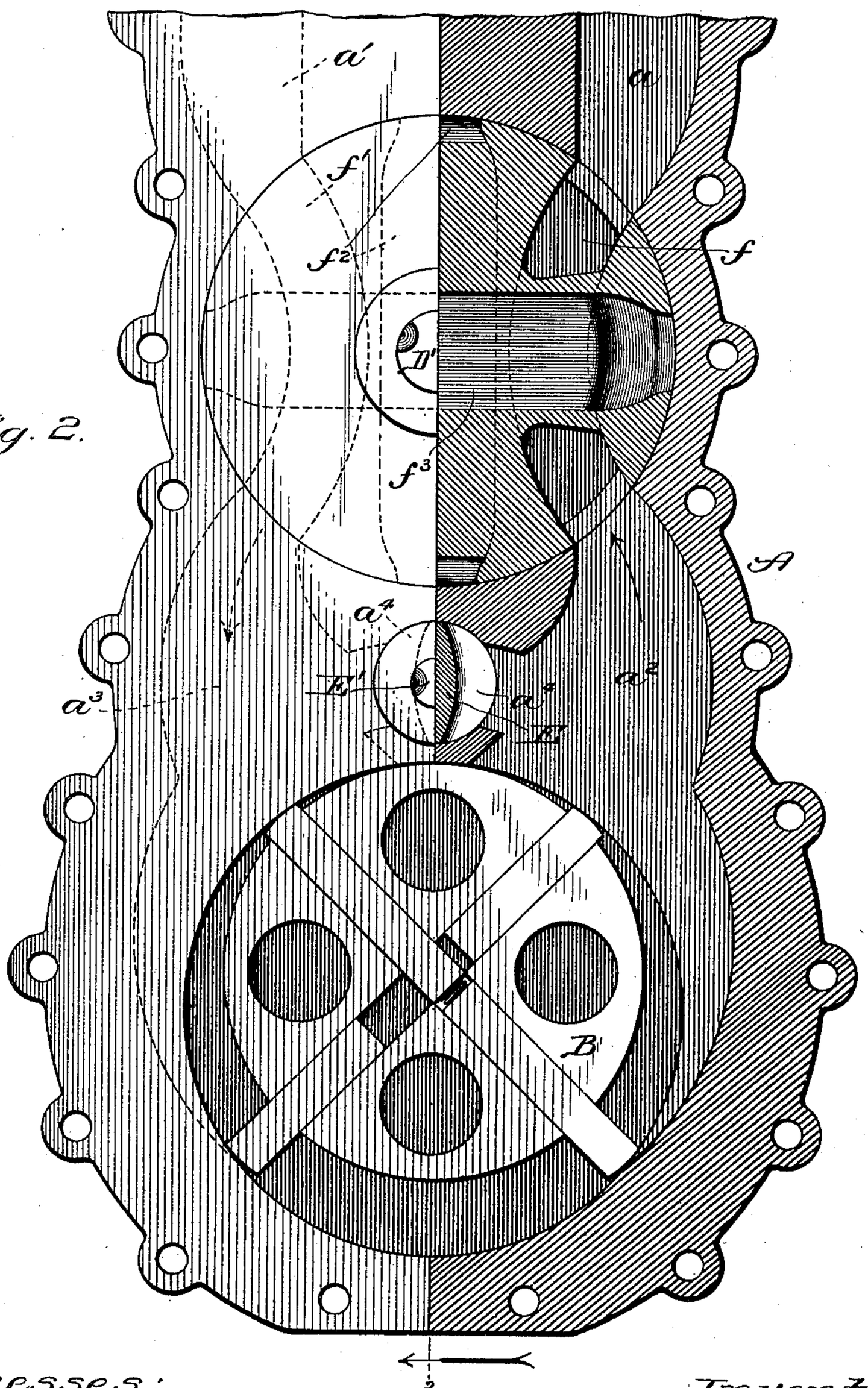
Fig. 2.



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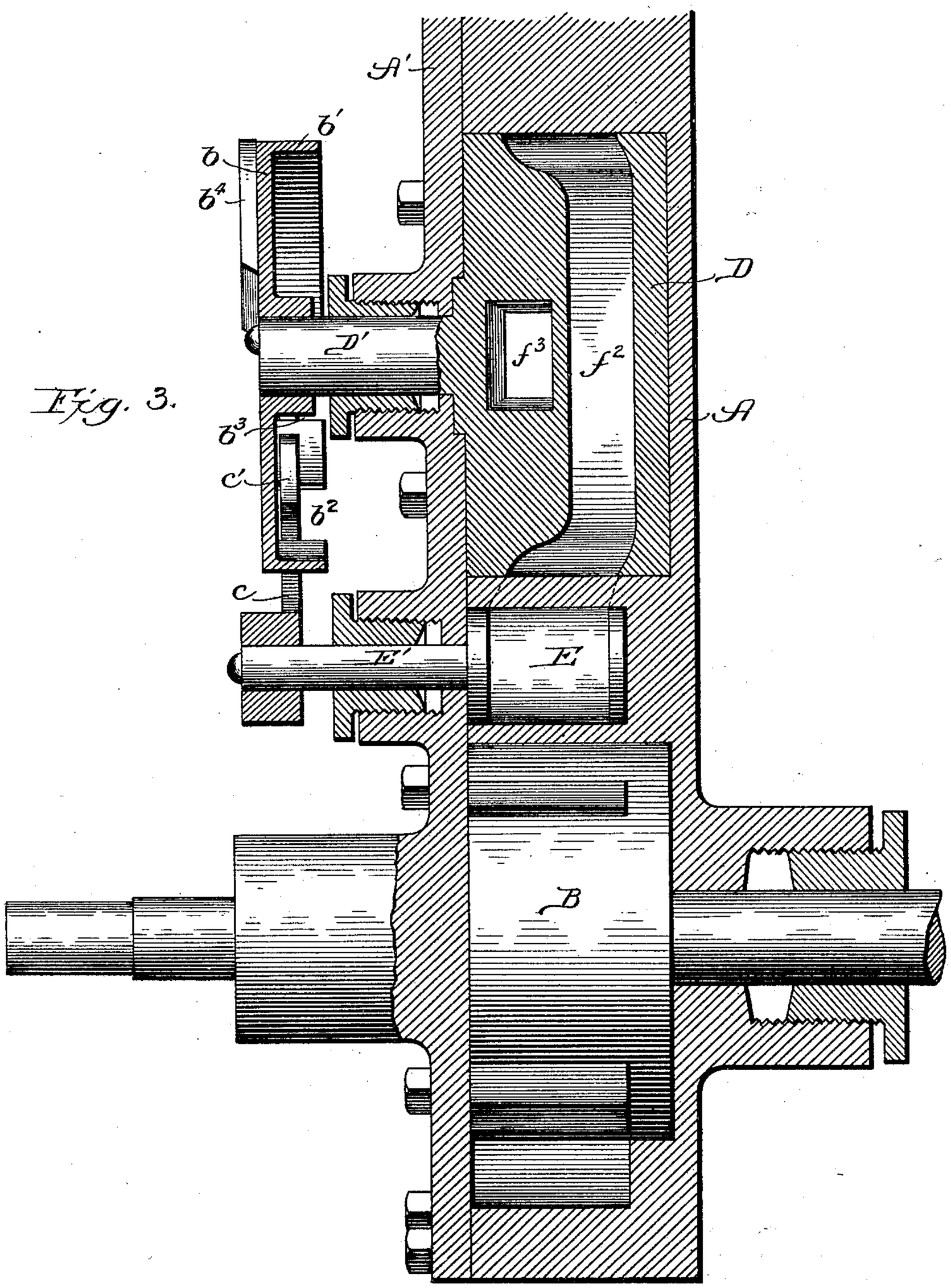
FLUID POWER TRANSMISSION MECHANISM.

(Application filed May 9, 1901.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



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FLUID POWER TRANSMISSION MECHANISM.

(Application filed May 9, 1901.)

(No Model.) 4 Sheets—Sheet 4.

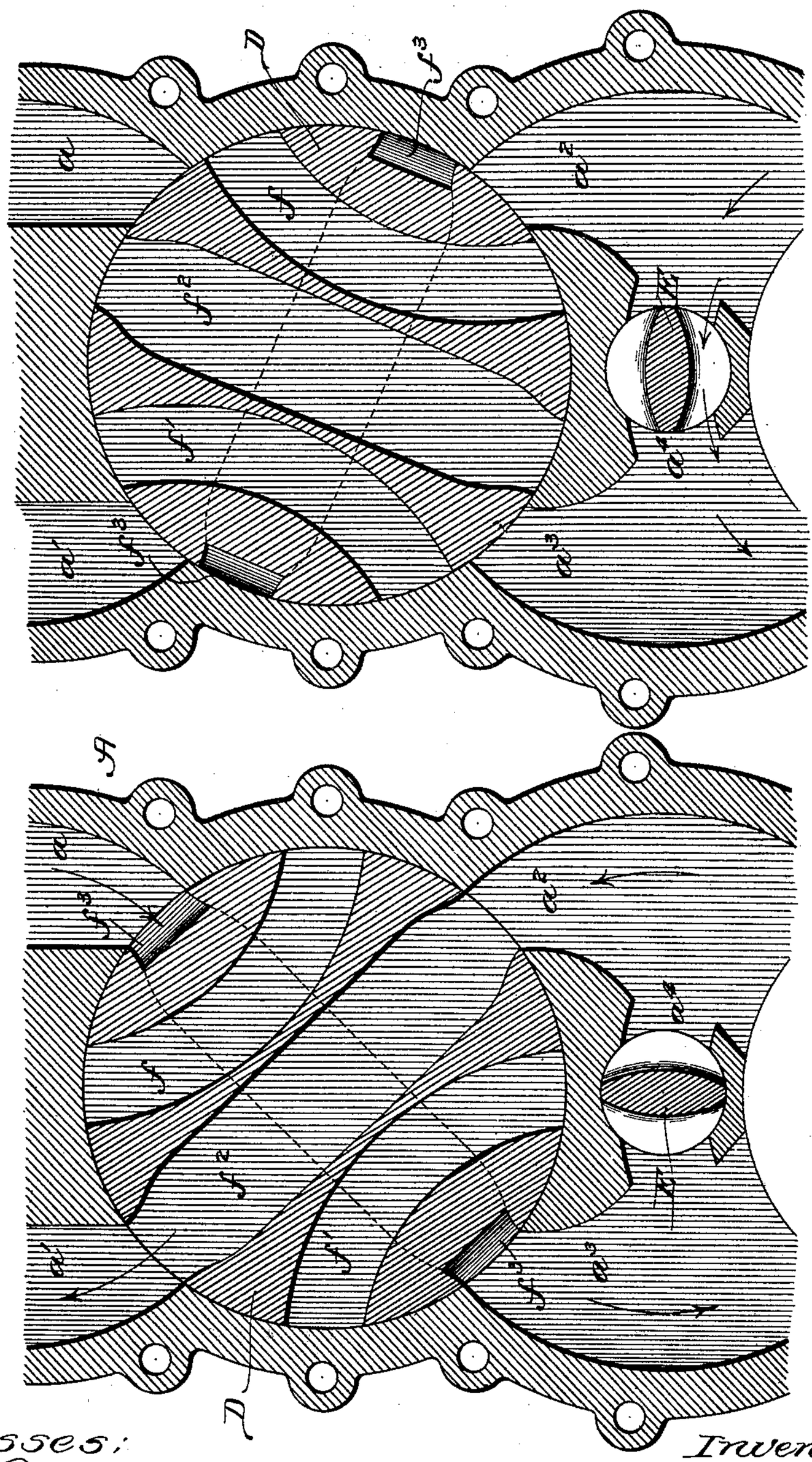

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN HARDING, JR., OF CHICAGO, ILLINOIS.

FLUID-POWER-TRANSMISSION MECHANISM.

SPECIFICATION forming part of Letters Patent No. 697,143, dated April 8, 1902.

Application filed May 9, 1901. Serial No. 59,501. (No model.)

To all whom it may concern:

Be it known that I, JOHN HARDING, Jr., a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Fluid-Power-Transmission Mechanism, of which the following is a specification.

My invention relates particularly to fluid-power-transmission mechanism wherein are employed a fluid-circulating device, a fluid-motor, and a reversing-valve interposed between the fluid-circulating device and the fluid-motor, the fluid-circulating device being operated usually by a prime motor running at a given speed.

My primary object is to provide improved means for regulating the speed of the fluid-motor and to provide improved safety means for preventing accidental closure of the fluid-circuit while the circulating device is in operation.

My invention is illustrated in its preferred form in the accompanying drawings, in which—

Figure 1 is a view of my improved power-transmission mechanism, showing the same in elevation, but with a portion of the front side plate removed; Fig. 2, an enlarged broken view showing the lower portion of the same, the front plate being removed and a portion being in section; Fig. 3, a broken section taken as indicated at line 3 of Fig. 2; Fig. 4, an enlarged broken section parallel to the front of the casing and illustrating the position of the reversing-valve when the motor is reversed; and Fig. 5, a section similar to Fig. 4, but illustrating the position of said valve when the supply of fluid to the motor is entirely cut off.

A description of the preferred construction is as follows:

A represents a casing provided with a removable front plate A′; B, a rotary pump located in the lower portion of said casing; C, a rotary fluid-motor located in the upper portion of said casing; D, a reversing-valve located in said casing intermediate said pump and motor and provided with an operating-stem D′, and E an independent speed-controlling valve located in said casing intermediate the pump B and the reversing-valve D, the same being provided with an operating-stem E′.

The casing is provided between the motor and reversing-valve with passages or channels a a' and between the reversing-valve and pump with passages a^2 a^3, connected by a passage a^4, the latter affording a by-pass through which the fluid passes idly when the valve E, which controls said by-pass, is open. The stem D′ of the reversing-valve is equipped with a disk b, having a flange b', the latter being provided with slots or perforations b^2 b^3, said disk being shown broken away in Fig. 1 to expose said slots. Connected with the disk b is an arm b^4, through the medium of which the reversing-valve is actuated. The stem E′ of the speed-controlling valve is equipped with an operating-arm c, having a curved projection c' with its center of curvature in the stem E′, said projection being adapted to enter either the slot b^2 or the slot b^3, according to the position of the reversing-valve. The reversing-valve is provided with direct passages f f' and cross-passages f^2 f^3.

Fig. 2 shows the valve D set with the direct passages f f' connecting the passages a^2 a^3 with the passages a a', respectively, and also shows the valve E closed. This position corresponds with the positions of the valve-actuating arms b^4 c illustrated in full lines in Fig. 1, and it will be observed that while the valve D is in this position the arm c may be swung to open the valve E any desired distance to permit any portion of the liquid being circulated by the pump to pass idly through the passage a^4. When the valve E is completely open, the projection c' is disengaged from the slot b^2, and the valve D may then be turned to reverse the motor. The dotted lines of Fig. 1 illustrate the position of the disk b and the arm b^4 when the reversing-valve is in the proper position to reverse the motor, as illustrated in Fig. 4. When the valve D is in the reverse position, the slot b^3 occupies a position corresponding to the full-line position of the slot b^2, (shown in Fig. 1,) and in this position will receive the projection c', permitting the valve E to be closed. In any other position than the positions mentioned the flange on the disk b will prevent

the arm *c* from being swung upwardly to assume the position shown in Fig. 1. It appears, therefore, that it is impossible to direct fluid from the pump to the motor by closing the valve E unless the valve D is first set to admit fluid in one direction or another to the motor. Fig. 5 illustrates the position of the valve D in which the fluid-supply to the motor is cut off.

It may be observed that in practice the arms *c* and b^4 will be connected with suitable hand-levers and that certain positions of the hand-levers will correspond with the several positions of the valves already indicated. Any suitable pump or fluid-circulating means may be provided and any suitable passages for the fluid may be provided. So, also, any suitable motor may be employed. Preferably I employ a motor such as is illustrated generally in Fig. 1 and is described in detail and claimed in my application, Serial No. 59,500, filed on even date herewith.

The operation may be briefly summarized thus: The valve D for direct motion of the motor is set in the position shown in Fig. 2. In this position the slot b^2 occupies the position shown in Fig. 1. When it is desired to start the motor, the valve E is moved, and this action is permitted by the slot b^2 receiving the projection *c'*. Fig. 1 illustrates the position when the motor is receiving the full current. Any amount of current between the maximum and zero may be supplied to the motor by swinging the arm *c* downwardly, thereby to open the speed-controlling valve E and permit a greater or less quantity of fluid to pass idly through the by-pass a^4. When it is desired to reverse the motor, the arm *c* is swung downwardly to disengage the projection *c'* from the slot b^2, after which the valve D may be moved by swinging the arm b^4 downwardly to the position shown in dotted lines. The valve E may then be closed to any desired extent, thereby to direct any desired quantity or all of the fluid to the motor.

Changes in details of construction within the spirit of my invention may be made. Hence no limitation is to be understood from the foregoing detailed description except as shall appear from the appended claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In fluid-transmission mechanism, the combination of a fluid-circulating device, a fluid-actuated motor, an interposed reversing-valve, a by-pass through which the fluid may pass idly, a speed-controlling valve at said by-pass, and interlocking means for said valves, substantially as and for the purpose set forth.

2. In fluid-transmission mechanism, the combination of a fluid-circulating device provided with a by-pass through which the fluid may pass idly, a speed-controlling valve at said by-pass, a reversing-valve, a fluid-actuated motor, fluid-passages connecting said fluid-circulating device, said valves and said motor, actuating-stems for said valves, and interlocking heads on said stems, the head on said reversing-valve stem being provided with two recesses corresponding to the direct and reverse position of said valve, and the head on said speed-controlling valve-stem being provided with a projection for entering either one of said recesses, according to the position of the reversing-valve, substantially as described.

3. In fluid-transmission mechanism, the combination of a fluid-circulating device, a fluid-actuated motor, an interposed reversing-valve, a speed-controlling by-pass valve, a head on the stem of said reversing-valve provided with recesses corresponding to the direct and reverse positions of the said valve, and an interlocking head on the stem of said speed-controlling valve, provided with a curved projection having its center of curvature lying in the axis of said last-named valve, said speed-controlling valve being disposed to close said by-pass when said heads are completely interlocked and to open said by-pass when said heads are disengaged from each other, substantially as described.

4. In fluid-transmission mechanism, the combination of a fluid-circulating pump provided with a by-pass, a fluid-actuated motor, an interposed reversing-valve, provided with an actuating-stem, a disk on said stem provided with a flange having recesses corresponding to the direct and reverse positions of said valve, a speed-controlling by-pass valve interposed between said pump and said reversing-valve and provided with an actuating-stem, and an actuating-arm for said stem provided with a curved projection to engage said flange or to enter one of said recesses, according to the position of the reversing-valve, said speed-controlling valve being disposed to close said by-pass when the parts are interlocked and to open the same when the parts are disengaged, substantially as described.

JOHN HARDING, JR.

In presence of—
D. W. LEE,
ALBERT D. BACCI.