

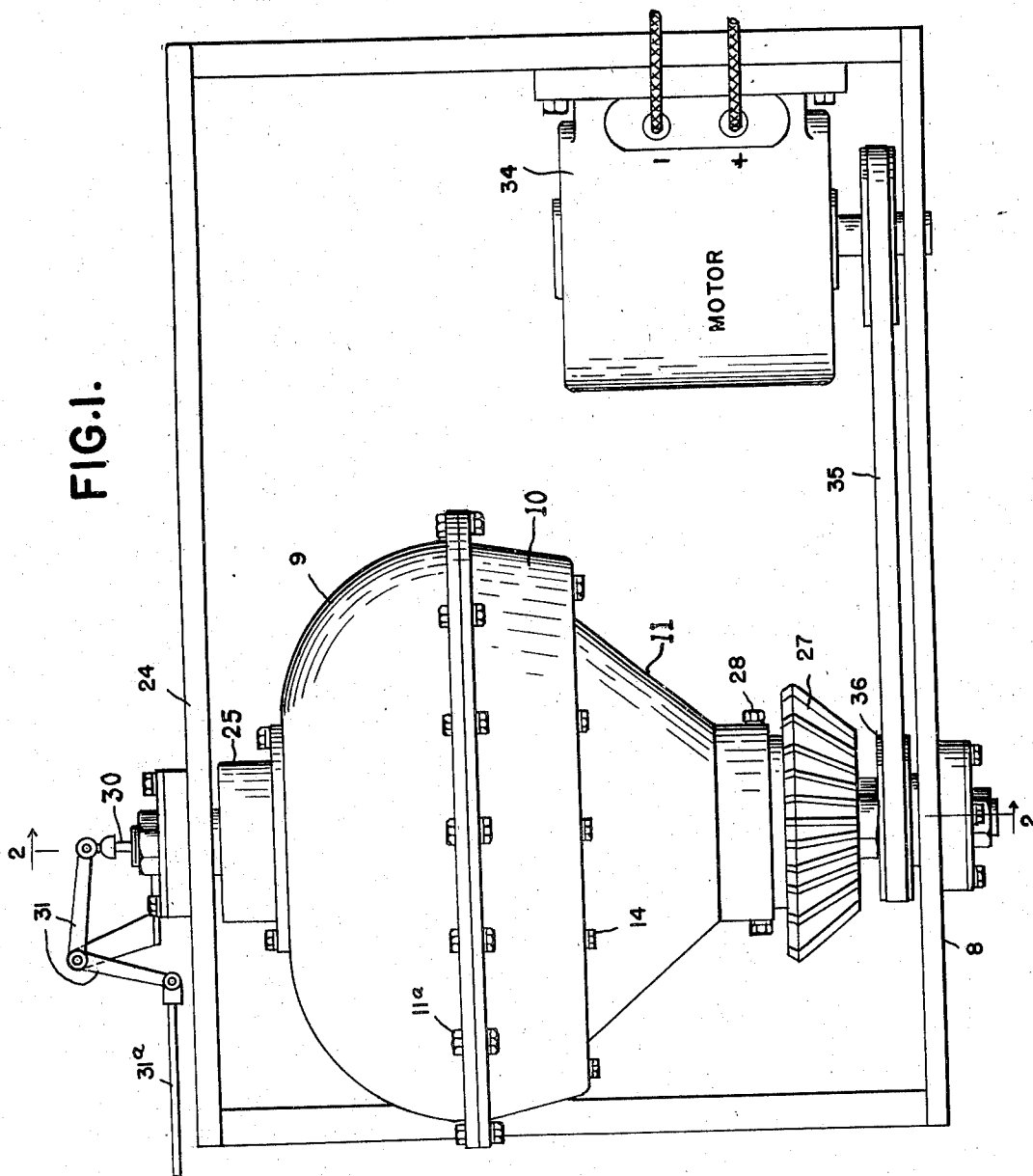
Aug. 3, 1937.

J. F. SKINNER
ROTARY POWER APPARATUS
Filed Nov. 16, 1935

2,088,818

3 Sheets-Sheet 1

FIG. 1.



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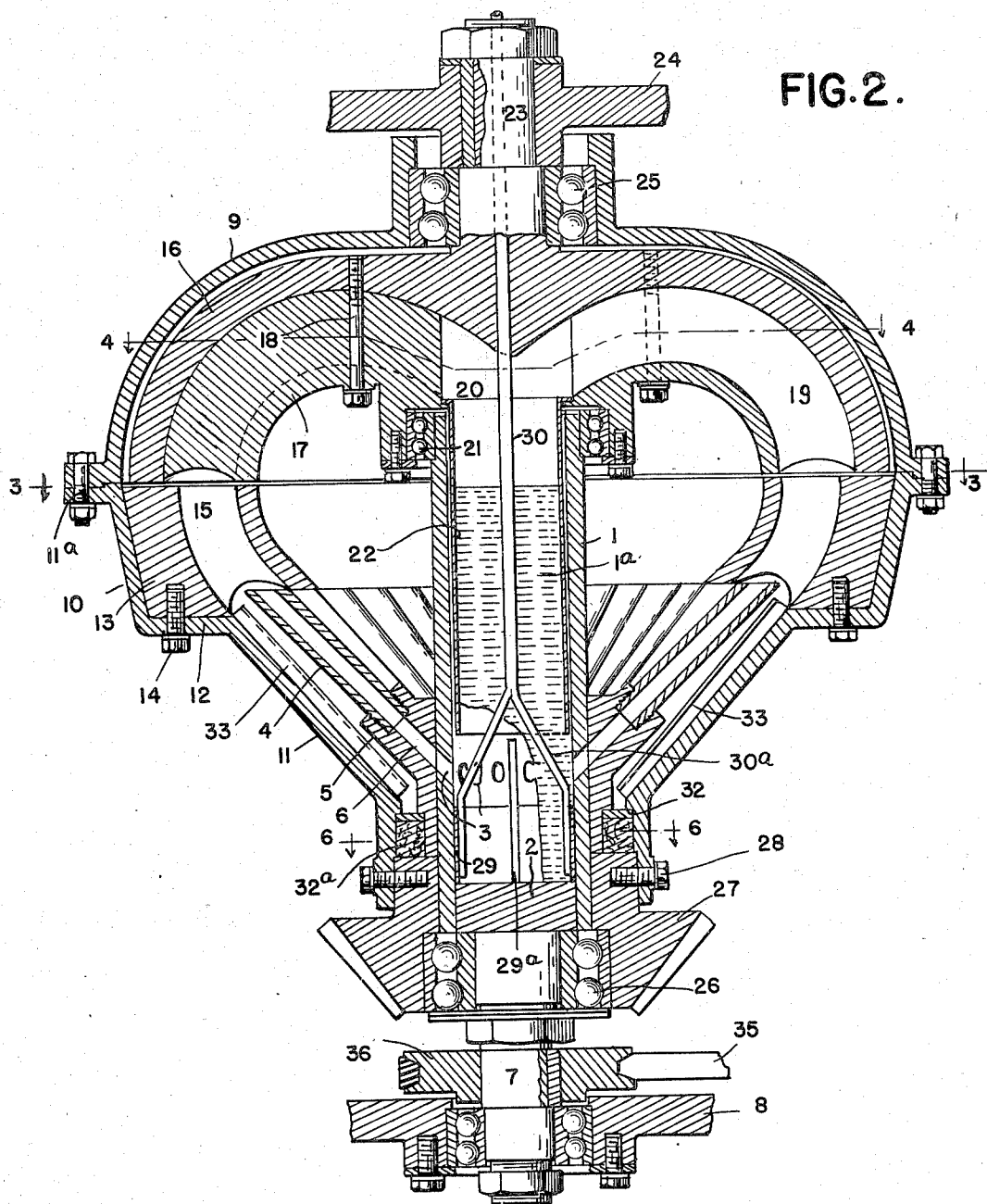
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FIG. 4.

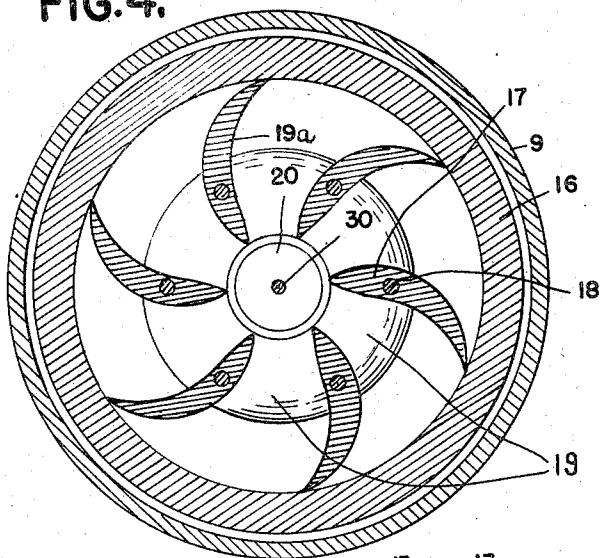


FIG. 6.

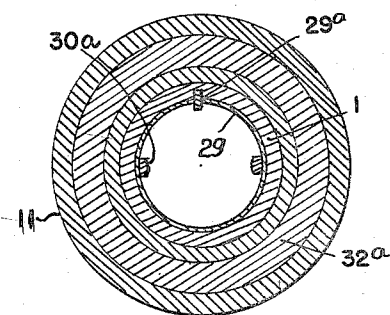


FIG. 3.

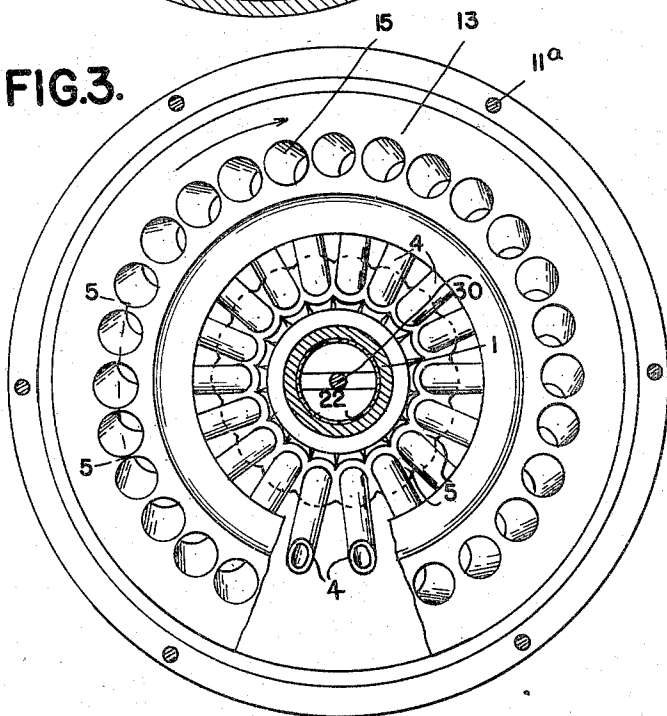
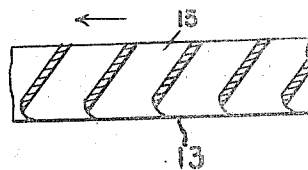


FIG. 5.



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2,088,818

ROTARY POWER APPARATUS

John F. Skinner, Flint, Mich.

Application November 16, 1935, Serial No. 50,114

5 Claims. (Cl. 60—54)

This invention relates to rotary power apparatus and particularly to apparatus employing a fluid medium to transmit a torque or rotation from a driving member to a driven member.

An object of the invention is to centrifugally discharge a liquid in numerous jets from a rapidly revolving driving member, and to impel a driven member by impact of such jets.

Another object is to vary the aggregate impact force of the jets to regulate the power applied to the driven member.

Further objects are to employ in the above connection, a relatively heavy liquid, as mercury, capable of exercising a powerful centrifugal force, and to so circulate said liquid as to minimize its required quantity.

These and various other objects the invention attains by the construction hereinafter described, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of an apparatus exemplifying the invention.

Fig. 2 is a vertical sectional view of the apparatus, taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal sectional view, taken on the line 3—3 of Fig. 2.

Fig. 4 is a cross section taken on the line 4—4 of Fig. 2, showing a stationary portion of the apparatus.

Fig. 5 is a cross sectional view of an impact ring, taken on the line 5—5 of Fig. 3.

Fig. 6 is a horizontal cross section of the lower portion of the machine, taken on the line 6—6 of Fig. 2.

In these views, the reference character 1 designates a vertically mounted, open-topped, rotary cylindrical receiver for a drive-transmitting liquid 1a, such as mercury. At a suitable elevation above its bottom 2, the receiver is formed with a circular series of outlets 3, and rigidly carries a set of similar nozzles 4, in individual communication with said outlets, extending outwardly and upwardly from the receiver in an inverted frusto-conical formation. Attachment of the nozzles to the receiver is effected by a collar 5, embracing the receiver and welded or otherwise rigidly attached thereto, the nozzles being threaded into said collar, and communication between the nozzles and outlets being established by passages 6 in the collar individually aligned with the nozzles. Projecting from the bottom 2, coaxially with the receiver, is a stub shaft 7 journaled in a suitable support 8, fixed beneath the apparatus.

Journalled coaxially with the described driv-

ing member, is a driven member forming a casing enclosing the driving member, and comprising an approximately hemispherical upper portion 9, an approximately cylindrical mid portion 10, and a lower portion 11, having the approximate form of an inverted frusto-cone. The mid and lower portions are preferably integral, and the upper portion is bolted to the mid portion, as indicated at 11a. Interiorly conforming to said mid portion and seating on a shoulder 12 formed at the juncture of the mid and lower portions, is an impact ring 13, rigidly attached to said shoulder by bolts 14 or the like. This ring projects into the casing above and in close proximity to the nozzle outlets, as best appears in Fig. 2, and is formed with a suitable number of upward passages 15, of considerably greater capacity than the nozzles, and providing walls to receive the impact of mercury discharged from the nozzles, the angular relation of these walls to the nozzles being such as to derive a maximum rotary impulse from the impact.

Within the upper portion of the casing, is mounted a stationary member comprising upper and lower parts 16 and 17 rigidly connected by bolts 18. The part 16 substantially conforms in shape to the portion 9 of the casing, and is spaced slightly from such portion. The parts 16 and 17 jointly form a circular series of passages 19 separated by gradually curved walls 19a integrally rising from the member 17, said passages having inlet ends in close proximity to the impact ring and registered rotatively with the outlet ends of the passages 15. The passages 19 curve upwardly and inwardly and are connected to a central chamber 20 in the part 17. Thus the mercury upwardly discharging from the impact ring is received by the passages 19 and delivered therefrom to the central chamber 20, from which it is gravity-returned to the receiver 1 underlying said chamber. A bearing 21 integrally depending from the part 17 encircles and journals the upper end portion of the receiver, and any access of mercury to the bearing is prevented by a sheet metal guard sleeve 22 carried by the part 17 and depending to a point in the receiver adjacent to the outlets 3. Said sleeve has the further effect of affording a body of mercury in the receiver of the receiver will not be materially imparted to such body except in proximity to or below the outlets 3. In the absence of such sleeve, a centrifugal force would be so exerted on the mercury as to induce its upward travel against the receiver wall.

To support the member 16, 17 and hold it stationary, a pin 23 projects integrally upward from the part 16, in vertical alignment with the stub shaft 7, and is clamped or otherwise rigidly secured to a suitable support 24, fixed above the apparatus.

To journal the driven member coaxially with the driving member, a pair of upper and lower bearings 25 and 26 are formed upon the driven member, engaging the pin 23 and shaft 7 respectively. The lower bearing, as illustrated, is formed within a bevel gear 27 bolted at 28 to the lower end of the driven member, and serving for power delivery.

The amount of power delivered to the driven member is regulable by a cylindrical valve 29 vertically slidable in the lower portion of the receiver, and adapted to be raised or lowered to close the outlets 3 to a desired extent. Thus, as shown in Fig. 2, said valve is fast upon the lower end of a control stem 30 rising axially through the receiver 1, part 16, pin 23, and support 24, and connected above said support to a bell crank lever 31, actuable by a control rod 31a to raise or lower the valve. Preferably the valve 29 consists of a resilient, split, sheet-metal ring which is inserted under some compression in the receiver and consequently is self-expanding to maintain a sealing fit with the receiver. A vertical spline 29a interiorly secured to the receiver wall engages between the ends of said ring to assure its rotation in unison with the receiver, while allowing it to freely slide up and down. The lower portion of the stem 30 is forked to engage opposite points of said valve, its forks 30a being sufficiently resilient to allow the described spring action of the valve.

Under certain abnormal conditions of operation, mercury discharged by the nozzles 4 may fail to travel through the intended circuit effecting its return to the receiver. If, for example, the outlets 3 are open upon an initial application of power to the apparatus, the mercury discharging from the nozzles will lack momentum to carry it through the passages 18, 19, and 20, until rotation reaches a suitable velocity. Under such conditions mercury will descend from the nozzle outlets and accumulate in the lower portion of the casing. Any such accumulation will rest upon an annular plate 32 fitted between the lower portion of the casing and the collar 5, an annular packing ring 32a being arranged beneath said plate to assure against any downward escape of mercury. When the driven member acquires an adequate speed, such accumulation will be centrifugally delivered to the impact ring and thence to the receiver together with the normally flowing mercury. In order that such mercury may exercise a driving effect, in its return to the receiver, the lower portion of the casing is preferably interiorly formed with a series of ribs 33, substantially coextensive with the nozzles, and compelling upward and outward travel of the mercury in planes radial to the axis of the machine.

Power from any desired source is applied to the driving member, there being illustrated an electric motor 34 effective upon the driving member through a belt 35 engaging a pulley 36 fixed on the stub shaft 7.

In the operation of the described apparatus, upon initial energization of the motor 34, the valve 29 is preferably closed. When the driving member has been brought up to a suitable speed, said valve is opened either entirely or partially,

depending on the amount of power which it is desired to transmit to the driven member. Centrifugal force will set up a flow of mercury from the receiver outwardly through the nozzles 4, and will induce a forceful discharge of the mercury from the outer ends of the nozzles, in a direction approximately tangent to the orbit of such ends. The mounting of the nozzles is such, however, as to upwardly incline the direction of discharge so as to direct the mercury into the impact ring. The tangential component of the impact force exerted by the mercury on the walls of said passages is such as to induce a rotation of the driven member corresponding in direction to that of the driving member, and of a speed jointly determined by the adjustment of the valve 29 and by the load on the driven member. The spent mercury in being returned through the passages 18 and 20 to the receiver, is not opposed by centrifugal force, since said passages are formed in a stationary portion of the apparatus.

The apparatus provides a type of drive between a driving and driven member that permits of simple, easy, and complete control of the magnitude of the power transmitted, and hence of the speed of the driven member. The drive furthermore is such that no damage may be done by sudden variations of load, and is particularly suited to handling a load which is subject to considerable and sudden variations.

The invention is presented as including all such modifications and changes as come within the scope of the following claims.

What I claim is:

1. A rotary power apparatus comprising driving and driven members rotative about a substantially vertical axis, a circular series of impact blades carried by the driven member and centered substantially at said axis, a cylindrical liquid receiver carried by and rotative with the driving member and centered substantially at said axis, a stationary sleeve within said receiver shielding the receiver contents from the driving effect of the receiver, a plurality of nozzles outwardly extending upon the driving member from the receiver and centrifugally withdrawing the liquid from the receiver, responsive to rotation of the driving member, and directing the liquid from their outer ends against said blades, and means for returning the liquid from the blades to the receiver.

2. A rotary power apparatus comprising driving and driven members rotative about a substantially vertical axis, the driven member forming a casing and the driving member occupying the lower portion of such casing, a stationary member occupying the upper portion of the casing, a plurality of impact blades interiorly carried by the driven member between the driving and stationary members, a liquid receiver within the casing centered substantially at said axis, and means carried by the driving member for receiving liquid from the receiver and delivering it centrifugally against said blades, the stationary member being formed with passages for returning the liquid from the blades to the receiver.

3. In a rotary power apparatus as set forth in claim 2, said receiver being carried by and rotative with the driving member, a sleeve carried by and held from rotation by the stationary member and depending within the receiver to shield the receiver contents from the driving effect of the receiver.

4. A rotary power apparatus as set forth in

claim 2, said receiver being carried by and rotative with the driving member, and having an upper end portion journaled in the stationary member.

- 5 5. A rotary power apparatus comprising driving and driven members rotative about a common axis, the driven member forming a casing substantially enclosing the driving member, a circular series of impact blades carried by and
10 within the driven member and centered substantially at said axis, a plurality of liquid delivery nozzles carried by the driving member at one

side of the impact blades, having outlet ends adjacent to and directed toward the blades, said nozzles extending toward the axis in an approximately conical form, a member stationary within the casing at the other side of the impact blades, and formed with passages to receive a drive-transmitting liquid from the blades and discharge it toward the axis, and means for receiving such liquid from the passages and delivering it along said axis to said nozzles. 5 10

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