P. ENGLISH.

CLUTCH.

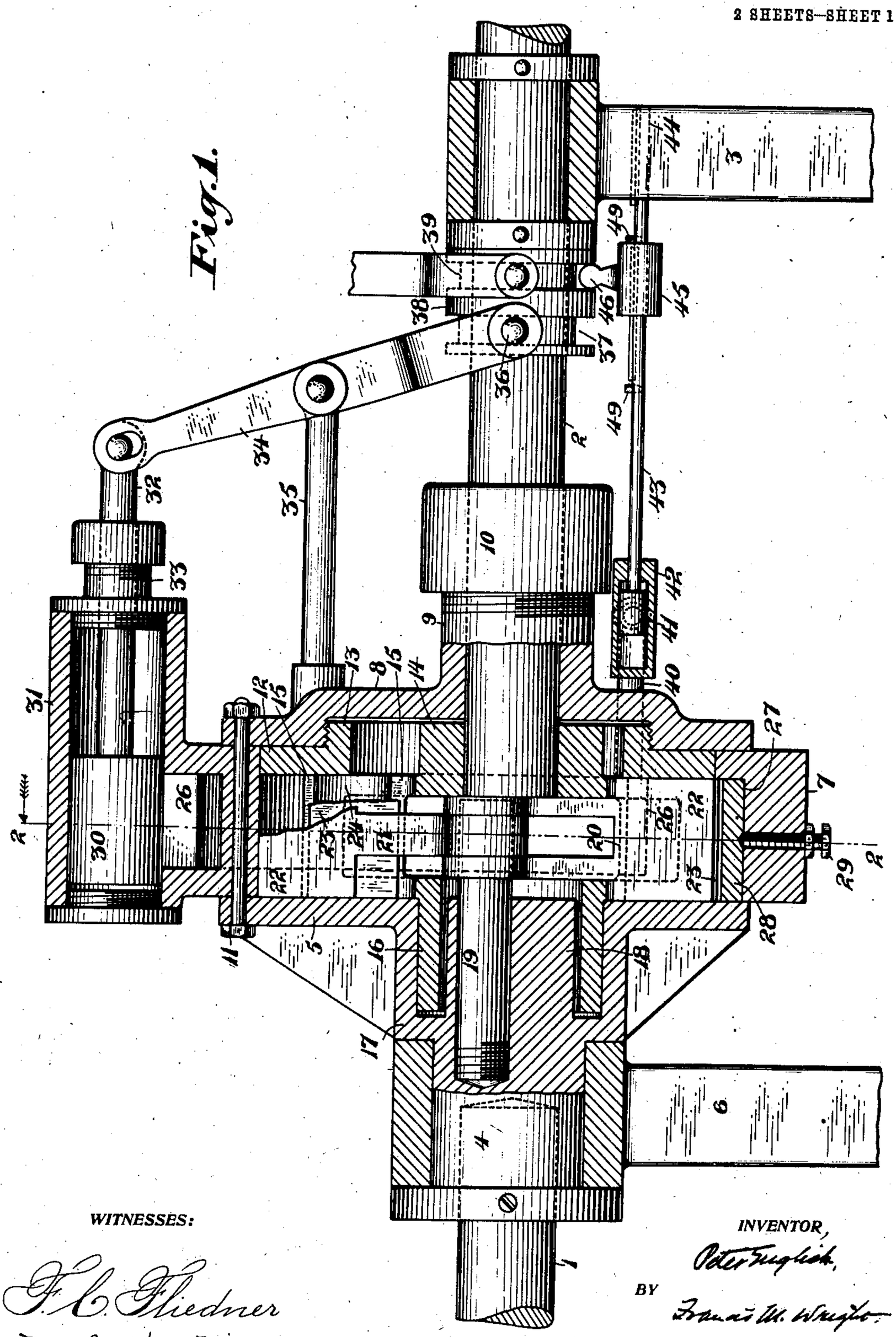
APPLICATION FILED AUG. 4, 1909.

973,767.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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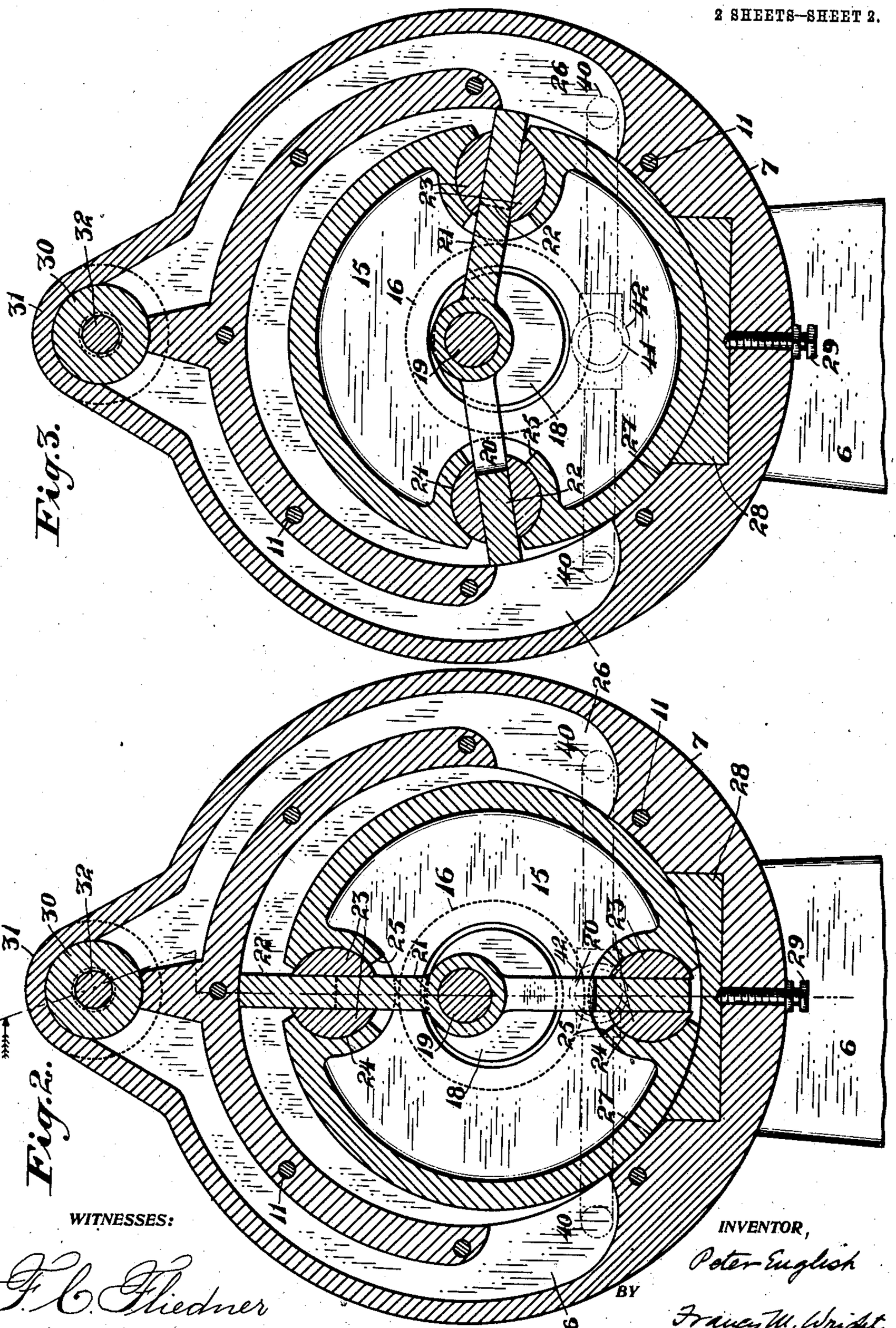

Fig. 2.

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PETER ENGLISH, OF SATHERS STATION, CALIFORNIA, ASSIGNOR TO THE HYDRAULIC CLUTCH COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF ARIZONA TERRITORY.

CLUTCH.

973,767. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed August 4, 1909. Serial No. 511,104.

To all whom it may concern:

Be it known that I, PETER ENGLISH, a citizen of the United States, residing at Sathers Station, in the county of Alameda and State of California, have invented new and useful Improvements in Clutches, of which the following is a specification.

The object of the present invention is to provide improved means for transmitting motion from a driving shaft to the shaft to be driven, which will permit of the speed of the driven shaft being varied to any desired extent, and of the connection between the driving and driven shafts being made and broken, both of these results being obtained without any jar or shock such as accompanies the use of gear wheels, generally used for this purpose.

In the accompanying drawings, Figure 1 is a broken side view of the mechanism; Fig. 2 is a cross section on the line 2 of Fig. 1; Fig. 3 is a similar view showing the mechanism in a different position from that shown in Fig. 2.

Referring to the drawing, 1 indicates the driving shaft, and 2 the shaft which is to be driven. The latter shaft is supported in a bearing 3, and the former is secured to a hub 4 of a cover plate 5, which hub is supported in a bearing 6.

7 indicates a cylindrical casing and 8 is a cover plate on the other side of said casing to the cover plate 5, and having a hub 9 and a stuffing box 10 through which the driven shaft 2 passes. Said plates 5 and 8 are bolted to said cylinder by bolts 11.

12 indicates a take-up plate, which has a reduced portion 13 secured within the cavity of the cover plate 8 for the purpose of taking up the wear within the cylinder 7. This extension 13 is screw-threaded, and fits corresponding screw-threads in the cover-plate, and by this means the take up plate or disk may be advanced to any small desired degree from time to time, to compensate for wear which may take place between the revoluble parts.

Secured upon the inner end of the shaft 2 is a hub 14 of a drum 15, upon the other side of which is formed a hub 16 which revolves within a bearing 17 formed in the cover plate 5. The center of said cover plate 5 is formed with a boss 18 extending inwardly within the hub 16 of the drum, and in said boss there is screwed a pin 19 extending through the drum nearly to the opposite wall thereof. The driving shaft 1, driven shaft 2, drum 15, and hubs 14 and 16 are coaxial with each other, and eccentric to the cylinder 7, while the pin 19 is concentric to said cylinder. Upon said pin within said drum are pivoted the inner ends of two wings or vanes 20 and 21, each vane having a wide head 22 extending between the cover plate 5 on one side and the take-up plate on the other side, the inner end of the vane 20 being forked and extending around the pin 19 on each side of the inner end of the vane 21 in the manner of a hinge. Each vane head can slide between approximately semi-cylindrical gibs 23 which can rock in corresponding recesses 24 formed in the periphery of the drum. Said recesses have enlargements 25 to permit the vanes to oscillate in the movement of the drum, as hereinafter appears. These gibs serve two purposes: They support the ends of the vanes in their proper position while permitting them to have an oscillating movement, and they serve to make a fluid tight joint at the parts where the vanes pass through the circumference of the drum.

Within the body of the cylinder, there is formed a conduit 26 for a liquid, preferably oil, said conduit opening into the interior of the cylinder at two points spaced from each other about 120°. In the part of the inner surface of the cylinder which is nearest the center of the drum, and between the points where the ends of the conduit enter the interior of the cylinder, there is formed a cavity or socket 27 to receive an abutment block 28, the inner surface of which is made cylindrical to fit snugly against the surface of the drum 15, which rotates in contact therewith. Against the back of said block can press a screw 29, which can be screwed up from time to time to take up the wear on the block. Since the inner surface of the abutment block 28 accurately conforms to the surface of the drum, the latter can, between these two points of entrance of the conduits, revolve in close contact with the inner surface of the abutment block; but, owing to the eccentric location of the pin 19 upon which the inner ends of the vanes are pivoted, it results that the outer end of each vane, in traveling over the above mentioned surface between the entering ends of the conduits is, by said eccentricity, withdrawn

inwardly within the surface of the drum, the outer end of each vane following, at all times, the circle of the inner surface of the cylinder. It is thus provided that this outer end of the vane never comes into contact with the abutment block and there is no chance of jar, shock, or vibration from such a cause. Midway between its two ends, the liquid conduit 26 is adapted to be closed by a piston valve 30 in a cylinder 31 operated by a rod 32 passing through a gland 33 and actuated by a lever 34 pivoted upon the end of a supporting rod 35, the other end of said lever being forked and having pins 36 engaging a groove 37 in a clutch-collar 38 slidable upon the shaft to be driven. Said collar 38 has also a groove 39 by which it can be moved longitudinally, thereby causing the piston valve 30 to slide to open or close the conduit as may be desired.

In addition to the conduit 26, there is provided a smaller auxiliary conduit 40, which is adapted to be closed by a piston valve 41 working in a cylinder 42 and operated by a rod 43, the latter sliding in a guide 44 in one of the standards, said rod being adapted to be actuated by means of a sleeve 45 having a knob 46 engaged by the groove 39, said sleeve 45 being slidable on said rod and adapted to engage, at opposite ends of its slidable movement, pins 49 on said rod, so as to thereby impart longitudinal motion to said rod and to the piston valve 41 to open or close said auxiliary conduit.

The operation is as follows: When the clutch is operated to withdraw the two piston valves, the liquid, as oil, will flow freely around the conduit 26, and, if the driving shaft is rotating, then the effect will be to expel, by centrifugal force, the oil from the interior of the cylinder into the conduit 26, and into the piston valve chamber. The cylinder can then rotate freely around the drum without appreciable loss of power in continually expelling the oil from the space between the drum and cylinder. When it is desired to transmit motion from the driving to the driven shaft, the mechanism is operated to move the piston valves and close, first, the conduit 40, and then the conduit 26. As these passages are closed, the oil is forced into the interior of the cylinder, so that the cylinder is now full of oil, and since the oil cannot pass by the escape conduits, and is confined, the effect of the rotation of the driving shaft, and of the cylinder around the drum is to rotate the drum with them, thus rotating the shaft to be driven. The above effect is produced gradually or suddenly according as the passage in the conduit is gradually or suddenly closed, it being evident that motion can be communicated to the driven shaft quickly or slowly as may be desired. To disconnect the driving from the driven shaft, the reverse operation is performed, that is, when the clutch is operated to open the piston valves, it allows the liquid to pass freely through the conduits, and immediately removes all operative connection between the casing and the drum, so that the latter is no longer driven by the former. But for the use of the auxiliary conduit 40, the effect would be that, when the valve 30 is wide open, the drum rotating freely in the cylinder, and the clutch loose, the pistons of the drum would be compelled to force oil in front of them and around by the conduit 26. The friction caused by the flow of the oil through this conduit would be considerable and would uselessly absorb power. By providing the auxiliary conduit 40, the result is that, when the clutch is loose, all of the oil is withdrawn from between the drum and the cylinder into the conduit 26, and the pistons 22 propel in front of them only air, which passes from one side of the drum to the other through the auxiliary conduit 40. Thus instead of constantly propelling a heavy liquid, the only work that the pistons have to do is to propel air in the aforesaid channel. It is apparent that, if said mechanism is operated so that the main piston valve is slightly open, the liquid, while passing through the valve opening, does so with difficulty, and to that extent causes the drum to be revolved by the revolution of the cylinder around it; but at a slower speed. The speed to be obtained can thus be regulated by opening the valve more or less.

In place of the above described arrangement, the driving shaft can be connected to the drum and the cylinder to the shaft to be driven, but the former arrangement is preferred because the cylinder then takes the place of a fly-wheel for the engine shaft.

I claim:—

1. In a hydraulic clutch, the combination with a casing having an eccentric bearing-box in one of its heads, and a supporting arm extended from said box inward toward the center of the cylinder, of a main shaft in line with said bearing-box and extending through the other head of the cylinder into the interior thereof, a slotted drum secured on and concentric with said main shaft and bearing, and having a hollow interior and a hollow trunnion adapted to run within the bearing-box, a fixed shaft supported by the arm of the bearing-box and extending through the hollow trunnion into the interior of the drum, and wings or vanes pivotally mounted on said fixed shaft extending through the slots in the drum and bearing against the inner face of the cylinder.

2. In a hydraulic clutch, the combination with a cylinder or casing having in one of its heads an externally closed eccentric bearing box communicating with the interior of the cylinder, and a fixed shaft concentric

with the cylinder and extending into the interior thereof, said shaft being provided with wings or vanes pivotally mounted thereon and bearing against the inner face of the cylinder, of a main shaft extending through the other head of the cylinder a short distance into the interior thereof, said shaft being eccentric relatively to the cylinder and concentric with the bearing-box, and a drum closed at one end to form a hub whereby it is secured to the end of the main shaft, having a hollow interior to receive the fixed shaft and provided with a hollow open trunnion at its opposite end supported within the bearing-box, said drum being concentric with the main shaft and bearing-box and eccentric relatively to the cylinder, and provided with slots through which the wings or vanes extend.

3. In a hydraulic clutch, the combination with a cylinder having a fixed concentric shaft, wings or vanes having hubs encircling said shaft, said cylinder having also an eccentric externally closed bearing-box in one of its heads, of a correspondingly eccentric main shaft extending through the other head, a hollow drum secured at one end to said shaft and concentric therewith, and having at its other end a hollow trunnion through which the fixed shaft passes, said drum having slots in which the wings or vanes are slidable.

4. In a hydraulic clutch, the combination with a cylinder having in its inner face a depression or recess of smaller radius and less length than the cylinder proper, of an eccentric hollow drum inclosed in said cylinder and having a body portion of a radius conforming to the depression or recess to bear upon the true cylindrical face of the cylinder, and reduced ends, an abutment block located in said depression or recess, a fixed shaft concentric with the cylinder and extending into the interior of the hollow drum, and wings or vanes pivotally mounted on said fixed shaft, extending through slots in the drum, and having their outer ends widened.

5. The combination in a hydraulic clutch, of a cylindrical shell, a shaft fixed and turnable with said shell, a second shaft axially in line with the first, extending through and turnable within the opposite head of the shell, a slotted drum fixed to and turnable with said second shaft, wings or vanes extending transversely through the drum, an eccentric pin upon which the inner ends of said vanes are carried, and by which the outer ends of the vanes are caused to traverse the inner periphery of the cylinder, a segmental conduit opening into the interior of the cylinder upon each side of the point of contact between the drum and the cylinder, a packing plate or abutment fitting the cylinder between the conduit inlet openings, and means to adjust said plate to maintain contact between it and the periphery of the drum.

6. A hydraulic clutch to transmit power between independent shafts axially in line, said clutch including a shell or casing fixed to one shaft and eccentric thereto, a drum fixed concentrically to the contiguous end of the opposite shaft, said drum turnable with one part of its periphery substantially in contact with the interior of the casing, a pin or stem concentric with the casing extending into the drum, wings or vanes having their inner ends turnable upon said pin, and projecting radially therefrom through the drum with their outer edges in contact with the interior of the casing, a circumferential conduit in the body of the casing having ports opening into the interior on each side of the point of contact between the drum and casing, a liquid medium filling said conduit and the interior of the casing, and means by which the flow of said liquid induced by the vanes may be varied or stopped.

7. The combination with alined contiguous shafts, of a casing eccentrically fixed to one shaft and having a stuffing-box through which the other shaft is turnable, a drum fixed concentrically to said second shaft within the casing, a pin or stem extending into the drum from the casing head, and eccentric to the shafts and drum, wings or vanes slidable through slots in the drum, said vanes having their inner ends carried by the eccentric pin, and their outer ends contacting with the interior of the casing, said casing having a circumferential conduit with ports opening to the interior, a liquid medium within the case and conduits, and a gate or valve by which the movement of the liquid may be regulated or stopped.

8. A shell or casing with opposed heads, one of said heads having a hub to form a journal-bearing, and a shaft keyed to the outer end of the hub, said head having an annular channel in its inner face, a second shaft extending through the opposite head in line with the first named shaft, a drum, the hub of which is keyed to said second shaft, and a hollow hub extending from the opposite end of the drum, and turnable in the channel of the opposed head.

9. A shell or casing having opposed heads, one of which has a hub to form an exterior journal-bearing, and a shaft keyed to its outer end, a second shaft turnable through the opposite head in line with the first shaft, and having a drum keyed to its inner end and turnable within the casing, a hollow annular hub extending from the opposite end of the drum, and a groove or channel in the first named head within which said hub bears and is turnable.

10. A shell or casing having opposed

heads, one of which has a hub to form an exterior journal-bearing, and a shaft keyed to its outer end, a second shaft turnable through the opposite head in line with the first shaft, and having a drum keyed to its inner end and turnable within the casing, a hollow annular hub extending from the opposite end of the drum, a groove or channel in the first named head within which said hub bears and is turnable, an eccentrically fixed pin projecting from said head into the drum, wings or vanes slidable through slots in the drum, having their inner ends turnably fitted to the pin and their outer edges contacting with the interior of the casing.

11. A hollow cylindrical casing, a drum eccentrically mounted with its periphery in contact with the interior of the casing, a stem or pin concentric with the casing, vanes having their inner ends carried by the pin and the outer edges in contact with the interior of the casing, and rockable bearing plates or gibs in the drum through which the vanes are slidable.

12. A shell or casing having opposed heads, one of which has a hub to form an exterior journal-bearing, and a shaft keyed to its outer end, a second shaft turnable through the opposite head in line with the first shaft, and having a drum keyed to its inner end and turnable within the casing, a hollow annular hub extending from the opposite end of the drum, a groove or channel in the first named head within which said hub bears and is turnable, and a wear-compensating disk fitting the opposite end of the drum, said disk having a screw-threaded extension turnable in a correspondingly threaded cavity in the contiguous head.

13. In means for transmitting motion from a driving to a driven shaft, the combination of a cylinder connected with the driving shaft, but eccentric thereto, a drum connected to the driven shaft concentric therewith, a vane carried by said drum and arranged to rotate concentrically to the cylinder, said cylinder having independent main and auxiliary conduits connecting opposite spaces between the drum and cylinder, and both wholly outside the space between the drum and cylinder, and means for closing both conduits in a single movement, substantially as described.

14. In means for transmitting motion from a driving to a driven shaft, the combination of a cylinder connected with the driving shaft, but eccentric thereto, a drum connected to the driven shaft concentric thereto, a vane carried by said drum and arranged to rotate concentrically to the cylinder, said cylinder having independent main and auxiliary conduits connecting opposite spaces between the drum and cylinder, and both wholly outside the space between the drum and cylinder, and means for closing both conduits in succession in a single movement, substantially as described.

15. In means for transmitting motion from a driving to a driven shaft, the combination of a cylinder arranged to contain a liquid and connected to one of said shafts, a drum within the cylinder connected to the other shaft, one of said shafts being connected concentrically, and the other eccentrically, a vane carried by one of said shaft-connected elements, and engaging the other element, an escape conduit for the liquid contained between the two elements, and an abutment supported in the cylinder and engaging the surface of the drum, and means for adjusting said abutment to and from said drum, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PETER ENGLISH.

Witnesses:
FRANCIS M. WRIGHT,
D. B. RICHARDS.