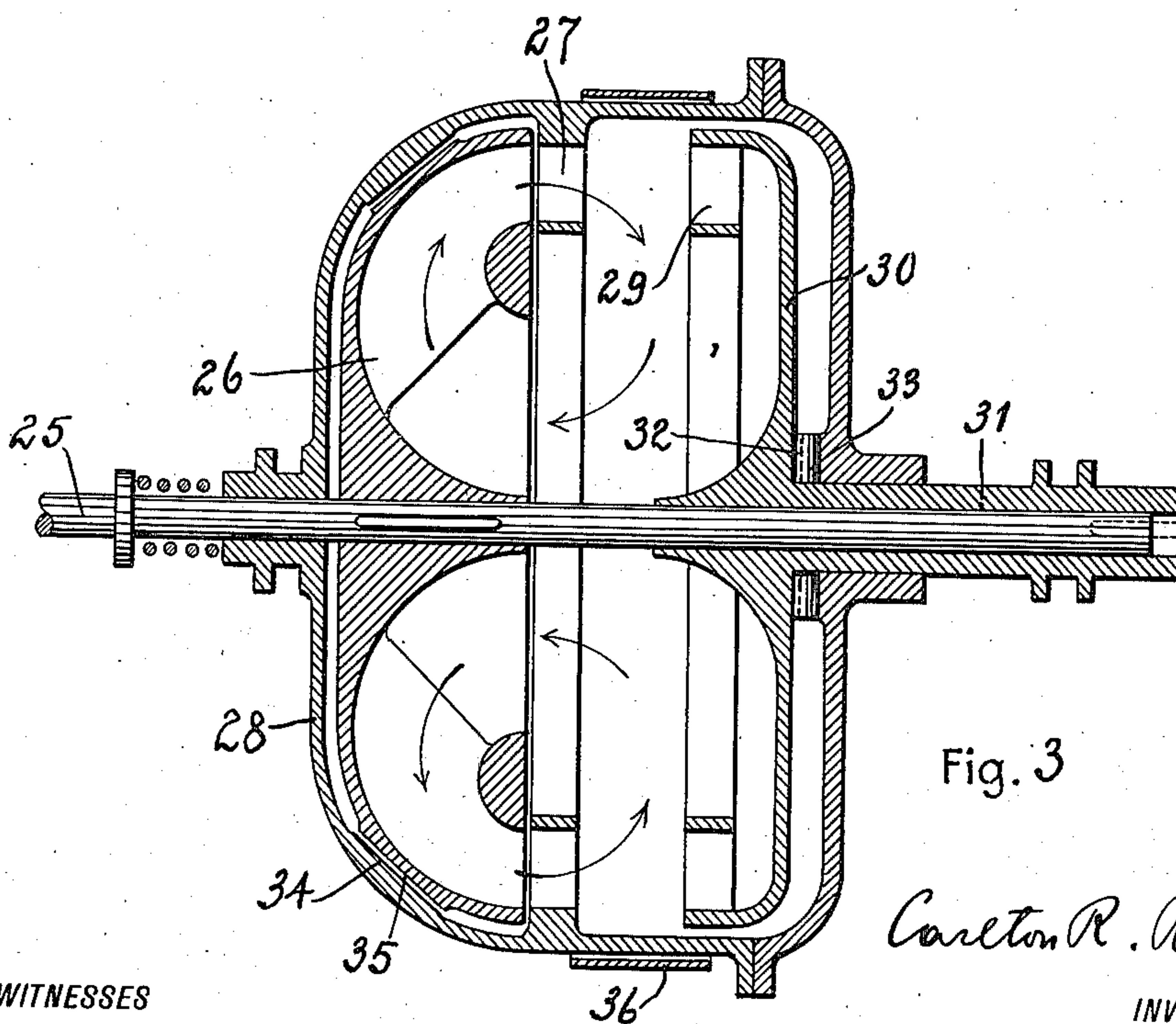
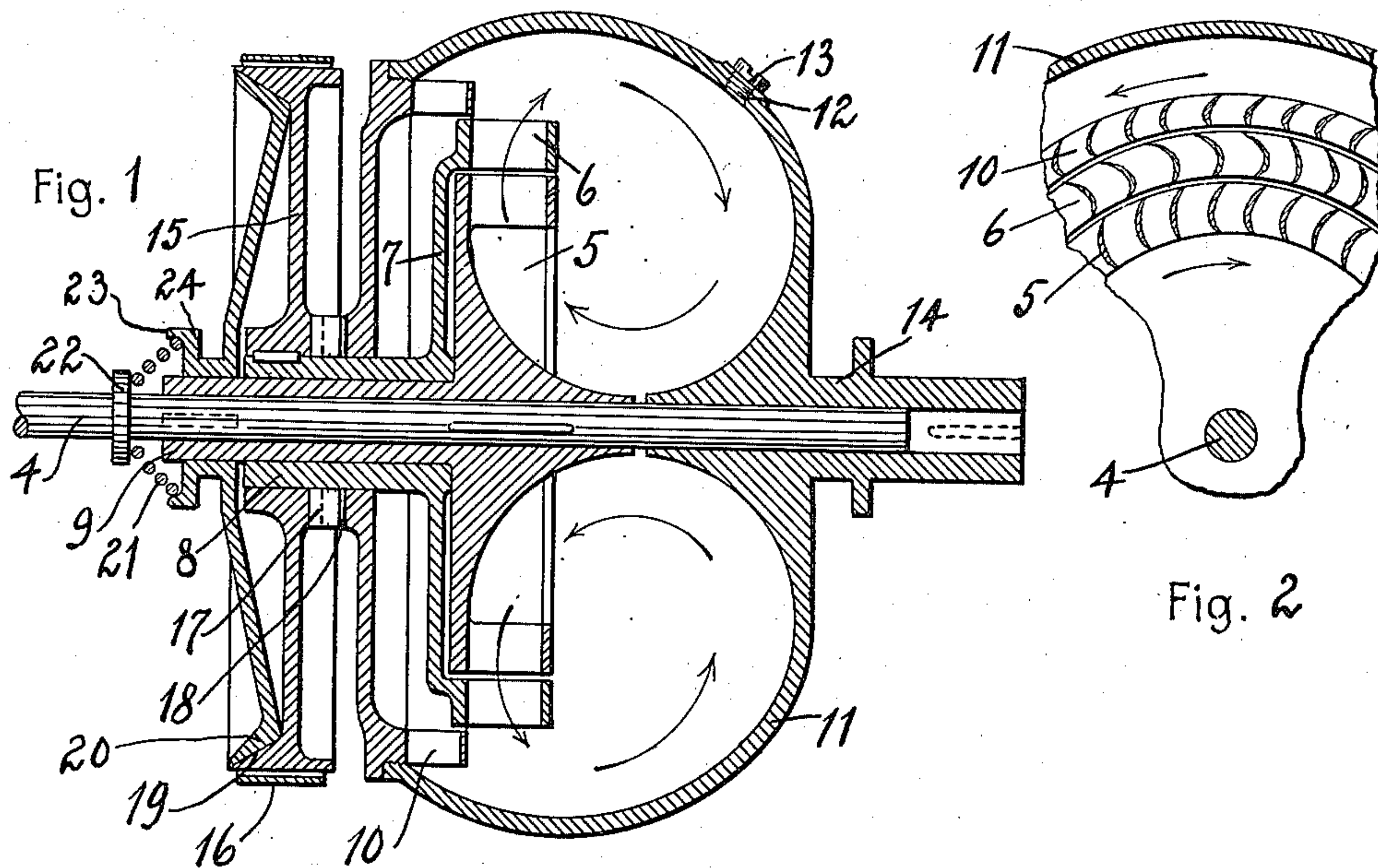


C. R. RADCLIFFE.
HYDRAULIC POWER TRANSMITTING APPARATUS.
APPLICATION FILED OCT. 21, 1908.

975,795.

Patented Nov. 15, 1910.



WITNESSES

S. Birnbaum
Arthur Ormby

Fig. 3

Carlton R. Radcliffe
INVENTOR

BY
Sigmund Herzog
his ATTORNEY

UNITED STATES PATENT OFFICE

CARLTON R. RADCLIFFE, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS,
TO THE SCIENTIFIC RESEARCH CO., OF NEW YORK, N. Y., A CORPORATION OF NEW
YORK.

HYDRAULIC POWER-TRANSMITTING APPARATUS.

975,795.

Specification of Letters Patent.

Patented Nov. 15, 1910.

Application filed October 21, 1908. Serial No. 458,871.

To all whom it may concern:

Be it known that I, CARLTON R. RADCLIFFE, a citizen of the United States, and resident of the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Hydraulic Power-Transmitting Apparatus, of which the following is a specification.

The present invention relates to hydraulic power transmitting apparatus, and more particularly to that class in which centrifugal pumps and turbines are combined for the purpose of obtaining a hydraulic transmission of power between a driving and a driven member, arranged on the same or on two independent shafts.

The invention has particular utility in connection with automobiles, although not limited to that use, and the object of the same is to provide a device of the character specified, the independent driving and driven members of which may be positively connected so as to obtain a high speed, or may be brought in such positions, whereby the rotation of the driven member is arrested when desired.

Another object of the invention is to provide means for reversing the driven member relatively to the direction of rotation of the driving member.

Other objects of the invention will be apparent in reading the specification and in examining the drawings, forming part of the present application for Letters Patent.

To attain the hereinbefore mentioned objects, the device consists of a primary turbine wheel and two secondary wheels, which may vary their relative positions in the direction of their longitudinal axis, and run either independently of each other or be locked together for a purpose to be described.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a section through the longitudinal axis of a device constructed according to the present invention, Fig. 2 is a section through the primary and secondary wheels of a portion of the device, and Fig. 3 is a modification of the apparatus.

Referring more particularly to Figs. 1 and 2, the numeral 4 designates the driving shaft, rotated by means of any suitable source of power. To this driving shaft is

keyed or otherwise attached a primary turbine wheel 5, or more particularly, a runner of a centrifugal pump, adapted to impart velocity to the actuating liquid, which flows from the said primary wheel to a secondary wheel 6, concentrically arranged with the primary wheel 5, and fixed against longitudinal movement in relation thereto. The secondary wheel 6 comprises a runner of a turbine of the radial outflow type, but it will be easily seen that a radial inflow type turbine wheel or an axial flow type wheel may be combined with a primary wheel. The secondary wheel 6 is arranged on a spider 7, carried by a sleeve 8, which is rotatably mounted on a sleeve 9, forming part of the primary wheel and snugly fitting the driving shaft 4.

A second secondary wheel 10 is arranged concentrically with the primary and secondary wheels 5 and 6, and may be secured to the inner side of a casing 11, inclosing also the primary wheel 5 and the secondary wheel 6. This casing is preferably made of two parts and provided with a hole 12, closed by a plug 13, through which hole the casing may be filled with the operating liquid, such as water, alcohol, glycerin, mercury, etc. The casing 11 is rotatably mounted upon the sleeve 8 and the driving shaft 4, and is provided with a collar 14, adapted to be engaged by an operating lever (not shown in the drawings), by means of which the casing and the secondary wheel 10, secured thereto, may be shifted to change their positions relative to the primary wheel 5 and the secondary wheel 6, whereby the outlets of the passages of the secondary wheel 6 may register with the inlets of the passages of the secondary wheel 10, when desired, or may be brought out of their registering positions for a purpose to be described.

A drum 15 is keyed or in any other manner secured to the sleeve 8 of the secondary wheel 6, and is provided with a band brake 16, which may be employed to arrest the rotation of the secondary wheel 6. This band brake affords one means for arresting the rotation of the secondary wheel 6, but other means may be employed equally well. The hub end of the drum 15 carries clutch members 17, adapted to engage the corresponding clutch members 18, arranged on the casing 11.

The inner face of the drum 15 is tapered at 19 to receive an annular tapered clutch 20, keyed to the sleeve 9 of the primary wheel 5, and kept in engagement with the tapered surface 19 by means of a spring 21, bearing against a flange 22, arranged on the driving shaft 4, and a flange 23, carried by the clutch member 20. The clutch member 20 is furthermore provided with a collar 24, adapted to receive an operating lever (not shown in the drawings).

The casing 11, that is the driven member, may be geared with the device intended to be driven in any suitable manner.

The vane curvature of the primary wheel 5 and the secondary wheel 10 is the same, while the vanes of the secondary wheel 6 are bent in a direction opposite to the direction in which the vanes of the wheels 5 and 10 run. The object of this arrangement will be seen presently.

The operation of the device is as follows: When it is desired to run the driven member 11 ahead, that is in the direction of rotation of the driving member 4, the clutch member 20 is freed from the clutch member 19, and the casing 11 locked to the secondary wheel 6 by shifting the casing 11 and thus engaging the clutch members 17 and 18. The secondary wheel 10 is thereby brought out of its registering position with the secondary wheel 6, and the liquid, to which energy has been imparted in the centrifugal runner 5, passes into the secondary wheel 6, to which it yields up almost the whole of its energy and rotates the same in the direction of rotation of the primary wheel 5. The energy, still remaining in the liquid, enables it to flow back through the casing to the inlet side of the wheel 5 to follow again the described circle.

To attain the high speed, that is to rotate the driven member at the speed of the driving member, the casing is locked to the secondary wheel 6, by means of the clutch members 17 and 18, and then the secondary wheel 6 is locked to the primary wheel by means of the clutch members 20 and 19, whereby the driving shaft is positively engaged by the driven member.

To reverse the direction of rotation of the driven member, the primary wheel is disengaged from the secondary wheel 6, by disengaging the clutch members 20 and 19, then the casing 11 is shifted, whereby the casing is disengaged from the secondary wheel 6 and the passages of the same coincide with the passages of the secondary wheel 10, and finally the brake band is applied to the drum 15 so as to hold the secondary wheel 6 against rotation, which acts now as a guide for reversing the direction of the liquid, flowing thereto from the primary wheel, and directing the same to the secondary wheel 10. Thus the latter will be

rotated in a direction opposite to the direction of rotation of the primary wheel 5, owing to the direction of the vane curvature of the wheel 10 relative to the primary wheel 5 and the guide-wheel 6.

In order to arrest the rotation of the driven member, the casing is disengaged from the secondary wheel 6 by shifting the same into the position which it occupies for the reverse direction, and the brake band is brought out of operation.

It will be thus seen, that when the parts of the device are in the positions for the high speed, that is when all the parts are locked, it necessitates only the movement of one or two levers to cause the driven member to run in the ahead or reverse directions or to be in its neutral position.

A modification of the device is shown in Fig. 3 of the drawings, in which the driving shaft is indicated at 25, and carries the primary wheel 26, causing the liquid to flow horizontally through the secondary wheel 27, arranged in the casing 28. The secondary wheel is of the axial flow type. A second secondary wheel 29 is carried by a spider 30, having a sleeve 31, shiftably mounted upon the driving shaft 25. In a similar manner the casing 28 may be shifted in the direction of its longitudinal axis. The casing may be locked to the secondary wheel 29 by means of the clutch members 32, engaging the clutch members 33, arranged on the spider 30, and may be locked with the primary wheel 26 by means of the tapering surface 34, adapted to engage the tapering surface 35 of the primary wheel. A brake band 36 may be applied to the casing in order to arrest the rotation of the secondary wheel 27.

The operation of the device is obvious from the foregoing description.

In the ahead direction the primary wheel and the secondary wheel 27 are disengaged, and the secondary wheel 29 locked to the casing. For obtaining the high speed, the primary wheel is locked to the casing and the casing to the secondary wheel 29. To reverse the direction of the driven member 31, the primary wheel is freed from the casing and the secondary wheel 29 shifted so that the passages of the same register with the passages of the secondary wheel 27, which latter is held against rotation by means of the brake band 36. The neutral position is obtained by freeing the secondary wheel 29 from the casing and disengaging the band 36 from the same.

It will, of course, be understood that many minor changes may be made in the construction and arrangement of the several parts without departing from the spirit and scope of the present invention.

What I claim is:

1. In a hydraulic power transmitting ap-

paratus, the combination with a primary turbine wheel, of a plurality of secondary turbine wheels adapted to rotate independently of each other and of said primary wheel, and means for locking together all of said wheels or some of said wheels at will.

2. In a hydraulic power transmitting apparatus, the combination with a primary turbine wheel, of a plurality of secondary turbine wheels adapted to rotate independently of each other and of said primary wheel, means for locking together all of said wheels or some of said wheels at will, and means for arresting the rotation of one of said secondary wheels to reverse the direction of rotation of another of said secondary wheels.

3. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member, a secondary turbine wheel attached to said driven member, a second secondary turbine wheel interposed between said primary and said first secondary wheel, and means whereby the operating liquid is directed through the passages of said interposed secondary wheel or through the passages of both of said secondary wheels at will.

4. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member, a secondary turbine wheel attached to said driven member, a second secondary turbine wheel interposed between said primary and said first secondary wheel and adapted to be locked to said driven member, means for arresting the rotation of said interposed secondary wheel at will, and means whereby the operating liquid is directed through the passages of said interposed secondary wheel, whereby the driven member rotates in the direction of rotation of the driving member, or directed through the passages of both of said secondary wheels, whereby the rotation of the driven member is reversed relatively to said driving member when the interposed secondary wheel is locked against rotation.

5. In a hydraulic power transmitting apparatus, the combination with a driving member, of a longitudinally shiftable driven member, a primary turbine wheel secured to said driving member, a secondary turbine wheel attached to said driven member, a second secondary turbine wheel interposed between said primary and said first secondary wheel, means adapted to lock said secondary wheels together, whereby the driven member is rotated in the direction of rotation of the driving member, means for arresting the rotation of said interposed secondary wheel, and means producing the longitudinal movement of said driven member, whereby the passages of the said secondary

wheels register, reversing thus said driven member when said interposed secondary wheel is locked against rotation.

6. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member, a secondary turbine wheel attached to said driven member, a second secondary turbine wheel interposed between said primary and said first secondary wheel, coacting clutch members on said primary and said interposed secondary wheel, and cooperating clutch members on said interposed secondary wheel and said first secondary wheel, substantially as specified.

7. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member, a secondary turbine wheel attached to said driven member, a second secondary turbine wheel interposed between said primary and said first secondary wheel, coacting clutch members on said primary wheel and said interposed secondary wheel, cooperating clutch members on said interposed secondary wheel and said first secondary wheel, and means for arresting the rotation of the interposed secondary wheel.

8. In a hydraulic power transmitting apparatus, the combination with a driving member, of a longitudinally shiftable driven member, a primary turbine wheel secured to said driving member, a secondary turbine wheel attached to said driven member, a second secondary turbine wheel interposed between said primary wheel and said first secondary wheel, means for locking the interposed secondary wheel against rotation at will, cooperating clutch members on said primary wheel and said interposed secondary wheel, coacting clutch members on said interposed secondary wheel and said longitudinally shiftable driven member, whereby, first, the driven member is positively driven by the driving member when both series of clutch members on said interposed wheel are engaged by their respective coacting clutch members, second, the speed of the driven member is equal to zero when the same is shifted so that its clutch members are disengaged from the clutch members of the interposed wheel and the latter is allowed to rotate freely, third, the driven member is driven ahead when the same is locked to the interposed wheel and the primary wheel freed from the latter, and, fourth, the driven member is reversed when all the clutches are disengaged and the interposed wheel is locked against rotation.

9. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member,

a secondary turbine wheel attached to said driven member, and a second secondary wheel independent of said first secondary wheel and adapted to be locked therewith at will.

10. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member, two secondary turbine wheels, one of which is connected to and the other being adapted to be operatively connected to said driven member, and means adapted to arrest the rotation of one of said secondary wheels, whereby the direction of rotation of the other and thus of the driven member is reversed relative to the driving member.

11. In a hydraulic power transmitting apparatus, the combination with a driving member, of a driven member, a primary turbine wheel secured to said driving member, two secondary turbine wheels having different vane curvatures, one of said secondary wheels being connected to and the other being adapted to be operatively connected to said driven member, and means adapted to arrest the rotation of one of said secondary wheels, one of said secondary wheels serving for the ahead direction of the driven member and being also adapted to serve as a guide wheel for the reverse direction when the rotation of the same is arrested.

12. In a hydraulic power transmitting apparatus, the combination with a driving member, of a longitudinally shiftable driven member, a primary turbine wheel secured to said driving member, two secondary tur-

bine wheels, one of said secondary wheels being connected to and the other being adapted to be operatively connected to said driven member, one of said wheels being adapted to be shifted with said driven member, and means adapted to arrest the rotation of one of said secondary wheels, whereby the direction of rotation of said driven member is reversed relative to the driving member when said driven member is shifted so that the passages of the secondary wheels register.

13. In a hydraulic power transmitting apparatus, the combination with a driving member, of a longitudinally shiftable driven member, a primary turbine wheel secured to said driving member, two secondary turbine wheels having different vane curvatures, one of the same being adapted to be shifted with said driven member, and means adapted to arrest the rotation of one of said secondary wheels, the non-shiftable secondary wheel serving for the ahead direction of the driven member and being also adapted to serve as a guide wheel to reverse the direction of rotation of the other secondary wheel when the rotation of the guide wheel is arrested and the other is shifted so that the passages of the same register with the passages of the non-shiftable secondary wheel.

Signed at New York, in the county of New York and State of New York, this 19th day of October, A. D. 1908.

CARLTON R. RADCLIFFE.

Witnesses:

HENRY L. FRIDENBERG,
SIGMUND HERZOG.