No. 660,749. Patented Oct. 30. 1900.

P. CUNNINGHAM.

FLUID CLUTCH.

(Application filed Mar. 10, 1900.)

(No Model.) 3 Sheets—Sheet 1.

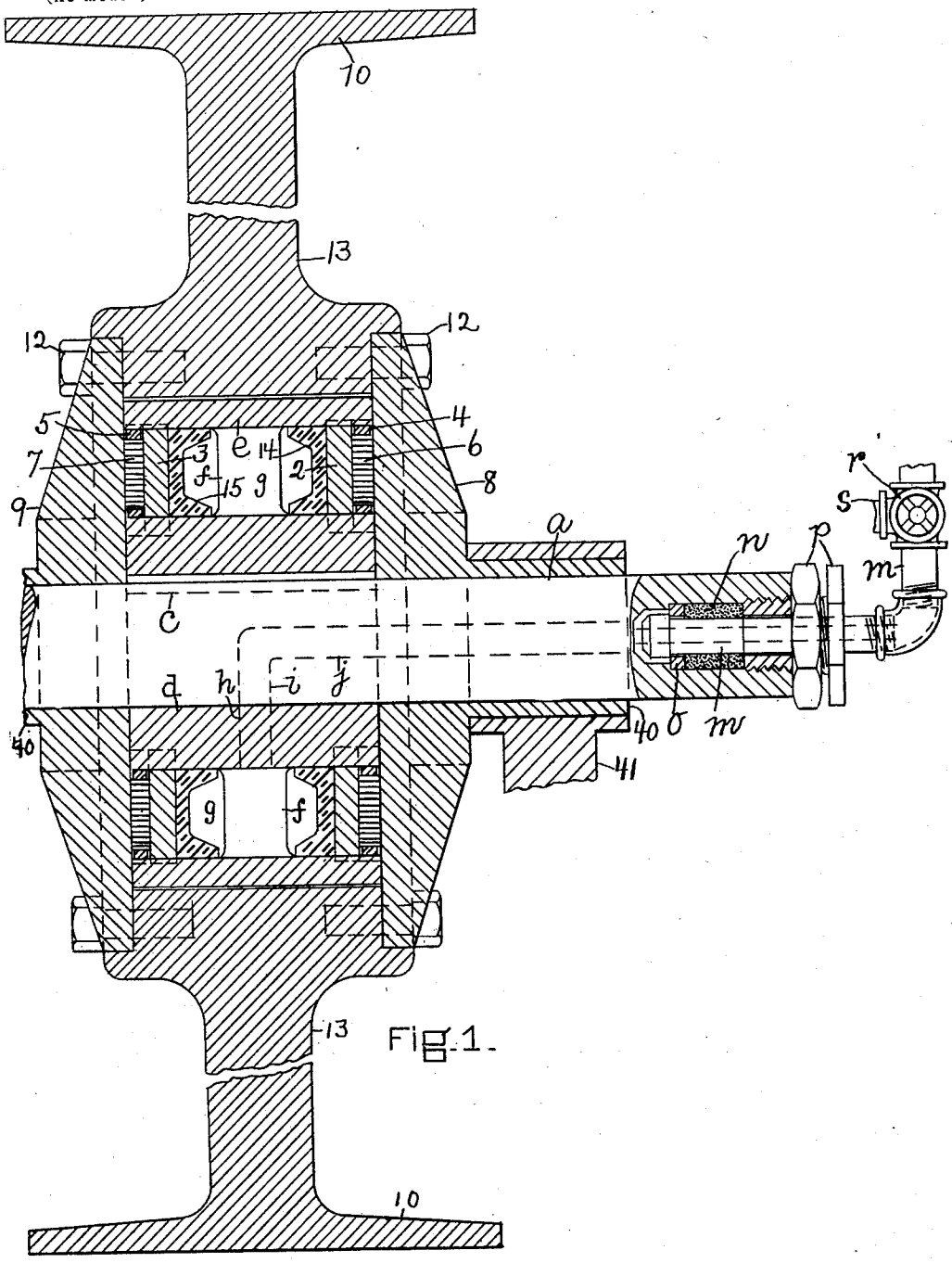


Fig. 1.

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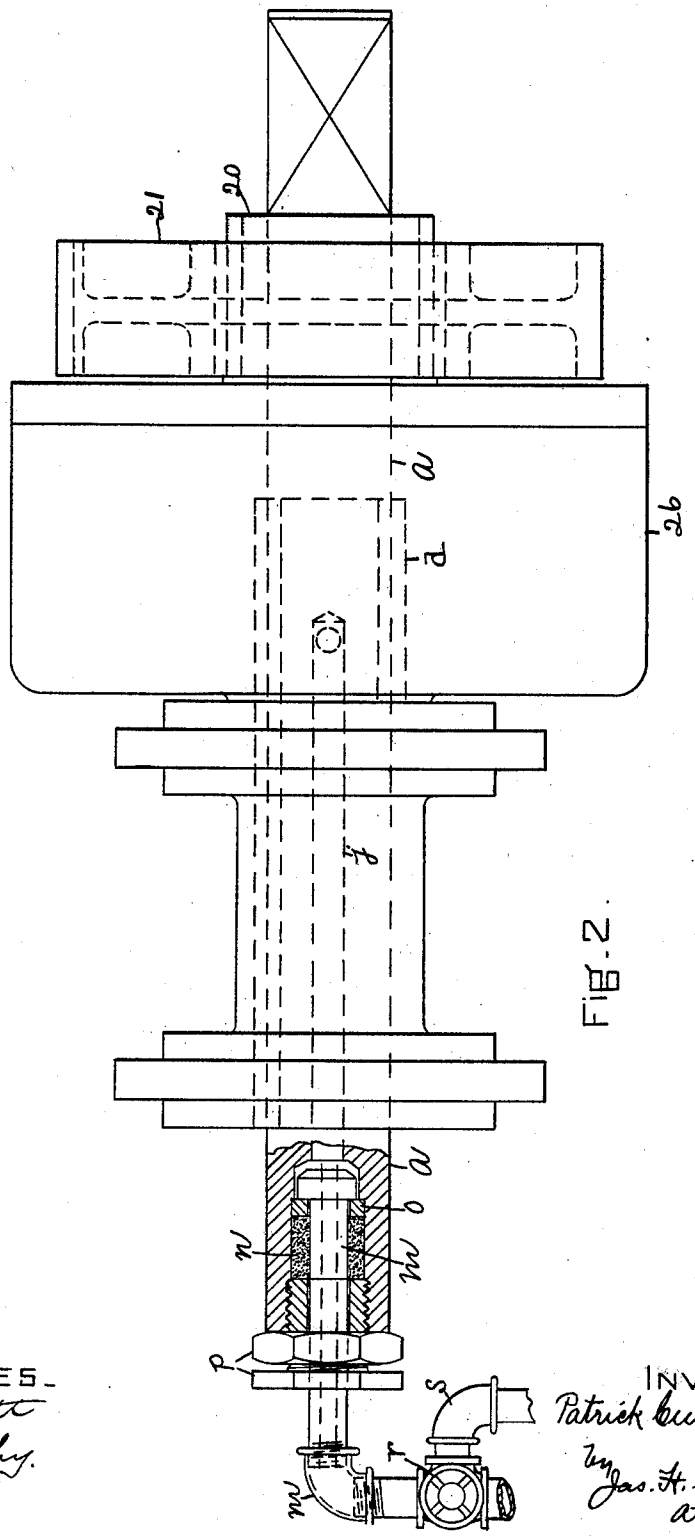


Fig. 2.

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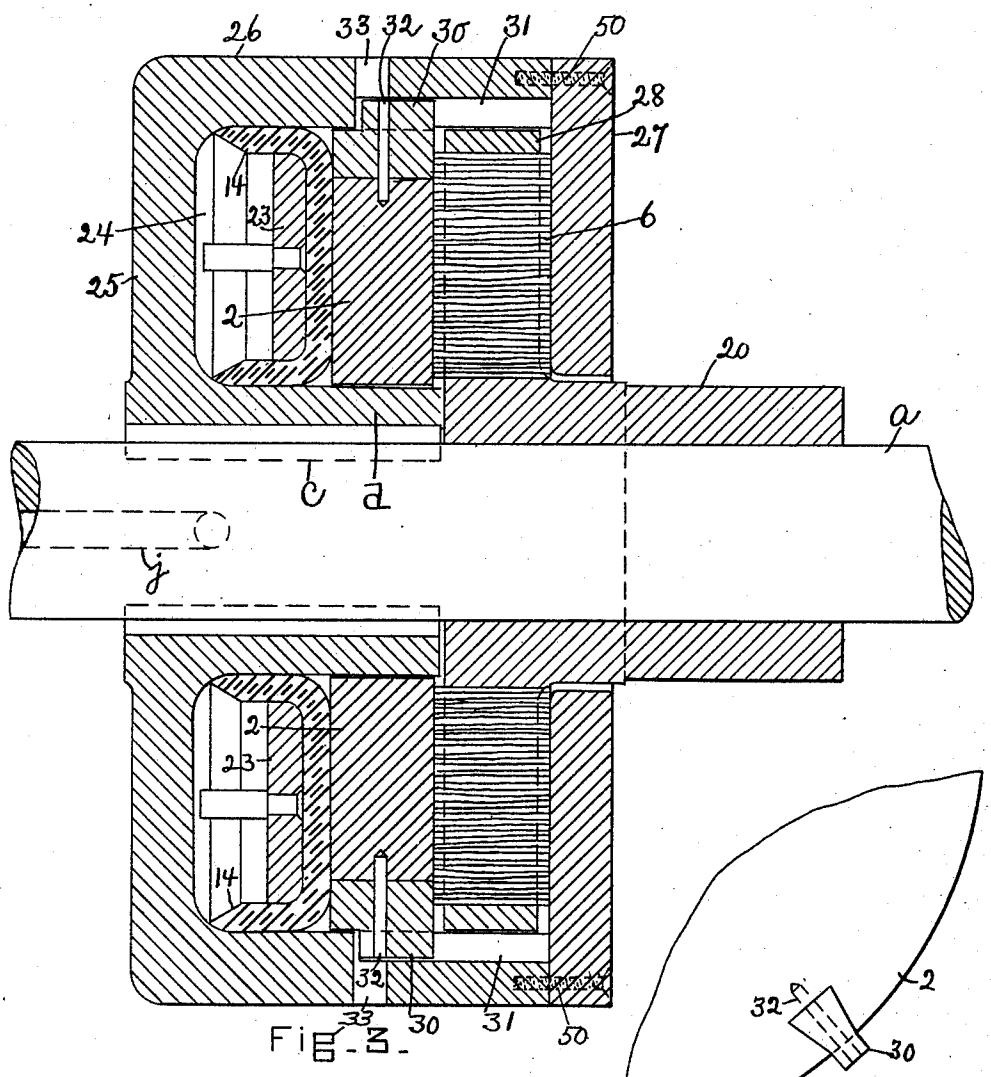


Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

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FLUID-CLUTCH.

SPECIFICATION forming part of Letters Patent No. 660,749, dated October 30, 1900.

Application filed March 10, 1900. Serial No. 8,139. (No model.)

To all whom it may concern:

Be it known that I, PATRICK CUNNINGHAM, a citizen of the United States, residing in New Bedford, in the county of Bristol and State of Massachusetts, have invented an Improvement in Fluid-Clutches, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to fluid-pressure friction-clutches, and has for its object to provide a simple, efficient, and durable clutch of the class described which can be controlled in its operation by a single valve in the fluid-supply pipe. For this purpose the shaft upon which the clutch is mounted has fast on it a cylinder or casing, into which fluid is admitted through a longitudinal passage in the shaft and with which communicates the fluid-supply pipe. The cylinder or casing fast on the shaft contains within it a disk or piston movable longitudinally on the hub of the said casing and suitably keyed to said casing. The disk or piston coöperates with a spider carrying blocks or pieces of wood or like non-metallic material constituting wearing-surfaces, which are frictionally engaged by the disk or piston when fluid-pressure is admitted into the cylinder or casing to thereby clutch the loose member to the shaft. The cylinder or casing is provided with a ring or washer, of rubber, leather, or other suitable material, which bears against the disk or piston and which itself is directly acted upon by fluid-pressure. The cylinder or casing referred to may be provided with two pistons or disks movable in opposite directions and coöperating with the loose member of the clutch when it is desired to obtain a clutch of increased power; but for ordinary work a single disk or piston without the cylinder or casing will suffice. These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 represents in sectional elevation one form of clutch embodying this invention; Fig. 2, an elevation with parts broken away of a single clutch embodying the invention; Fig. 3, a sectional detail of the clutch shown in Fig. 2, and Fig. 4 a detail to be referred to.

Referring to Fig. 1, the shaft a, supported in suitable bearings, has fast on it, as by key c, a cylinder or casing comprising a hub portion d, a rim portion e, and spokes or arms f, connecting the rim portion e with the hub portion d, the said rim and hub forming between them a chamber g, into which the fluid which actuates the clutch is admitted through a passage h in the hub, which communicates with the radial passage i, forming an extension of the longitudinal passage j in the shaft a, the latter passage being enlarged at the outer end of the shaft to receive the stationary supply-pipe m, which, as shown in the drawings, is surrounded by packing material n, secured in place by the washer o and nuts p. The supply-pipe m is provided with a three-way valve r, of any suitable or usual construction, which controls the admission of fluid into the chamber g and the discharge of the fluid from the chamber g into the waste-pipe s. The cylinder or casing formed by the hub d and rim e has keyed to it disks, rings, or pistons 2 3, which coöperate, as shown in Fig. 1, with annular rings or spiders 4 5, carrying blocks or pieces of wood 6 7, which are adapted to be forced by movement of the pistons 2 3, under the influence of the fluid-pressure, away from each other and into engagement with the side pieces 8 9 of a pulley 10, the side pieces 8 9 being loose on the shaft a and, as shown, being detachably secured, as by bolts 12, to the web 13 of the pulley 10. The pulley 10 and its attached side pieces 8 9 constitute the loose member of the clutch, and the said side pieces are provided with hubs 40, which extend into and are supported by bearings 41, only one of which is herein shown.

The pistons or disks 2 3 have coöperating with them rubber, leather, or other non-metallic washers or rings 14 15, which prevent leakage of the water out of the chamber g. In the operation of the fluid-clutch shown in Fig. 1 the loose member or pulley 10 may be clutched to the fast member or casing keyed to the shaft a by admitting fluid under pressure through the passages j i in the shaft a and through the passage h in the hub d into the chamber g, which is filled with fluid, and

the latter acting on the washers or rings 14 15 moves the same and the pistons or disks 2 3 away from each other and into frictional engagement with the wooden blocks 6 7, which are themselves forced firmly against the sides 8 9 of the loose member or pulley 10, thereby clutching the loose member to the shaft *a*. When the valve *r* is turned so as to shut off the water-supply and connect the chamber *g* with the waste-pipe *s*, the pressure is relieved from the loose member of the clutch, and the said member is thus unclutched from the shaft *a*.

In Figs. 2 and 3 I have shown the invention as embodied in a clutch in which the wooden blocks 6 are carried by a spider attached to the loose member, which is shown as a sleeve or hub 20, loose on the shaft *a*, and to which is keyed or otherwise fastened the pulley 21. (Shown in Fig. 2.) In the construction shown in Fig. 3 a single piston 2 is shown, with which coöperates the rubber washer or ring 14, reinforced by a metal ring 23, and which coöperates with one side of the cylinder to form the chamber 24, into which the water is admitted from the passage *j* in the shaft *a*. The cylinder or casing, as shown in Fig. 3, comprises a hub *d*, a plate or web 25, from which extends an annular rim 26, to which is fastened by screws 50 or in other suitable manner the side plate 27, between which and the piston or ring 2 is located the spider 28, attached to the hub 20 of the loose member and carrying the wooden or other wearing surfaces 6. The hub *d* is secured to the shaft *a* by the key *c*.

The piston or ring 2 is provided, as shown in Figs. 3 and 4, with radial lugs or projections 30, which project into axially-extended slots or grooves 31 in the rim or periphery 26, so as to key the piston or disk 2 to the cylinder or casing. The radial lugs 30 may be secured to the ring or disk by pins 32, driven into the piston 2 through suitable openings 33 in the rim 26 of the cylinder or casing.

The operation of the clutch shown in Fig. 3 is the same as that shown in Fig. 1, the piston or ring 2 being forced against the wearing-blocks 6, so as to clutch the same between it and the side plate 27 of the casing when fluid-pressure is admitted into the cylinder 24 to thereby render the loose member—namely, the hub 20 and its attached pulley 21—fast on the shaft *a*. In both the constructions shown in Figs. 1 and 3 it will be noticed that the clutch is long-lived by reason of the fact that it may be used until the wearing-surfaces 6 and the piston or disk 2 are worn thin.

In Fig. 1 the loose member is shown as a pulley; but it may be any other body or structure, and in practice it may be the armature of a dynamo or generator, in which case it is desirable to relieve the shaft from the weight of the armature, and for this purpose the side plates 8 9 are provided with the hubs 40, supported by the bearings 41, so that the weight of the armature falls on the bearings 41 rather than on the shaft. It will thus be seen that when the generator is not in use the shaft *a* is running light and is relieved from the weight of the armature.

I claim—

1. In a clutch of the class described, the combination with a rotatable shaft provided with a fluid-inlet passage extended longitudinally and radially thereof, of a cylinder or casing fast on the said shaft, a disk or piston within said casing and keyed thereto to move bodily within the same and forming therewith a fluid-receiving chamber, a coöperating member normally loose on the said shaft and adapted to be rendered fast thereon by movement of the piston or disk in one direction, a supply-pipe communicating with the longitudinal passage in the rotatable shaft and provided with a valve controlling the admission of fluid into the said cylinder or casing, substantially as described.

2. In a clutch of the class described, the combination with a rotatable shaft provided with a fluid-passage extended longitudinally and radially thereof, of a cylinder or casing fast on the said shaft and provided with a slot or groove in its rim extended for a portion of the length of the same on the inner side thereof, a piston or disk within said casing provided with a lug or projection extended into said slot or groove, a clutch member normally loose on said shaft, a spider carrying non-metallic wearing-surfaces with which said piston coöperates to render the loose member fast on said shaft, a fluid-supply pipe communicating with the longitudinal passage in the rotatable shaft, and a valve in said supply-pipe, substantially as described.

3. In a clutch of the class described, the combination with a rotatable shaft provided with a fluid-passage extended longitudinally and radially thereof, of a cylinder or casing fast on said shaft and provided with a hub and a rim connected to said hub, a piston or disk mounted on the hub of said casing to move longitudinally thereon, a non-metallic ring or washer fitted on said hub and engaging said piston and the rim of said casing to form a liquid-tight chamber within the casing, a hub normally loose on said shaft, wearing-surfaces interposed between said hub and piston, and means to control the inlet and outlet of fluid into and out of the chamber within the casing through the longitudinal passage in the said shaft, substantially as described.

4. In a clutch of the class described, the combination with a rotatable shaft provided with a fluid-passage extended longitudinally and radially thereof, a cylinder or casing comprising a hub keyed on said shaft and a rim connected with said hub and keyed to said casing, one or more disks or pistons movable on said hub, a washer of non-metallic material bearing against said piston and the rim of said casing to form a liquid-chamber within said casing, a loose member coöperating with

said piston, a supply-pipe communicating with the passage in said shaft and with said liquid-chamber, and a valve in said supply-pipe, substantially as described.

5. In a clutch of the class described, the combination with a rotatable shaft, a cylinder or casing fast on it, a normally loose member provided with a hub extended into and supported by a bearing, the said bearing, a disk or piston within said cylinder or casing and keyed thereto and coöperating with said normally loose member, and means to control the supply of fluid into said cylinder or casing, substantially as described.

6. In a clutch of the class described, the combination with a rotatable shaft, a cylinder or casing fast on it, a clutch member normally loose on said shaft, a disk or piston within said casing and keyed to the inner side of its rim to move longitudinally thereof and engage said normally loose member, a fluid-supply extended longitudinally and radially of said shaft and communicating with the said cylinder or casing, and means to control the supply of fluid into said cylinder or casing, substantially as described.

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

PATRICK CUNNINGHAM.

Witnesses:
JAS. H. CHURCHILL,
J. MURPHY.