W. S. ELLIOTT & F. M. FABER.

TURBINE.

APPLICATION FILED DEC. 31, 1906.

983,032.

Patented Jan. 31, 1911.

2 SHEETS—SHEET 1.

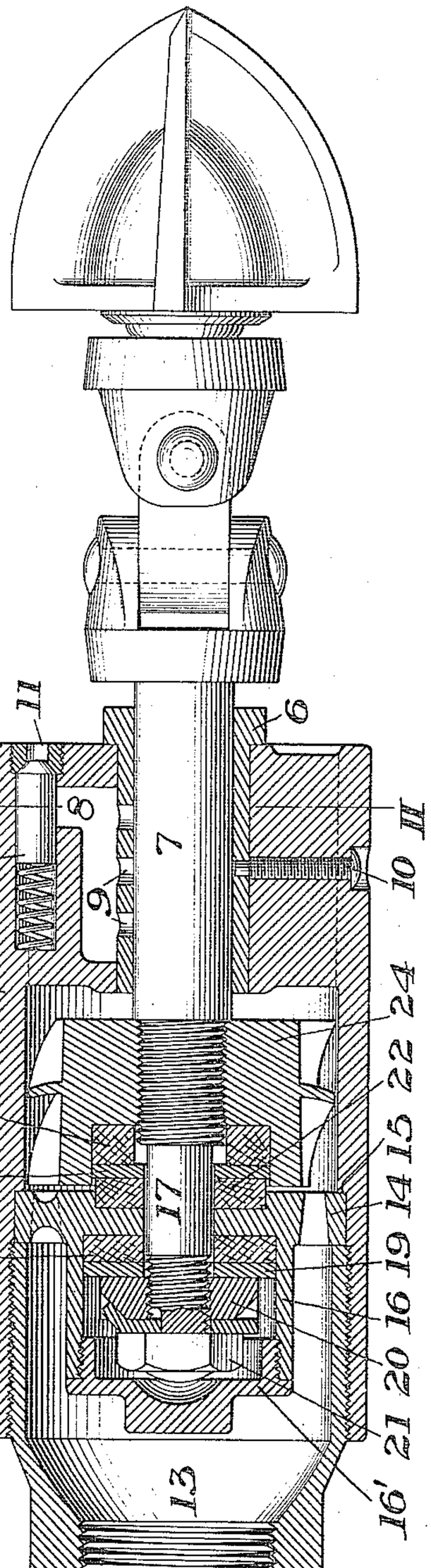

Fig. 1.

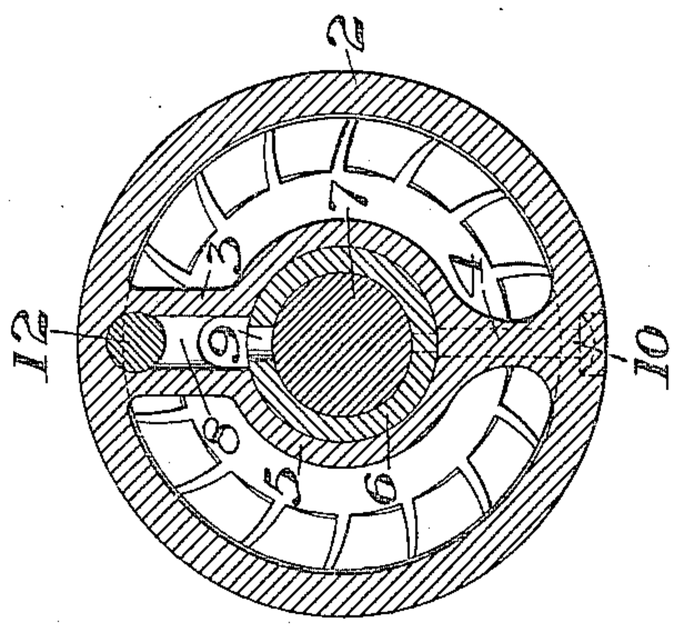

Fig. 2.

WITNESSES

W. W. Swartz

R. A. Balderson.

INVENTORS.

W. S. Elliott

F. M. Faber

by Dekkers & Byrnes

their attys

W. S. ELLIOTT & F. M. FABER.

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2 SHEETS—SHEET 2.

Fig. 4.

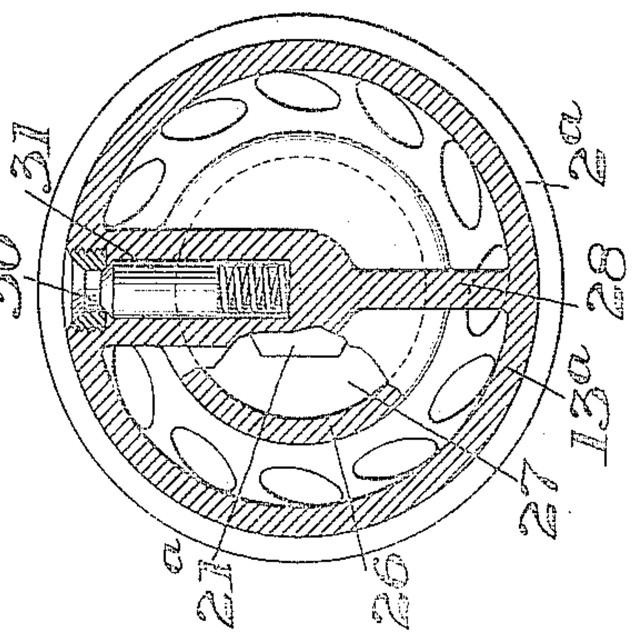


Fig. 3.

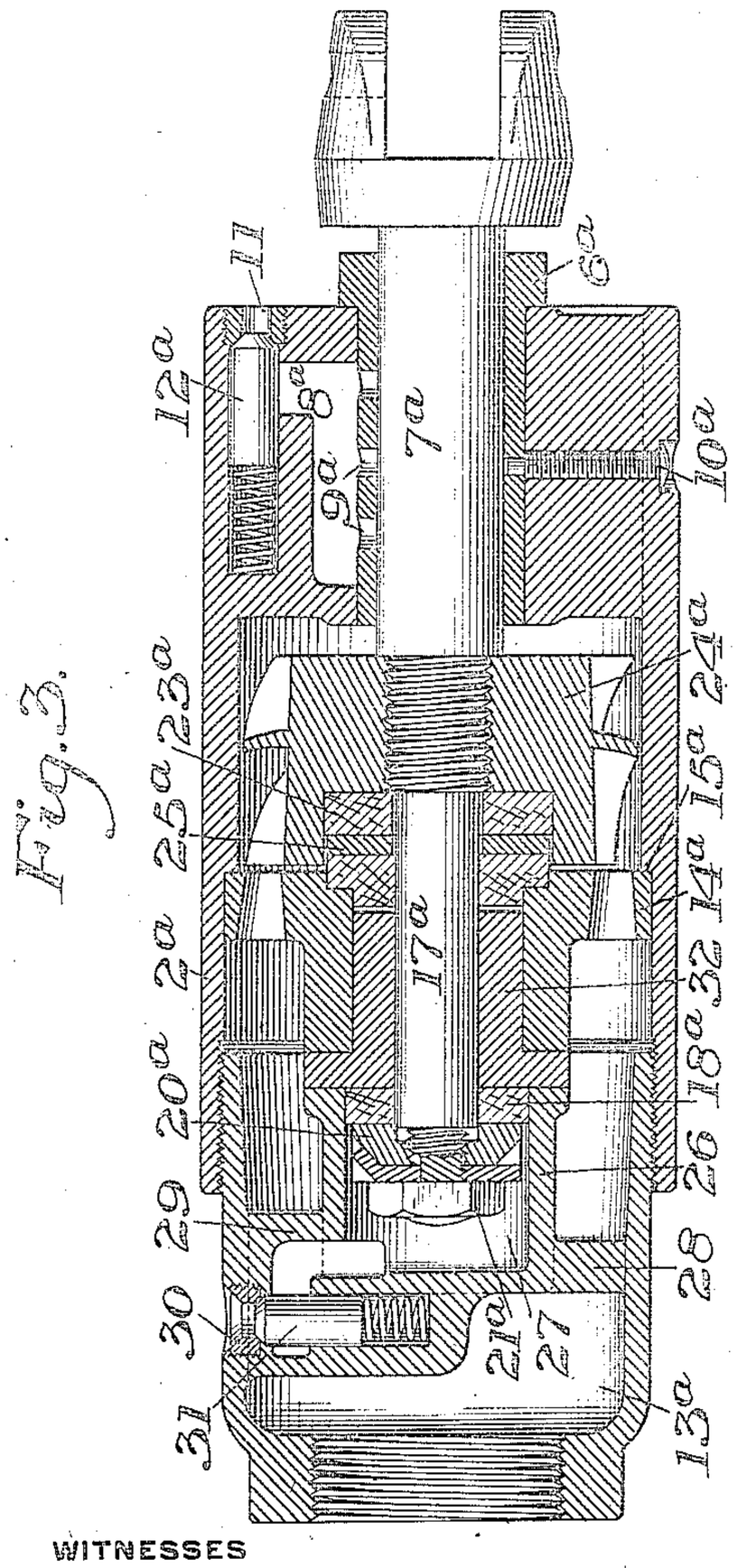
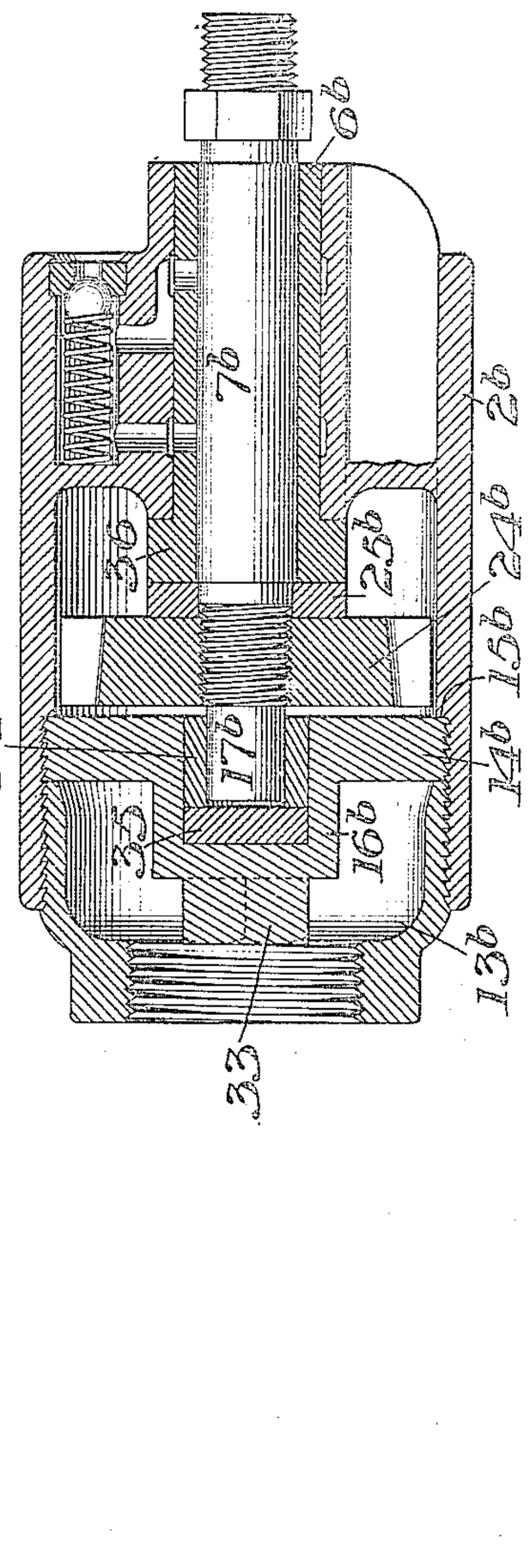


Fig. 5.



WITNESSES

W. W. Swartz

R. A. Balderson.

INVENTORS.

W. S. Elliott

F. M. Faber

by Baldwin & Hopkins

their attys

UNITED STATES PATENT OFFICE.

WILLIAM S. ELLIOTT, OF PITTSBURG, PENNSYLVANIA, AND FRANK M. FABER, OF CANTON, OHIO; SAID FABER ASSIGNOR TO SAID ELLIOTT.

TURBINE.

983,032. Specification of Letters Patent. Patented Jan. 31, 1911.

Application filed December 31, 1906. Serial No. 350,246.

To all whom it may concern:

Be it known that we, WILLIAM S. ELLIOTT, of Pittsburg, Allegheny county, Pennsylvania, and FRANK M. FABER, of Canton, Stark county, Ohio, have invented a new and useful Turbine, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional side elevation showing one form of our invention; Fig. 2 is a cross section on the line II—II of Fig. 1; Figs. 3 and 4 are views similar to Figs. 1 and 2, showing a modified form of the invention; and Fig. 5 is another view similar to Fig. 3, showing a further and simpler form of the invention.

Our invention relates to the class of turbines, and particularly those intended for driving tools or removing scale or sediment from the interior of tubes.

The object of the invention is to provide a simple and efficient, and long-lived turbine device in which the shocks upon the cutting head are largely absorbed or cushioned before they reach the turbine wheel.

In the drawings, referring to the form of Figs. 1 and 2, 2 is the casing or barrel of the turbine, which is provided with inwardly projecting webs or ribs 3 and 4, supporting a tubular bearing 5. The webs preferably extend longitudinally for a part of the length of the barrel from the front end, and within the bearing is carried the removable bushing 6, through which the turbine shaft 7 extends. We preferably form at least one of the webs with an oil cavity 8 having holes 9 leading through the removable bushing to the shaft. This bushing may be held against rotation by the screw 10 inserted through the solid web and entering the bushing, or the bushing may be pressed in. The oil cavity may be filled through a hole in a plug 11 which is normally closed by the spring-pressed plug valve 12. The nozzle coupling or rear supply chamber 13 is preferably screwed into the rear end of the barrel or casing, and against the stationary turbine member 14, which has a smooth outer surface fitting neatly against a shoulder 15 in the barrel. The removable nozzle thus serves to clamp the stationary turbine member in place. The stationary turbine member has a rear annular extension 16 of smaller diameter than the bore of the chamber 13, and this is closed by the screw cap 16′. The rear reduced portion 17 of the turbine shaft extends back within this chamber, which contains washers 18 and 19 surrounding the shaft and preferably held by a nut and lock-nut 20 and 21. At the front of the stationary turbine portion a washer 22 seats in a recess therein, and a ring 23 seats within a mating recess in the turbine wheel 24, a washer 25 being placed between them. A thrust bearing is thus provided for the shaft on both sides of the stationary turbine portion. We have shown the turbine wheel as screwed to the shaft, though it may be secured in any desirable manner.

In Figs. 3 and 4 we show a form similar to that of Figs. 1 and 2, except that the closure at the rear end of the casing is of different form. In this case the screw coupling 13^a is made in the form of a plug with a central hub 26 containing the chamber 27 for the rear bearing of the reduced portion 17^a of the turbine shaft. This central hub portion is carried on radial webs 28 and 29, which allow the water entering the rear end chamber to flow around the hub to the ports in the stationary part of the turbine. The chamber 27 in this case is an oil chamber having a supply channel with an entrance plug 30 closed by spring-pressed plug 31. In this case again the shaft is extended through the stationary member, thrust bearings being provided both at the front and rear of said stationary member. In this case the removable nozzle does not seat against the edge of the stationary member, but clamps it through the bushing 32, against which the hollow chamber 27 abuts.

In Fig. 5, a still simpler form of the invention is shown, wherein the stationary turbine member 14^b is screwed into the rear end of the barrel 2^b and against the shoulder 15^b. In this case the nozzle 13^b is substantially the same as in the form of Fig. 1, and screws against the stationary turbine member. This stationary member 14^b is in this case provided with a rear hub extension 16^b, which is shown as having an itegral closure with a squared portion 33 for screwing it to place. Within the recess in this

stationary member are a metal collar 34 and a metal disk 35, to receive the reduced portion 17^b of the turbine shaft. In this case the bushing 6^b has an enlarged rear end portion 36 which fits against the rear end of the web portions with a washer 25^b between the turbine wheel 24^b and this bushing. The thrust bearing in this case is against the stationary turbine member at the rear of the wheel and against the bushing at the front of the wheel. The wheel may be screwed on the shaft or secured in any other desirable manner.

The advantages of the invention result from the simplicity, strength and long life of the structure. A long outbored bearing is provided between the external tool and the turbine wheel, which cushions the jars and shocks, thus saving wear on the turbine. The extending of the shaft within or through the stationary member and the providing of bearings in front of and in the rear of the turbine wheel, gives a strong and efficient bearing construction, especially in connection with the long outbored bearing. The oiling device affords a steady supply of lubricant to the long shaft bearing, and the device is well adapted for the hard usage to which such cleaners are subjected.

Many variations may be made in the form and arrangement of the parts without departing from our invention.

We claim:—

1. A rotary motor having a casing, a revoluble motor element therein, a shaft carrying said motor element and projecting forwardly and rearwardly therefrom, a bearing member carried by the casing for the forwardly projecting portion of the shaft, a ported admission member removably secured in the rear portion of the casing and carrying a bearing for the rearwardly projecting portion of the shaft, and a hollow inlet member detachably connected with the casing and engaging the admission member to normally retain it against rearward movement; substantially as described.

2. A turbine comprising a casing having inwardly projecting webs, a bushing carried by said webs, and a turbine at the rear of the bushing having a shaft fitting within said bushing, one of the webs having an oil reservoir with holes extending through the bushing; substantially as described.

3. In a turbine, a casing having an inner shoulder and a turbine having a removable stationary portion clamped against the shoulder by a rear screw-plug, said screw-plug containing a chamber surrounding a thrust-bearing at the rear end of the turbine; substantially as described.

4. A rotary motor having a casing, a revoluble motor member therein carried by a shaft projecting forwardly and rearwardly therefrom, a bearing member carried by the casing and having a bearing for the forwardly projecting portion of the shaft, a removable ported admission member carrying a bearing for the rearwardly projecting portion of the shaft, and a hollow inlet member detachably connected with the rear portion of the casing and engaging the admission member to normally retain the same against rearward movement, said motor and admission members being removable through the rear end of the casing when the inlet member is detached; substantially as described.

5. In a turbine, a barrel or casing having inwardly projecting longitudinal webs integral therewith, a removable bushing supported by the webs, a shaft within the bushing, and a revoluble turbine member mounted on the shaft intermediate of its length in the rear of the bushing; substantially as described.

6. In a turbine, a barrel or casing, a stationary turbine member secured in a rear part thereof, a removable turbine member in front of the stationary member and having a shaft extending through it and into the stationary member, the casing having inwardly projecting longitudinal webs in front of the revoluble member, and a bushing carried by the webs and supporting the shaft; substantially as described.

7. In a turbine, a barrel or casing, a stationary turbine member secured in a rear part thereof, a removable turbine member in front of the stationary member and having a shaft extending through it and into the stationary member, the casing having inwardly projecting longitudinal webs in front of the revoluble member, and a bushing carried by the webs and supporting the shaft, said shaft having two thrust bearings, one of these thrust bearings being in front of the stationary member; substantially as described.

8. In a turbine, a barrel or casing, a stationary turbine member secured in a rear part thereof, a revoluble turbine member in front of the stationary member and having a shaft extending through it and into the stationary member, the casing having inwardly projecting longitudinal webs in front of the revoluble member, and a bushing carried by the webs and supporting the shaft, said shaft having two thrust bearings, one of these thrust bearings being in front of the stationary member, and the other thrust bearing being in the rear part of the stationary member; substantially as described.

9. In a turbine, a barrel or casing having inwardly projecting webs, a removable bushing carried by the webs, a rear turbine wheel having a shaft extending through it, the forward part of the shaft lying within the

bushing, and means for lubricating the forward portion of said shaft; substantially as described.

10. In a turbine, a barrel or casing having inwardly projecting webs, a removable bushing carried by the webs, and a rear turbine wheel having a shaft extending through it, the forward part of the shaft lying within the bushing, the bushing having oil-supply channels extending through it to supply a lubricant to the shaft; substantially as described.

11. In a rotary motor, a casing or shell having a shaft bearing at its forward end portion, a stationary member removably secured in the rear portion of the casing or shell and carrying another shaft bearing, and a shaft journaled in said bearings and carrying a rotary motor element, the front and rear ends of the motor element being in juxtaposition to the inner ends of said front and rear bearings together with an inlet member detachably connected to the casing and engaging the stationary member to normally retain it against rearward movement, said motor element and stationary bearing being removable from the rear end of the shell or casing when the inlet member is removed, substantially as described.

12. In a turbine, a casing, a stationary turbine member therein, a revoluble turbine member within the casing in front of the stationary member, a shaft for the revoluble turbine member projecting forwardly and rearwardly therefrom, and a rear thrust bearing for the revoluble member carried by the stationary turbine member, the barrel or casing having a removable supply chamber at its rear end; substantially as described.

13. In a turbine, a barrel or casing having inwardly projecting webs supporting a bearing, a removable bushing for said bearing, a turbine wheel having a forwardly and rearwardly projecting shaft within the bushing, a stationary turbine member secured within the casing at the rear of the turbine wheel, and a rear nozzle or supply chamber secured at the rear end of the casing; substantially as described.

14. In a turbine, a barrel or casing having inwardly projecting webs supporting a bearing, a removable bushing for said bearing, a turbine wheel having a forwardly projecting shaft within the bushing, said shaft also projecting rearwardly from the turbine wheel, a stationary turbine member secured within the casing at the rear of the turbine wheel, and a rear nozzle or supply chamber secured at the rear end of the casing, the stationary turbine member having a thrust bearing supported therein; substantially as described.

15. In a turbine, a barrel or casing having its bore enlarged in its rear portion to form a shoulder, a stationary turbine member removably fitting against the shoulder, a turbine wheel having a shaft extending through it and into the stationary member, and a removable nozzle or supply chamber joined against the rear of the stationary member within the casing; substantially as described.

16. In a turbine, a barrel or casing having its bore enlarged in its rear portion to form a shoulder, a stationary turbine member removably fitting against the shoulder, a turbine wheel having a shaft extending through it and into the stationary member, and a removable nozzle or supply chamber screwed into the rear end of the barrel and fitting against the stationary turbine member; substantially as described.

17. In a turbine, a barrel or casing having inwardly projecting webs, a bearing supported thereby, a removable bushing for the bearing having a rear shoulder fitting against the web or bearing, and a turbine wheel having a shaft projecting forwardly within the bushing, and also rearwardly into the stationary turbine member; substantially as described.

18. In a turbine, a barrel or casing having inwardly projecting webs, a bearing supported thereby, a removable bushing for the bearing having a rear shoulder fitting against the web or bearing, a turbine wheel having a shaft extending through it and projecting forwardly within the bushing, and a spacing washer between the turbine wheel and the rear end portion of the bushing; substantially as described.

19. In a turbine, a barrel or casing having supporting webs, a bearing carried by the webs, a longitudinal shaft carrying the turbine wheel extending through the bearing, a removable stationary turbine member having a thrust bearing for the rear part of the shaft extending through the turbine wheel, and a rear supply chamber removably attached to the casing; substantially as described.

20. In a turbine, a casing having longitudinal webs extending rearwardly from its front end, a removable bushing carried by said webs, a turbine wheel in the rear of the bushing and having a shaft extending forwardly within the bushing and rearwardly therefrom, means for oiling said shaft, a removable stationary turbine member in the rear of the turbine wheel and having a thrust bearing, and a removable hollow supply chamber screwed into the casing in the rear of the stationary turbine member; substantially as described.

21. In a turbine, a casing having longitudinal webs extending rearwardly from its front end, a removable bushing carried by said webs, a turbine wheel in the rear of the bushing and having a shaft extending for-

wardly within the bushing, means for oiling said shaft, a removable stationary turbine member in the rear of the turbine wheel and having a thrust bearing for the rearwardly projecting shaft portion of the turbine wheel, and a removable hollow supply chamber screwed into the casing in the rear of the stationary turbine member, the turbine wheel having a washer between it and the rear end portion of the removable bushing; substantially as described.

22. In a turbine, a casing having an inner shoulder, a stationary removable turbine portion containing nozzles located in rear and secured against the casing shoulder, and a turbine wheel in front of the stationary portion having a forwardly extending shaft, said shaft also extending rearwardly from the turbine wheel into the stationary removable turbine portion; substantially as described.

23. In a turbine, a casing having an inner shoulder in its rear portion, a removable stationary turbine portion containing nozzles and fitting against the shoulder, a turbine wheel in front of the stationary portion and having a shaft extending forwardly and rearwardly therefrom, and a removable rear clamping member arranged to clamp the stationary turbine portion in place and containing a chamber through which the motive fluid enters the casing; substantially as described.

24. A turbine including a casing a stationary turbine member therein having an annular series of nozzles, and a rotary turbine member within the case concentric with the stationary member and provided with a shaft journaled in the stationary member and having bearings within the casing at opposite sides of said member, substantially as described.

25. A turbine including a stationary turbine member having an annular series of nozzles and a rotary turbine member concentric with the stationary member and provided with a shaft journaled in the stationary member and having thrust bearings against opposite sides of said member, substantially as described.

26. In a turbine, a casing, an elongated tubular bearing at one end of the casing, a stationary turbine member provided with nozzles and located at the other end of the casing, and a rotary turbine member, located between the stationary member and the bearing and having a shaft journaled in the bearing and in the stationary turbine member, said shaft having a thrust bearing in the stationary member to take up forward thrusts, substantially as described.

27. In a turbine, a casing, a stationary turbine member therein, a revoluble turbine member within the casing in front of the stationary member, a shaft for the revoluble turbine member projecting forwardly and rearwardly therefrom, a thrust bearing for the rear portion of the shaft located within the stationary turbine member and disposed to take up the forward thrust, and means for compensating for the wear of said thrust bearing, substantially as described.

28. A turbine having a rotary member provided with a shaft projecting forwardly and rearwardly therefrom, a stationary nozzle member in which the shaft has a bearing removable shaft bushings against the front and rear of the stationary member, and means for taking up end thrust of the shaft, substantially as described.

29. In a rotary motor, a casing, a stationary member therein, a revoluble motor member within the casing in front of the stationary member, a shaft for the revoluble member projecting forwardly and rearwardly therefrom, and a rear thrust bearing carried by the stationary member for taking up the forward thrust of the shaft, said members being removable through the rear end of the casing, and a removable member having an admission chamber therein and securing the stationary member in place; substantially as described.

30. A rotary motor comprising a casing, a front bearing therein, a ported partition closing the rear part of the casing and containing a shaft bearing, said partition being removable through the rear end of the casing, a shaft journaled in the bearings, and a rotary element carried by the shaft and located between the bearings, substantially as described.

31. A rotary motor comprising a casing, a front bearing therein, a ported partition closing the rear part of the casing and containing a shaft bearing, said partition being removable through the rear end of the casing, a shaft journaled in the bearings, a rotary element carried by the shaft and located between the bearings, and a supply nozzle for the rear end of the casing, substantially as described.

32. A rotary motor comprising a casing, a front bearing therein, a removable ported partition within the rear part of the casing and constituting the front wall of the supply chamber and containing a shaft bearing, said partition being removable through the rear end of the casing, a shaft journaled in the bearing, and a rotary element carried by the shaft and located between the bearings, substantially as described.

33. In a rotary motor, a shell or casing having a shaft bearing at its forward end, a stationary member removably seated within the opposite end portion of the shell or casing, and carrying another shaft bearing, there being a motor chamber between said

bearings, a shaft extending through said chamber, a motor element on said shaft within said chamber, and an admission member removably secured to the rear end portion of the shell or casing and securing the stationary member in place, said admission member having an inlet opening and an admission chamber, and the stationary member having a port connecting said admission chamber with the motor chamber; substantially as described.

34. In a rotary motor, an elongated cylindrical casing having an integral head at its forward end provided with a bearing for the motor shaft, a stationary member secured at the rear end portion of the casing or shell, and carrying another shaft bearing, a sleeve member removably secured to the rear end portion of the shell and securing the stationary member in place, said sleeve member having an admission chamber therein, a shaft journaled in said bearings, a motor element on said shaft between its bearings, and thrust bearing members for taking the end thrusts of the shaft; substantially as described.

35. A rotary motor having a casing, a revoluble motor element within the casing, a shaft supporting said motor element and extending forwardly and rearwardly therefrom, the forwardly projecting portion of the shaft having a bearing within the casing, a ported admission member carrying a bearing for the rearwardly projecting portion of the shaft, and means whereby said member is normally held against rearward movement, said member being removable rearwardly from within the casing through its open rear end when the securing means are removed; substantially as described.

36. A rotary motor comprising a casing, a front bearing therein, a ported stationary member closing the rear part of the casing and containing a shaft bearing, said ported member being removable through the rear end of the casing, a shaft journaled in the bearings, a rotary element carried by the shaft and located between the bearings, and clamping means for locking the ported stationary member in place, substantially as described.

37. A rotary motor comprising a casing, a front bush bearing therein, a ported stationary member closing the rear part of the casing, and containing a bush bearing, said member being removable through the rear end of the casing, a shaft extending into the rear bush bearing and through the front bush bearing, a rotary element carried by the shaft and located between the bearings, and clamping means for locking the ported stationary member in place, substantially as described.

38. A rotary motor comprising a casing, a front bush bearing and a front thrust bearing within said casing, a ported stationary member removably held within the rear part of the casing and containing a bush bearing, said ported member being removable through the rear end of the casing, a shaft extending within the rear bush bearing and through the front bush bearing and the front thrust bearing, a rotary element carried by the shaft located between the bush bearings, and clamping means for locking the ported stationary member in place, substantially as described.

39. In a rotary motor, a portable casing or shell, a bush bearing and a thrust bearing supported within the forward portion of said casing, a stationary ported member removably secured in the rear portion of the shell or casing and carrying a shaft bearing, said member being removable through the rear end portion of the casing or shell, and a shaft extending within said bush and thrust bearings and carrying a rotary motor element in the rear of the front bush bearing and thrust bearing, substantially as described.

40. In a rotary motor, a portable casing or shell, a bush bearing and a thrust bearing supported within the forward portion of said casing, a stationary ported member removably secured in the rear portion of the shell or casing and carrying a shaft bearing, said member being removable through the rear end portion of the casing or shell, a shaft extending within said bush and thrust bearings and carrying a rotary motor element in the rear of the front bush bearing and thrust bearing, and means for lubricating the front bush bearing.

41. In a rotary motor, a casing or shell, a bush bearing and a thrust bearing supported in its forward portion, a stationary ported member removably secured in the rear portion of the shell or casing, and containing a bush bearing, said member being removable through the rear end portion of the casing or shell, and a shaft extending rearwardly into the ported member and within the bush bearing thereof, said shaft extending through the front bush bearing and thrust bearing and having a rotary motor element between the bush bearings, substantially as described.

In testimony whereof, we have hereunto set our hands.

WILLIAM S. ELLIOTT.
FRANK M. FABER.

Witnesses as to W. S. Elliott:
H. M. CORWIN,
JOHN MILLER.
Witnesses as to F. M. Faber:
E. L. STRONG,
J. WHITING, Jr.