(No Model.) 2 Sheets—Sheet 1.

G. M. RICHARDS.

AUTOMATIC FLUID PRESSURE FRICTION CLUTCH.

No. 574,269. Patented Dec. 29, 1896.

FIG. 2.

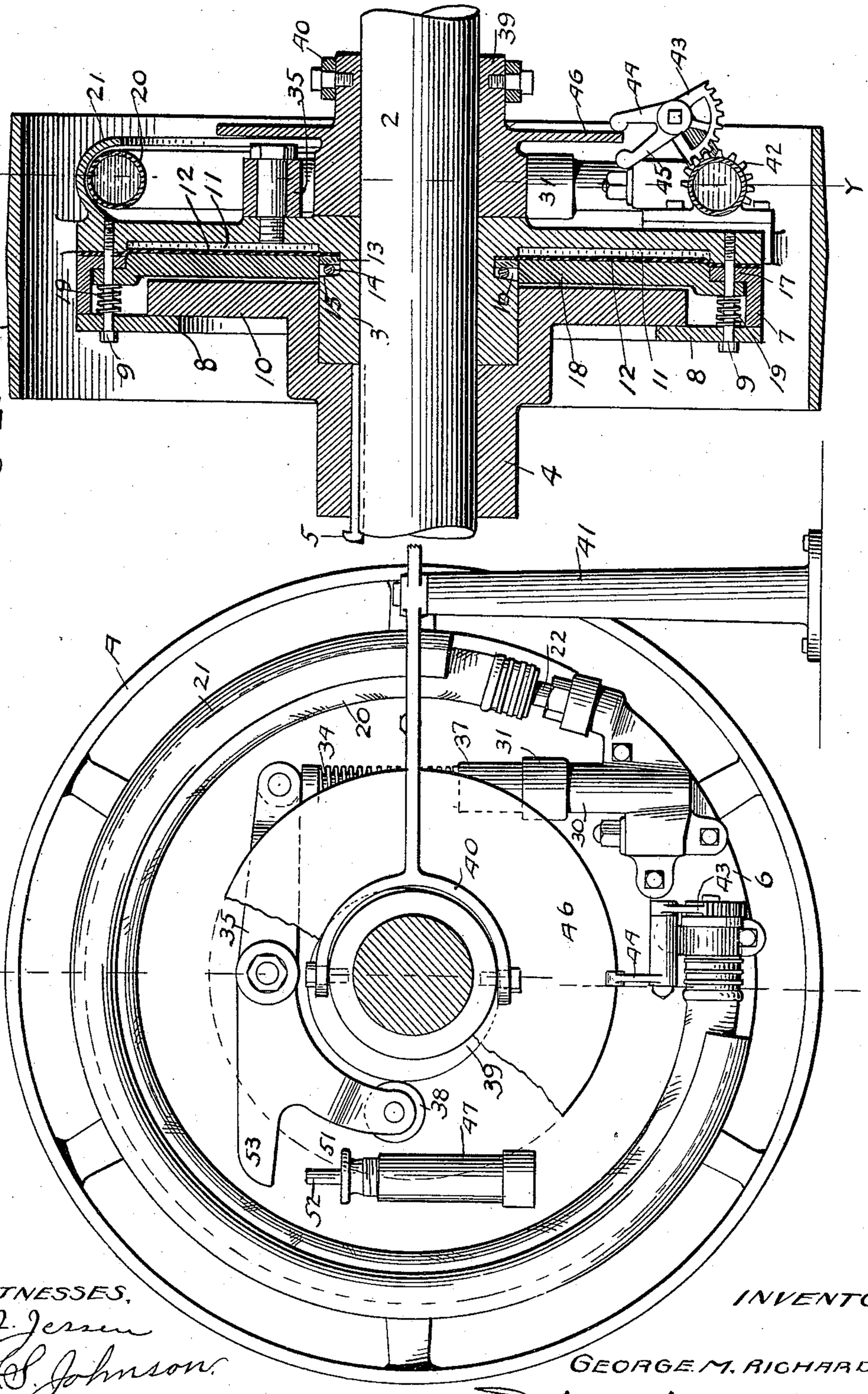

FIG. 1.

WITNESSES,
J. Jessen
H. S. Johnson.

INVENTOR,
GEORGE M. RICHARDS.
BY T. D. Merwin ATT'Y.

(No Model.) 2 Sheets—Sheet 2.

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FIG. 4.

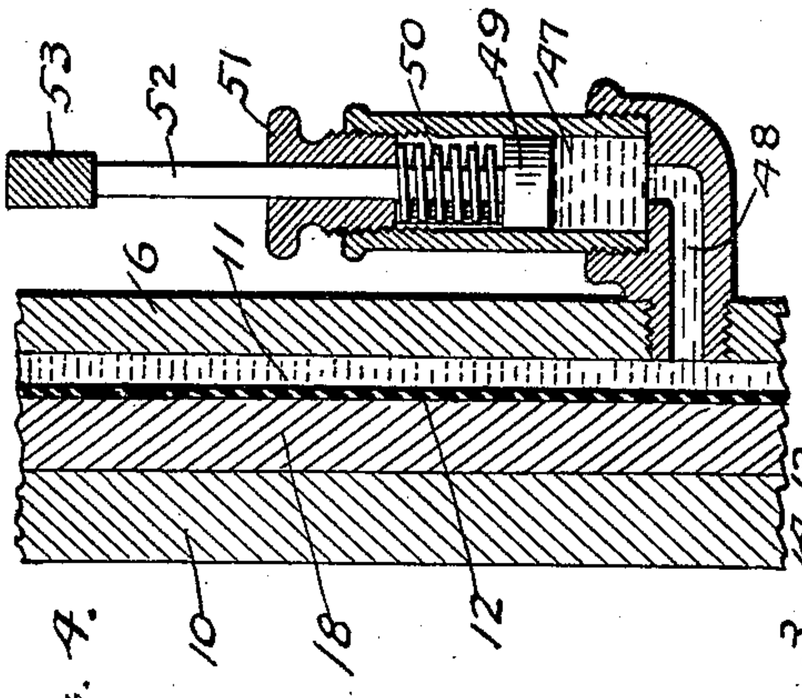


FIG. 5.

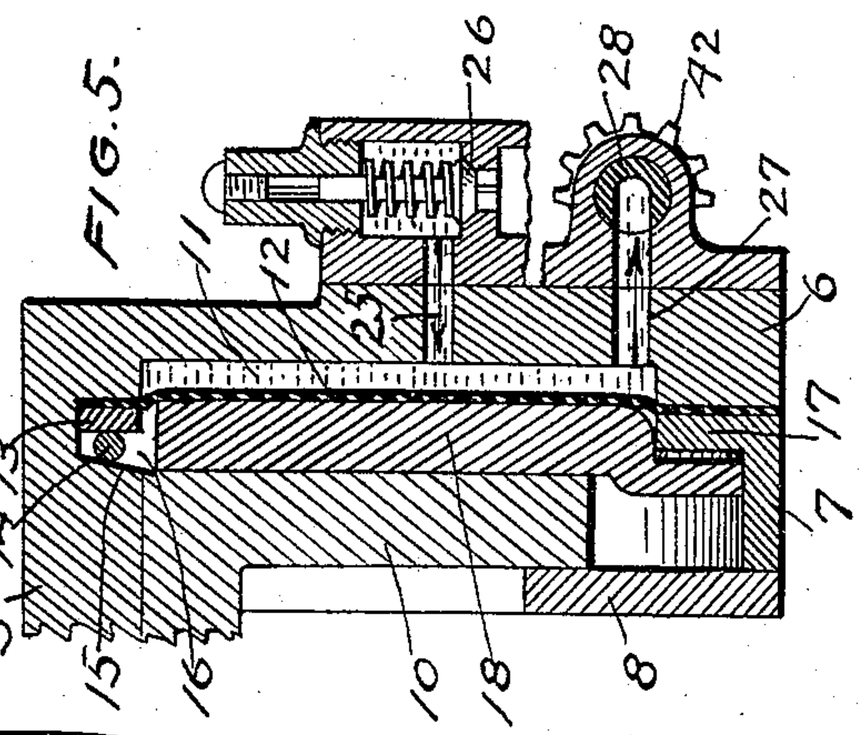
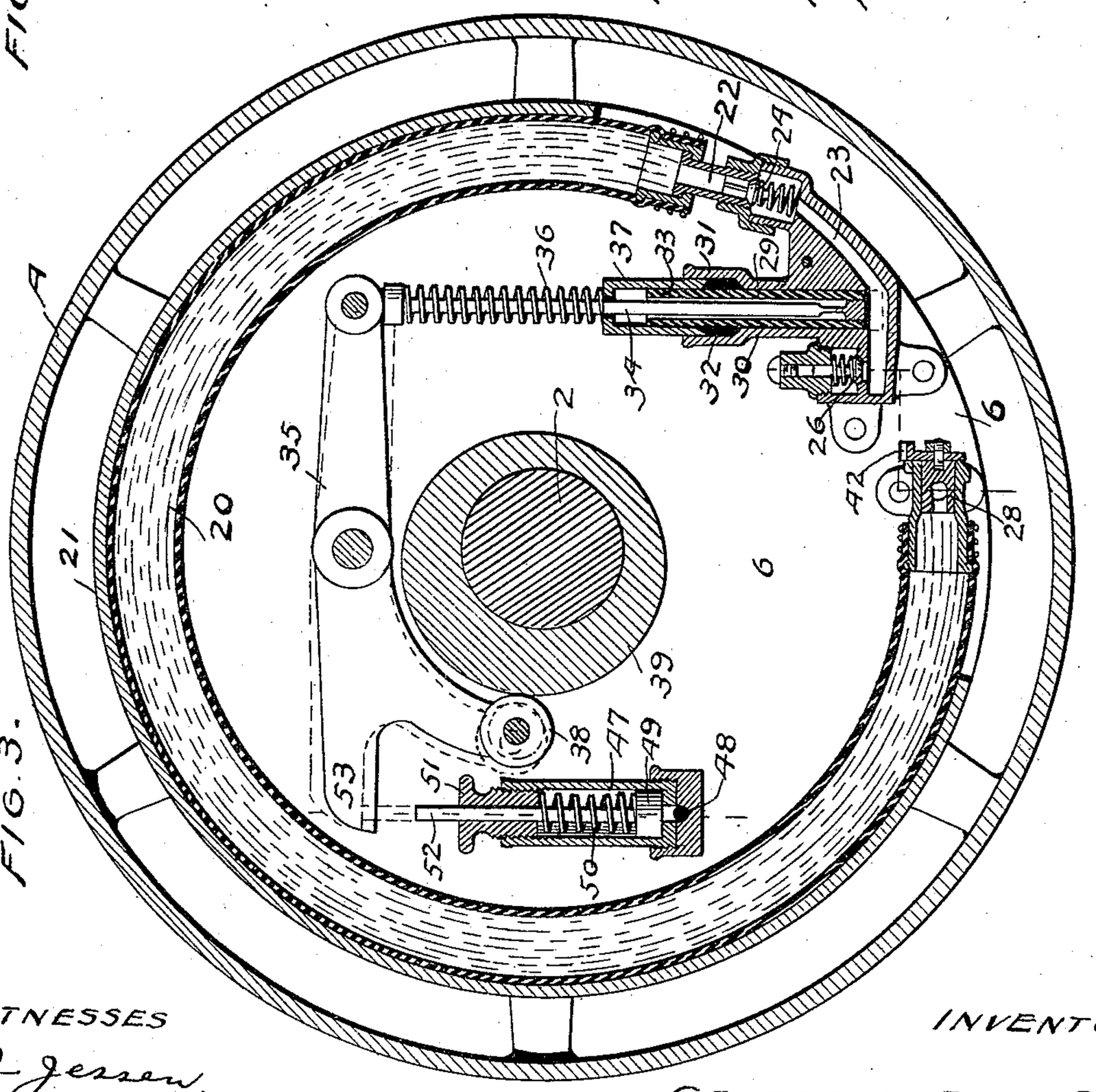


FIG. 3.



WITNESSES

J. Jessen.

H. S. Johnson

INVENTOR.

GEORGE M. RICHARDS.

BY V. D. Mennin ATT'Y.

UNITED STATES PATENT OFFICE.

GEORGE M. RICHARDS, OF ERIE, PENNSYLVANIA.

AUTOMATIC FLUID-PRESSURE FRICTION-CLUTCH.

SPECIFICATION forming part of Letters Patent No. 574,269, dated December 29, 1896.

Application filed July 31, 1896. Serial No. 601,137. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. RICHARDS, of Erie, Erie county, Pennsylvania, have invented certain Improvements in Automatic Fluid-Pressure Friction-Clutches, of which the following is a specification.

My invention relates to improvements in fluid-pressure friction-clutches, its object being to provide an improved construction thereof whereby when the same is thrown into action a predetermined pressure is applied and maintained so long as the driving and driven elements are in engagement.

To this end my invention consists generally in providing the continuously running or driving element of the mechanism with an expansible fluid-chamber, the movable wall of which carries a friction-plate adapted to be brought into contact with a friction-surface upon the driven element, in connecting with said pressure-chamber a collapsible fluid-reservoir, and interposing between the same a pump adapted to be brought into engagement with a relatively stationary part, so as to be automatically operated to force the contents of the reservoir into the chamber until a predetermined pressure is produced therein, and then to be automatically thrown and held out of engagement with said stationary part so long as said predetermined pressure is maintained, but to be again automatically actuated if said pressure falls below the predetermined limit, means also being provided for mechanically throwing said pump into and out of action and for relieving said fluid-pressure chamber by permitting its contents to reflow into the reservoir, said pressure-chamber, reservoir, and pump constituting a fluid-circulating system, and they and their attachments all being carried by the driving element of the apparatus.

My invention further consists in the features of construction hereinafter more particularly described and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 is an end elevation of my improved clutch, showing the pump and fluid-reservoir and attachments. Fig. 2 is a central longitudinal section of the same on line $x\,x$ of Fig. 1. Fig. 3 is a cross-section on line $y\,y$ of Fig. 2. Fig. 4 is a sectional detail of the pump-regulator, and Fig. 5 is a sectional detail of the valve-mechanism.

In the construction shown in the drawings the pulley A and its attachments hereinafter described constitute the continuously running or driving mechanical element, while the shaft 2 with its attachments constitutes the driven element. The pulley-hub 3 is journaled loosely on the shaft 2 and is held from lateral movement thereon in one direction by the hub 4, secured on the shaft 2 by means of the key 5 and socketed to receive the hub 3. The web 6 of the pulley is provided with the cylindrical shell 7, upon the other end of which is secured the annular flange 8 by means of the bolts 9, which flange engages the flange 10, integral with the hub 4, thereby holding the pulley A from lateral displacement in the opposite direction. The inner face of the web 6 has an annular groove or channel which, when inclosed, as hereinafter described, forms the fluid-pressure chamber 11.

12 is a diaphragm of sheet-rubber or other flexible elastic material, which is firmly clamped upon the face of the web 6, so as to cover and inclose the channel and form the chamber 11 by means of the annular ring 13, placed upon its inner edge and clamped against the same by means of the spring-wire 14, wedged between it and the inclined shoulder 15 of the circumferential groove 16 in the hub 3, the inner edge of the diaphragm, the annular ring, and spring 14 all lying in the said groove. The outer edge of the diaphragm is clamped between the web and the flange 17 on the shell 7, so as to make the chamber fluid-tight. Bearing upon the diaphragm is the annular friction-plate 18, which is held from displacement by the bolts 9, passing through its outer edge. The plate is also held normally thrust away from the flange 10 by the spiral springs 19, arranged upon the bolts 9 and interposed between the plate and the flange 8.

20 is a flexible hose arranged concentrically upon the face of the web and protected and kept in place by the shield 21. One end of the hose is connected through the port 22 with the passage 23, the port being controlled by the spring-pressed valve 24. This passage connects through the port 25, controlled by the spring-pressed valve 26, with the pres-

sure-chamber 11. The other end is also connected through the port 27, controlled by the plug-relief valve 28, with the chamber.

Connected with the passage 23 is the pump 29, of any appropriate construction. The construction which I prefer to use is that shown in the drawings, in which the cylinder 30 is provided with an enlarged part 31 to receive the packing 32. To the cylinder is fitted the cylindrical piston 33, through which extends the piston-rod 34, connected to the lever 35 and normally thrust upward by the spring 36, which presses upon the sleeve 37, fitted to the piston and entering the enlarged end of the cylinder, so as to bear upon the packing.

The lever 35 is operated by means of the antifriction-roll 38, adapted to ride upon the eccentric shifting sleeve 39, as operated by its lever 40, pivoted upon the standard 41. The pump when actuated serves to force the contents of the hose into the fluid-pressure chamber. The plug-valve 8 is controlled by the following means: The segmental pinion 42, mounted thereon, is engaged by the segmental gear 43, which carries the fingers 44 and 45, standing normally on opposite sides of the flange 46. This flange is carried by the shifting sleeve 39, and when the sleeve is thrust toward the hub 3, so as to be engaged by the roll 38, the flange engages the finger 45, operating the valve 28, so as to close the same and cut off the exhaust from the pressure-chamber.

When the shifting sleeve is thrust oppositely, so as to be disengaged from the pump, the flange 46 engages the finger 44, so as to open the valve 28 and release the contents of the pump, which then flow into the hose.

In order to control and limit the pressure in the pressure-chamber, I provide the valve-chamber 47, which communicates through the port 48 with the pressure-chamber and is provided with the valve 49, having the controlling-spring 50, and normally closing the opening into the chamber under the tension of its spring, which is adjustable by means of the thumb-nut 51. The valve-stem 52 extends in line with the projection 53 upon the pump-lever.

It will thus be seen that when a predetermined pressure has been reached in the pressure-chamber the valve 49 is lifted against the tension of its spring, thrusting its stem 52 upward, so as to engage the lever 55, and, acting against the tension of its spring 36, holds the roll 38 out of engagement with the shifting sleeve, and consequently throws the pump out of action. In case, however, from leakage or any other cause the pressure in the chamber falls below the predetermined limit the valve-stem 52 drops, allowing the roll 38 to again engage the shifting sleeve and operate the pump until the predetermined pressure is restored in the chamber, when the pump is again thrown out of action in the manner above described.

In considering the construction of this apparatus the pulley A and its connected parts are treated as the driving element, the shaft 2, with its hub 4 and flange 10, as the driven element, the shifting sleeve 39 as the relatively stationary part, and the chamber 11, with its plate 18, as the friction device interposed between the elements.

I claim—

1. In a clutch of the class described, the combination with the driving and driven elements, of the automatic mechanism for creating pressure between said elements carried by said driving element, and automatic means actuated by the pressure produced, for throwing said mechanism out of action when and so long as a predetermined pressure is reached and maintained.

2. In a clutch of the class described, the combination with the driving and driven members thereof and the interposed friction device, of automatic means actuated by the movement of the driving member for creating pressure in said friction device, and automatic means for throwing said pressure-creating mechanism out of action when and so long as a predetermined pressure is produced.

3. In a fluid-pressure clutch, the combination with the driving and driven members, and the interposed expansible friction device, of the pump carried by the driving member and operative by its movement, and means for automatically throwing said pump out of action when and so long as a predetermined limit of pressure is attained.

4. In a fluid-pressure clutch, the combination with the driving and driven elements thereof, of the pump carried by the driving element, the relatively stationary pump-operating device, and the regulator actuated by the pressure produced by said pump adapted to throw and hold said pump out of action when and so long as a predetermined pressure is attained.

5. In a fluid-pressure clutch, the combination with the driving element, its fluid-chamber, the expansible friction-surface operative by the pressure within the chamber, the driven element and its friction-surface, of the pump carried by the driving element, automatic means for operating said pump during and by means of the movement of said driving element, means for throwing said pump-operating mechanism into and out of engagement therewith, and an automatic regulator adapted to throw and hold the pump out of action when and so long as a predetermined pressure in said chamber is attained.

6. In a fluid-pressure clutch, the combination with the driving element, its fluid-chamber closed by a flexible diaphragm, a friction-surface actuated thereby, and the driven element having a friction-surface adjacent to that of the diaphragm, of the pump carried by said driving element communicating with said chamber, its operating-lever, the spring

engaging said lever, the eccentric engaged by said lever and operating it against the tension of said spring, and means for automatically throwing the lever out of engagement with said eccentric when a predetermined limit of pressure is attained.

7. In a fluid-pressure clutch, the combination with the driving element having a fluid-chamber with an expansible wall, and a friction device actuated thereby and the driven element, of the pump connected with said fluid-chamber and carried by said driving element, the spring for actuating said pump in one direction, the relatively fixed eccentric engaged by the lever and operating it in the other direction, and means for controlling the action of the pump within predetermined limits of pressure.

8. In a fluid-pressure clutch, the combination with the driving element, its fluid-chamber, diaphragm and friction device, and the driven element, of the pump carried by said driving element communicating with said chamber, the shifting eccentric adapted to be brought into position to be engaged by the pump-lever, automatic means for throwing the lever out of engagement with said eccentric at a predetermined limit of pressure in the fluid-chamber, and means for automatically releasing the pressure in the chamber when the eccentric is thrown out of engaging position with the lever.

9. In a clutch of the class described, the combination with its driving and driven elements and the interposed friction device, of the fluid-circulating system, comprising an expansible chamber for actuating the friction device, a collapsible reservoir, the relief-valve connecting the chamber with the reservoir, and the pump for forcing the contents of the reservoir into the chamber, and the automatic means for actuating said pump within a predetermined limit of pressure in said chamber.

10. In a clutch of the class described, the combination with its driving and driven elements, the interposed friction device, and the relatively stationary part, of the fluid-circulating system comprising a collapsible reservoir, an expansion-chamber for actuating the friction device, the pump for forcing the contents of the reservoir into the expansion-chamber actuated by operative connection with the relatively fixed part, and the automatic means for throwing the pump out of action, controlled by the pressure in the chamber.

11. In a clutch of the class described, the combination with the driving and driven elements, the interposed friction device, and the adjustable relatively fixed part, of the fluid-circulating system comprising an expansible chamber for actuating the friction device, a collapsible storage-reservoir, a relief-valve connecting the chamber with the reservoir, means for connecting the pump with the chamber, means for throwing it into operative connection with the relatively fixed part, and the regulator for controlling the pump, itself controlled by the pressure in the expansible chamber.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE M. RICHARDS.

Witnesses:
T. D. MERWIN,
MINNIE L. THAUWALD.