V. TICHOMIROFF & L. SCHECHTER.

HYDRAULIC COUPLING.

APPLICATION FILED JUNE 23, 1909.

973,893.

Patented Oct. 25, 1910.

3 SHEETS—SHEET 1.

Fig. 2.

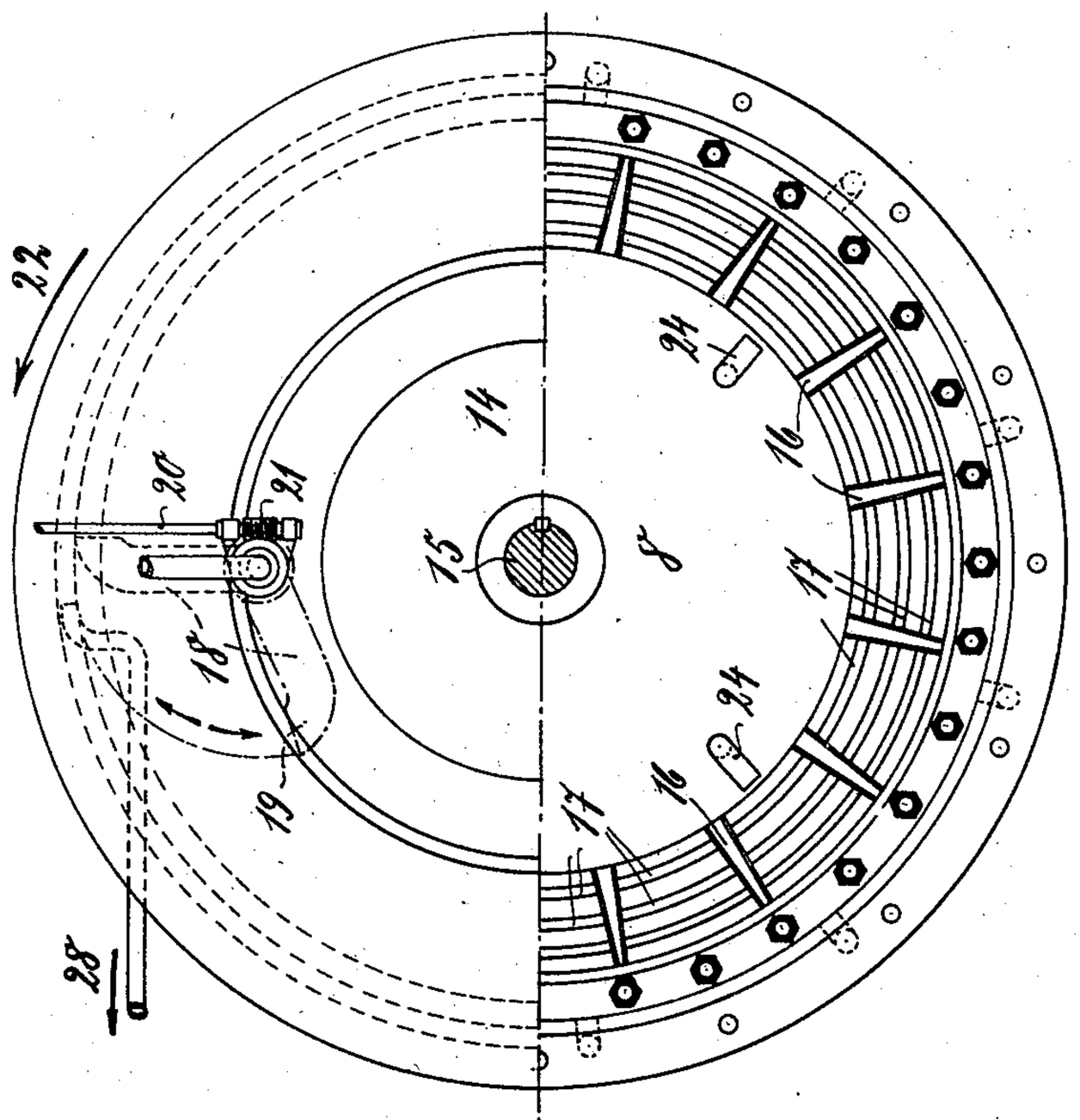
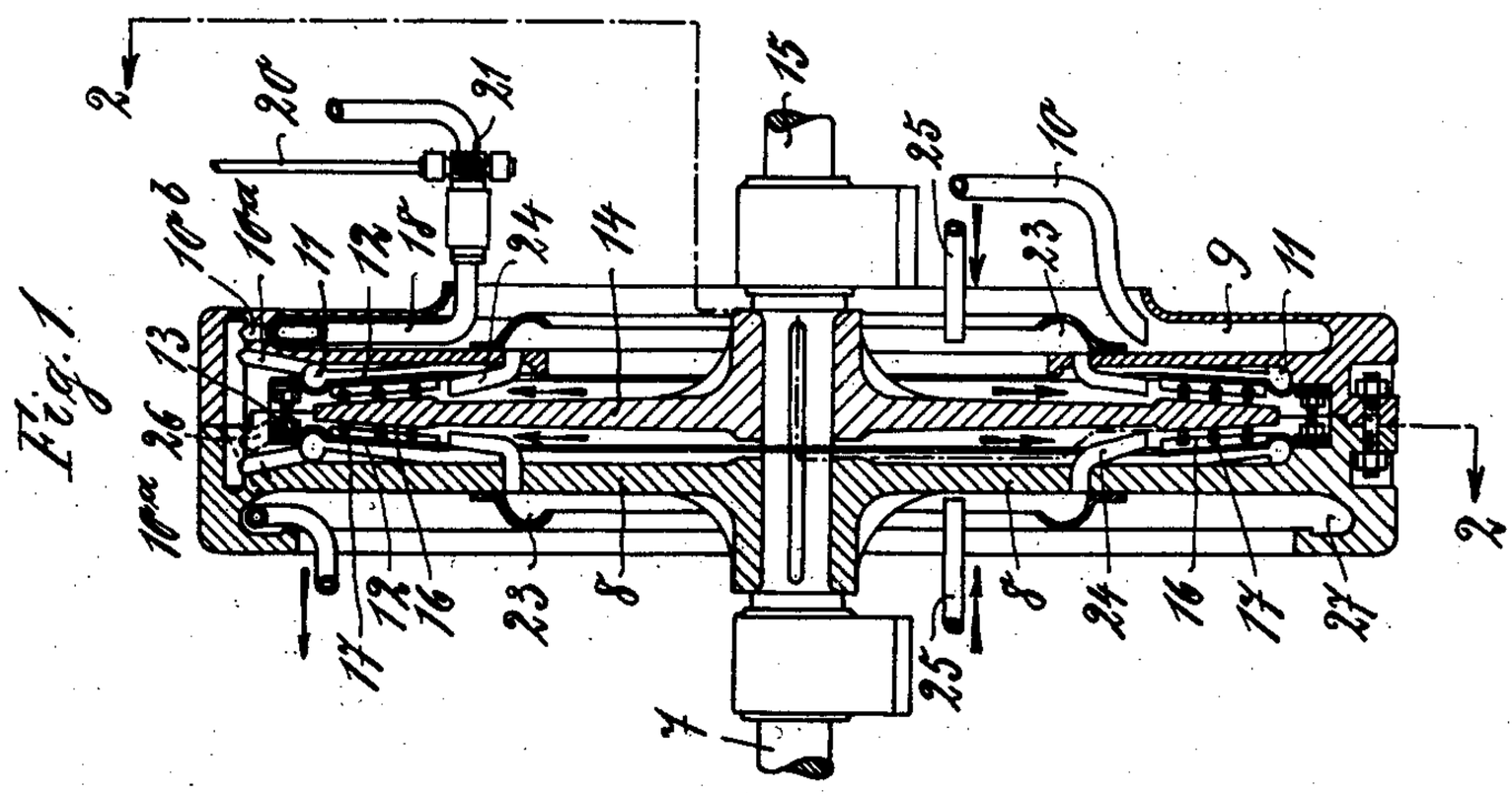


Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 4

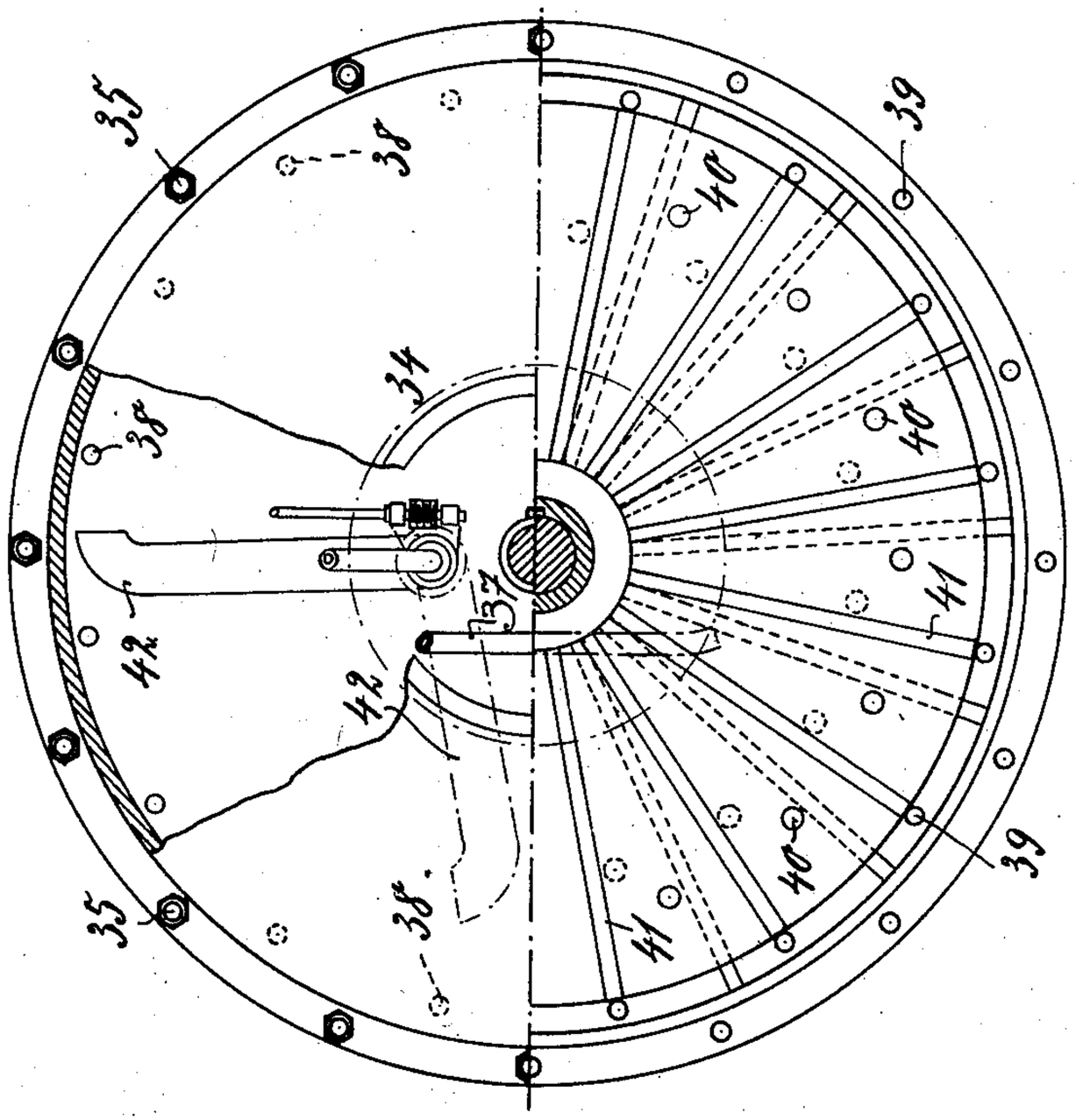
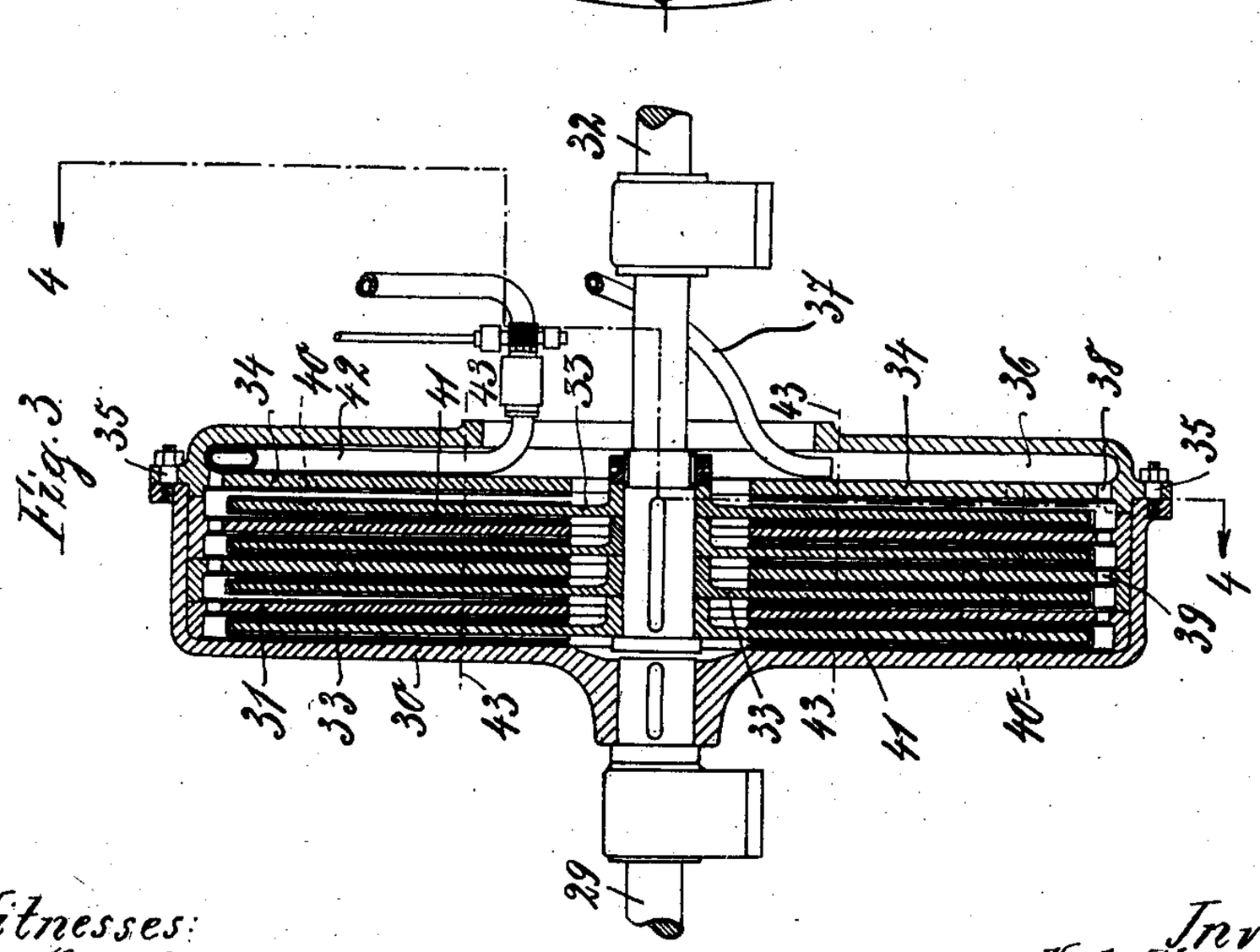


Fig. 3



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3 SHEETS—SHEET 3.

Fig. 6.

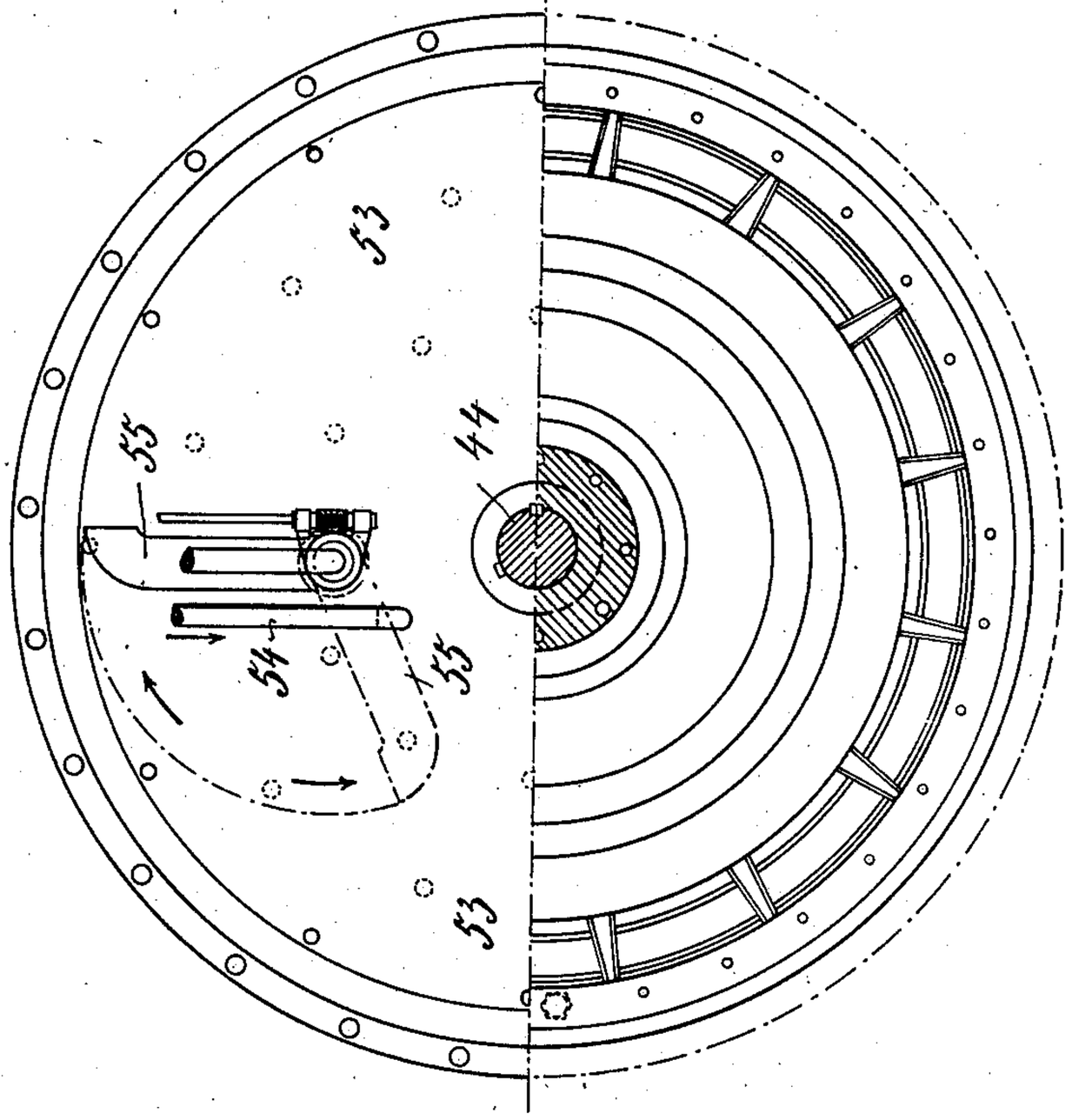
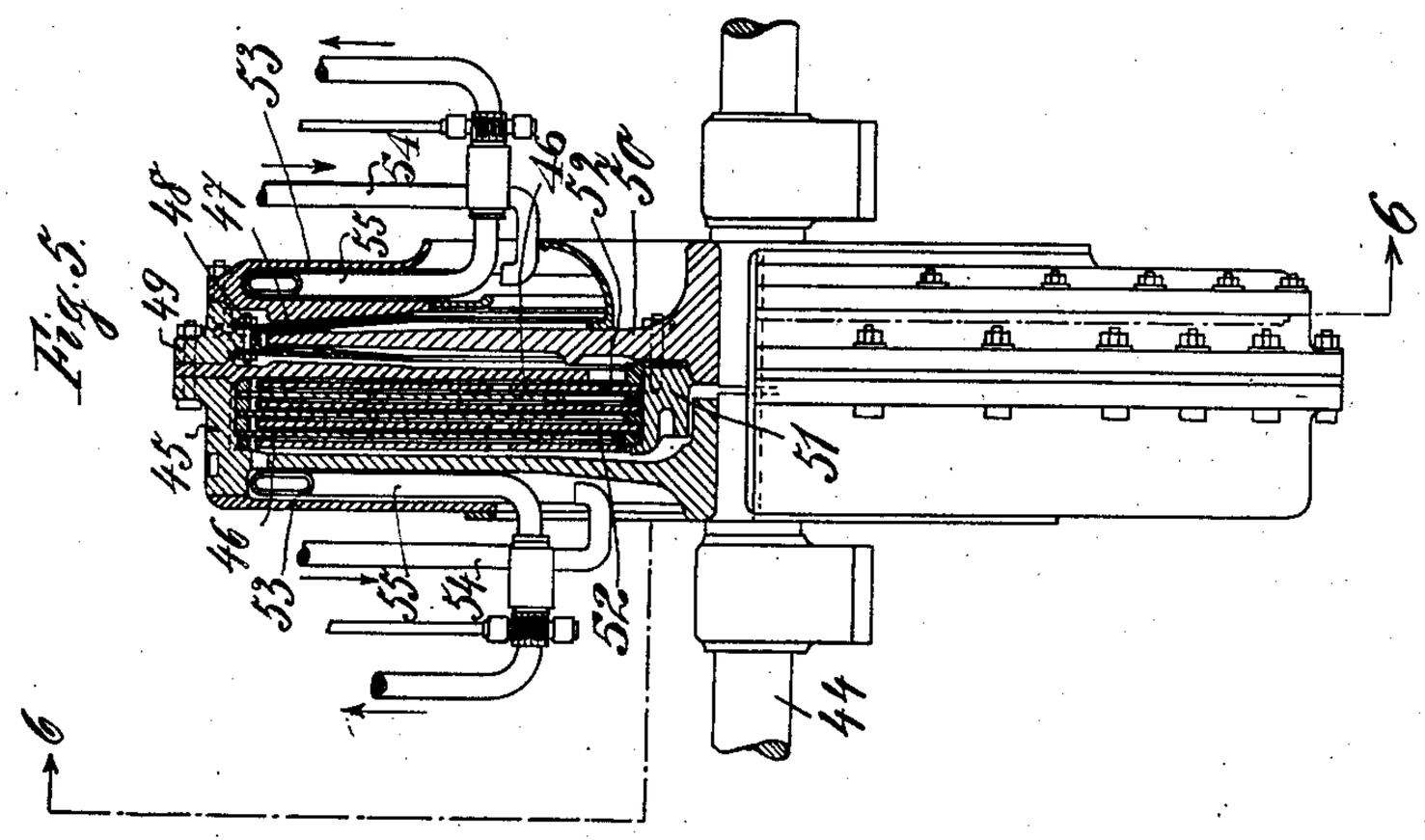


Fig. 5.



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UNITED STATES PATENT OFFICE.

VICTOR TICHOMIROFF AND LAZAR SCHECHTER, OF KOLOMNA, MOSCOW, RUSSIA.

HYDRAULIC COUPLING.

973,893. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed June 23, 1909. Serial No. 503,802.

To all whom it may concern:

Be it known that we, VICTOR TICHOMIROFF and LAZAR SCHECHTER, both subjects of the Emperor of Russia, and residents of Kolomna, Moscow, Empire of Russia, engineers, have invented a new and useful Hydraulic Coupling, of which the following is a specification.

This invention relates to couplings employing liquids for effecting the coupling between a driving and a driven member. According to the present invention the centrifugal action of a liquid in an annular chamber is employed to effect the coupling of a driving and a driven shaft.

The invention is illustrated in some typical modifications in the accompanying drawings, in which—

Figure 1 is a cross section through a coupling according to the present invention, Fig. 2 is a section on the line 2—2 of Fig. 1, Fig. 3 is a cross section and Fig. 4 is a section on the line 4—4 of Fig. 3 showing another form of hydraulic coupling according to the present invention, Fig. 5 is a side elevation with the upper part in section of a construction embodying the features shown in the modifications illustrated in Figs. 1–4, Fig. 6 is a view on the line 6—6 of Fig. 5.

In carrying the invention into effect according to the form shown in Figs. 1 and 2 a rotatable driving shaft 7 has fixed to it a hollow annular-chambered member 8. In the form illustrated two annular chambers are provided; one 9 is adapted to receive a suitable liquid such as water through a pipe 10. Owing to the rotation of the hollow annular-chambered member 8 the water or the like in the annular compartment 9 passes through ports 10^b and enters another annular chamber 11. Within this annular chamber there are supported ring shaped plates 12. These plates are held resiliently for instance by fixing them at their outer edges 13 to the walls of the annular chamber 11. The ports 10^a lead to the outside of the plates 12 and between the resiliently held plates 12 there is arranged the driven disk 14. The disk 14 is fixed to the driven shaft 15. Fixed to the plates 12 are a number of ribs 16 which support rings 17 of any suitable material for taking up the frictional action between the driven disk 14 and the driving members as hereinafter described.

The operation of this device is as follows: The water or like liquid passing through the ports 10^a is by the centrifugal action of the rotating member 8 driven to the periphery of the annular chamber and remains there under pressure. By supplying sufficient water to the annular compartment 9 the ring or annulus of water in the compartment 11 will embrace more or less of the plates 12. Owing to the pressure of the water these plates, which are resiliently held, are pressed against the driven member 14 and thereby coupling is effected between the hollow annular member 8 and the driven disk 14.

For the purpose of releasing the coupling we provide a tube 18 having a bent end 19. The tube 18 is adapted to be rotated by any suitable means such as a rod 20 having a screw 21 adapted to engage with a suitable wheel on the tube 18. The tube 18, as can be seen in Fig. 1 is adapted to move into the annular compartment 9. The coupling rotates in the direction of the arrow 22 and the tube 18 has its bend 19 facing in the opposite direction to the rotation of the coupling. By raising the tube 18 into the position shown in Fig. 1 the liquid will be drained from the annular compartments 9 and 11. The angle at which the plates 12 are arranged may be so chosen that when the water or the like is removed from the compartment 11 the plates 12 are forced back, away from engagement with the disk 14, by centrifugal force. With an angle such as illustrated however the disengagement would be effected much more by the spring or resilient action of the plate 12 than by any centrifugal action. For the purpose of lubricating the rubbing parts *i. e.* the rim of the disk 14 and the rings 17 oil or other suitable lubricant may be introduced to an annular groove 23. From this the oil or the like passes under the centrifugal action through tubes 24 into the space between the plates 12. The oil may be introduced by pipes 25. This oil may pass from the space between the plate 12 through the ports 26 into an annular space 27. From this annular space 27 oil may be removed by a pipe 28. It will be understood that the oil passed to the space between the plate 12 would be insufficient to create any counter-pressure to the water or the like in the annular space 11. With the device illustrated it is possible by rotating the pipe 18 to determine the amount

of liquid in the annular chambered member and thereby the amount of surface of the plate 12 which is exposed to the pressure of the fluid. In this way a very accurate and easy control of the pressure or power transmitted may be obtained. The coupling described, however, is preferably employed for transmitting the same velocity from the driving shaft 7 to the driven shaft 15 and when it is desired to effect transmission at different velocities the form illustrated in Figs. 3 and 4 is preferably employed.

According to the form shown in Figs. 3 and 4 the driven shaft 29 carries a multi-chambered annular member 30. The annular member 30 is divided into chambers by the diaphragms 31. To the driven shaft 32 there are fixed disks 33 which project between the diaphragms 31 on the annular-chambered member 30. The end diaphragm 34 is fixed to the main part 30 by bolts 35 and has an annular compartment 36 on its exterior. To this annular compartment liquid is supplied through a pipe 37. Ports 38 lead from the annular compartment 36 to the first of the plurality of annular chambers in the driving member 30. The various chambers of the driving member 30 are connected by ports 39. Ports 40 may also be provided in the disks 33. On the diaphragms 31 and disks 33 there are arranged ribs 41 which may be arranged radially as shown. A rotatable pipe 42 is provided and arranged as described with reference to Figs. 1 and 2.

The operation of this device is as follows: The water or the like supplied from the pipe 37 enters the spaces between the diaphragms 31 and disks 33 through the ports 38 and 39. Owing to the ribs 41 on these disks and diaphragms a considerable resistance is offered by the liquid when the driving member 30 is rotating. This resistance is exerted on to the driven members or disks 33 and thereby the shaft 32 is caused to rotate. If the liquid in the compartments of the driving member 30 is at the level indicated by the lines 43 the resistance would be much greater than if the level of the liquid in these chambers were nearer the periphery of the driving member 30. By rotating the tube 42 of the level of the liquid may be altered and thereby the power transmitted from the driving shaft 29 to the driven shaft 32 may be altered. In other words the shaft 32 may be driven at a smaller speed than that at which the driving shaft 29 rotates. In many cases it may be found advisable to combine a coupling adapted to transmit a variable power with a positive coupling adapted to effect driving of the driven shaft at the same velocity as that at which the driving shaft rotates. Such a construction is illustrated in Figs. 5–6. In this form the driving shaft 44 carries the annular-chambered member 45 on which in one compartment diaphragms 46 are arranged while in another annular compartment resilient plates 47 are disposed. The plates 47 are fixed to a rim 48 carried by a flange 49 fixed to the annular-chambered part 45. Between the plates 47 there is arranged the disk 50. Fixed to the disk 50 there is a ring 51 on which the disks 52 are arranged which project between the diaphragms 46. The diaphragms 46 and the disks 52 are arranged with ribs as described with reference to the form illustrated in Figs. 2 and 4. An annular compartment 53 is provided at each side of the coupling and these compartments are adapted to receive water from pipes 54. Rotatable pipes 55 are arranged to project into said compartments as desired. The operation of this form will be evident from the description given above of the forms described in Figs. 1–4.

Fluid clutches are already known, in which several parallel disks are provided, some of them being fastened to the driving part and the others to the driven part, and in which the transmission of power is effected and regulated by a fluid, which is passed into the disks-containing chamber with greater or smaller pressure. According to the present invention however the amount of transmitted power is regulated by the greater or smaller quantity of fluid, which is passed into the disk-containing chamber, increasing or diminishing thus the area of surface which is active for power transmission between the liquid and the disks respectively, in some cases the amount of pressure between the driven disks and some other rings of elastic material, which rings are pressed against the driven disks by the centrifugal force of the water rotating with the clutch.

It will be understood that the parts may be arranged in many different ways and for large couplings intended to transmit great powers a suitable increase in the number of annular chambers employed may, of course, be made.

We claim:—

1. In combination, a rotatable driving shaft; an annular-chambered member on said shaft; annular plates fixed to said member; a driven member between the plates; and means for passing liquid to said annular chamber to press said plates substantially axially into engagement with the driven member by the centrifugal action of the liquid on rotation of the driving member.

2. In combination, a rotatable driving shaft; an annular-chambered member on said shaft; resilient plates fixed to said member within an annular chamber thereof; means for supplying a liquid to said annular chambered member with a disk between; a driven member rotatable coaxially

with said annular-chambered member; and a pipe movable as desired into an annular-chamber of said member which removes the liquid therefrom and thereby releases the coupling.

3. In combination, a rotatable driving shaft; an annular-chambered member on said shaft; annular plates fixed to said member; a driven member with a disk between the plates; means for passing liquid to said annular chamber to press said plates substantially axially into engagement with the driven member; and means for passing a lubricant to said plates, where they coact with said driven members; and means for extracting said lubricants.

4. In combination, a rotatable driving shaft; an annular-chambered member on said shaft; parallel annular partition-walls extending from the outer circumference of the chamber radially inwardly and dividing thus the chamber into parallel compartments, and having holes near the outer circumference, so as to form direct communication between the different compartments; a driven member arranged coaxially with the driving part and having disks extending parallel and radially into the different compartments; means for passing a greater or smaller quantity of liquid into the chambered driving member and into all the compartments at the same time; and means for extracting any desired quantity of liquid out of the clutch during its action.

5. In combination, a rotatable driving shaft; an annular-chambered member on said shaft; parallel annular partition walls extending from the outer circumference of the chamber radially inwardly and dividing thus the chamber into parallel compartments and having holes near the outer circumference, so as to form direct communication between the different compartments; a driven member arranged axially with the driving part and having disks extending parallel and radially into the different compartments; ribs arranged on the driven disks and on the walls of the driving compartments; means for passing a desired quantity of liquid into the chambered driving member; and means for extracting any desired quantity of liquid out of the clutch during its action.

6. In combination a rotatable driving shaft; an annular-chambered member on said shaft; a driven member arranged coaxially with the driving member comprising a disk having friction surfaces and extending into the annular-chambered member; resilient annular plates fixed within said chambered member and having ribs preferably arranged radially against which the friction surfaces of the disk may bear; means for supplying a desired quantity of liquid in the space between the walls of the chambered member and the resilient annular plates; and means for extracting any desired quantity of liquid out of said space between the chambered members and the annular plates during the action of the clutch.

7. In combination a rotatable driving shaft; an annular-chambered member on said shaft; a driven member arranged coaxially with the driving member; a disk on said driven member extending into the chambered driving member and having on its outer part friction surfaces arranged inclined to a plane at right angles to the axis of the clutch; resilient annular plates fixed within said chambered member inclined to the plane at right angles to the axis of the clutch, so as to be swung out of engagement with the friction surfaces of the disk on the driven member by the mere centrifugal action, after the extraction of the liquid from the chambered member; means for passing at will liquid into said chambered member during the rotation of the clutch, for the purpose of pressing the resilient annular plates against the friction surfaces of the disk on the driven member; and means for extracting at will the liquid from the chambered member.

8. In combination a rotatable driving shaft; a driven shaft; and means for coupling said shafts to one another, comprising an annular-chambered member on the driving shaft, walls on said annular-chambered member adapted to offer resistance to a liquid, members fixed to the driven shaft also adapted to offer resistance to a liquid and to rotate between said walls, a disk fixed to the driving shaft, plates carried in a compartment of the annular-chambered member and adapted to be pressed by liquid pressure against said disk and means for passing liquid to the compartments of said annular-chambered member as desired.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

VICTOR TICHOMIROFF.
LAZAR SCHECHTER.

Witnesses:
N. KORNEFF,
P. SOKOLOPF.