No. 874,174. PATENTED DEC. 17, 1907.

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

TURBINE.

APPLICATION FILED MAY 4, 1905.

3 SHEETS—SHEET 1.

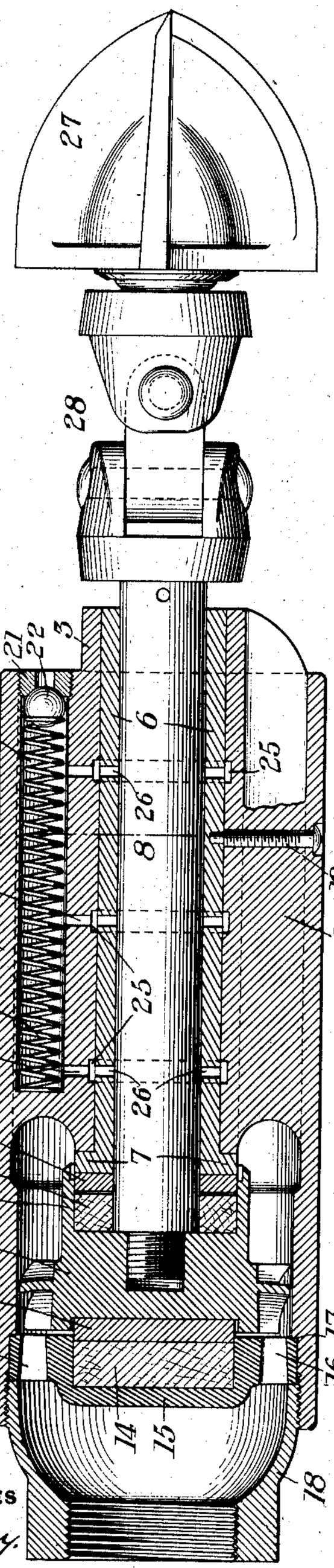

Fig. 1.

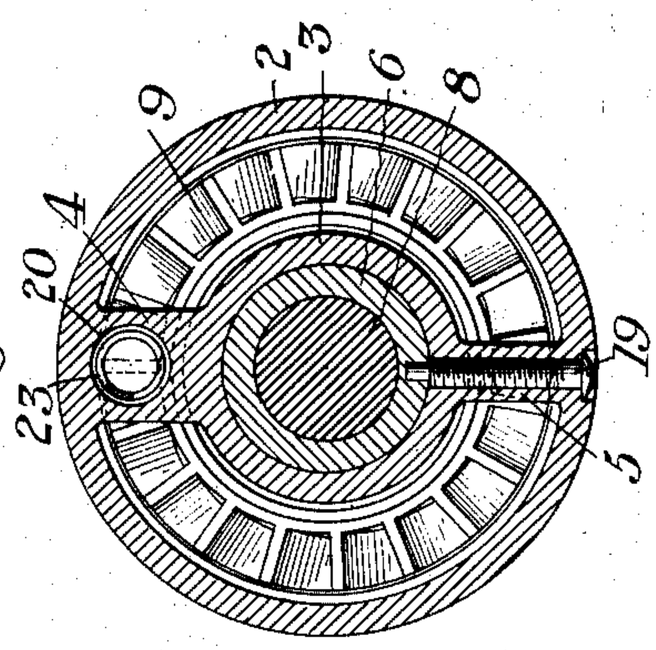

Fig. 3.

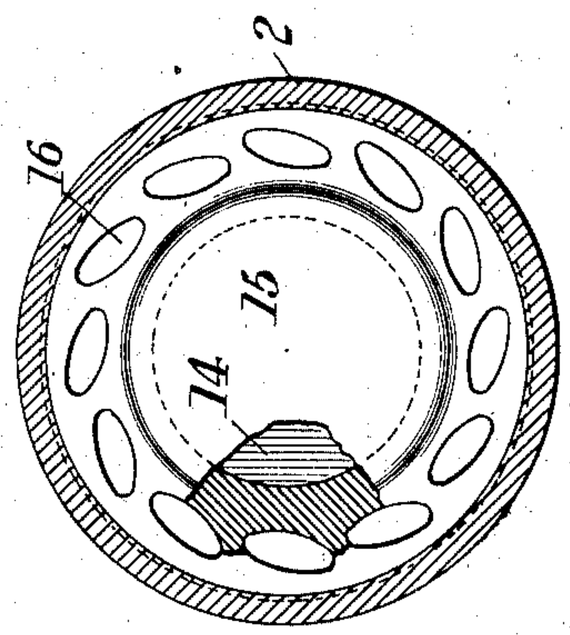

Fig. 2.

WITNESSES

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3 SHEETS—SHEET 2.

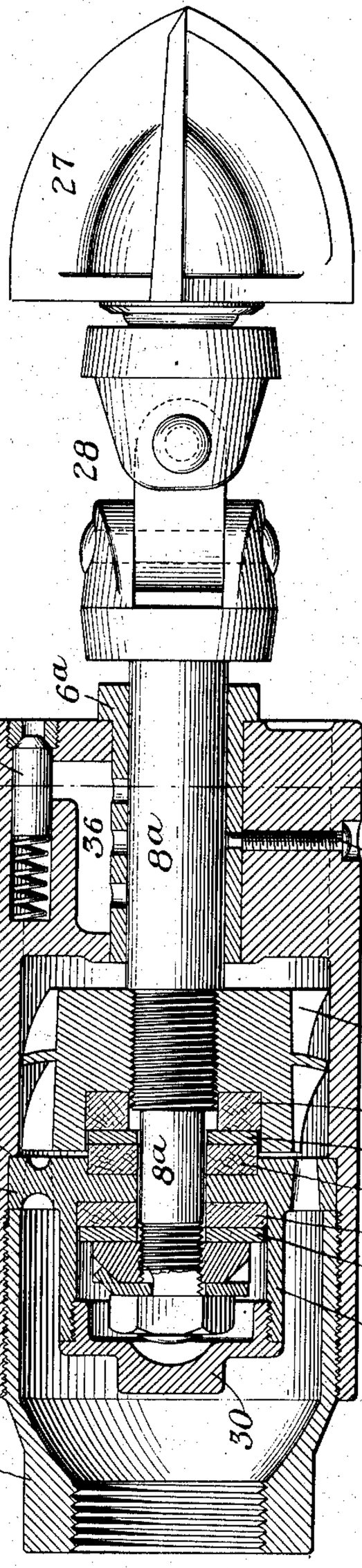

Fig. 4.

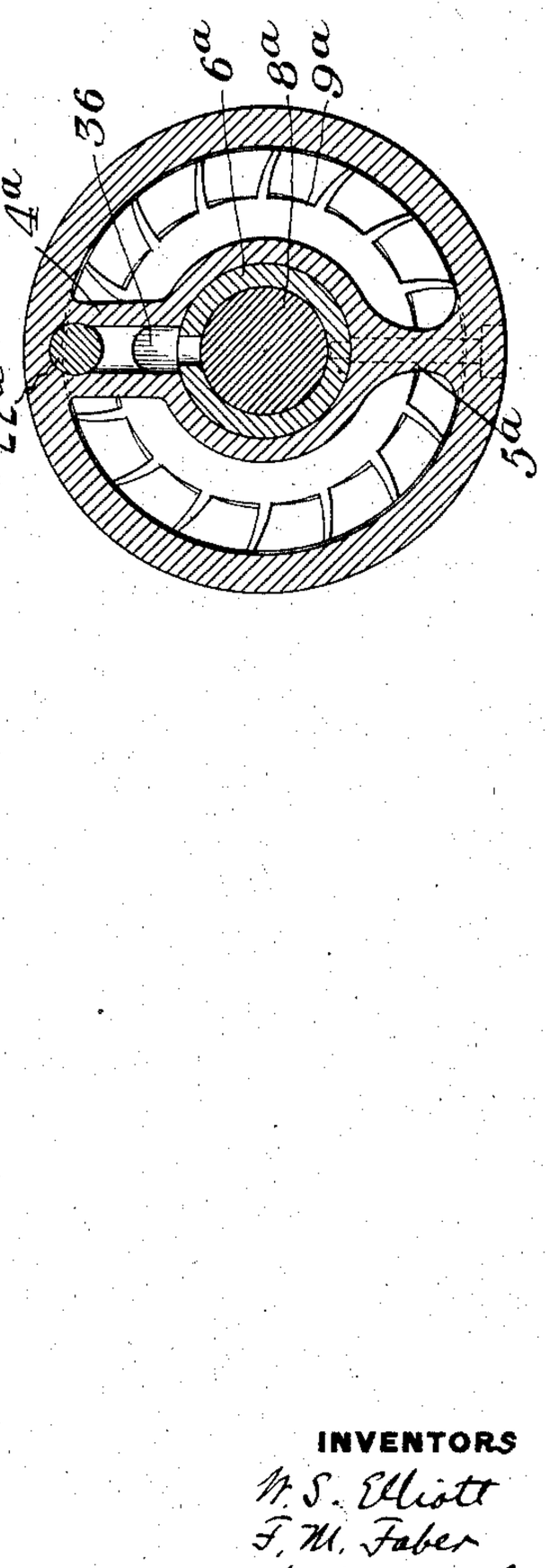

Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 6.

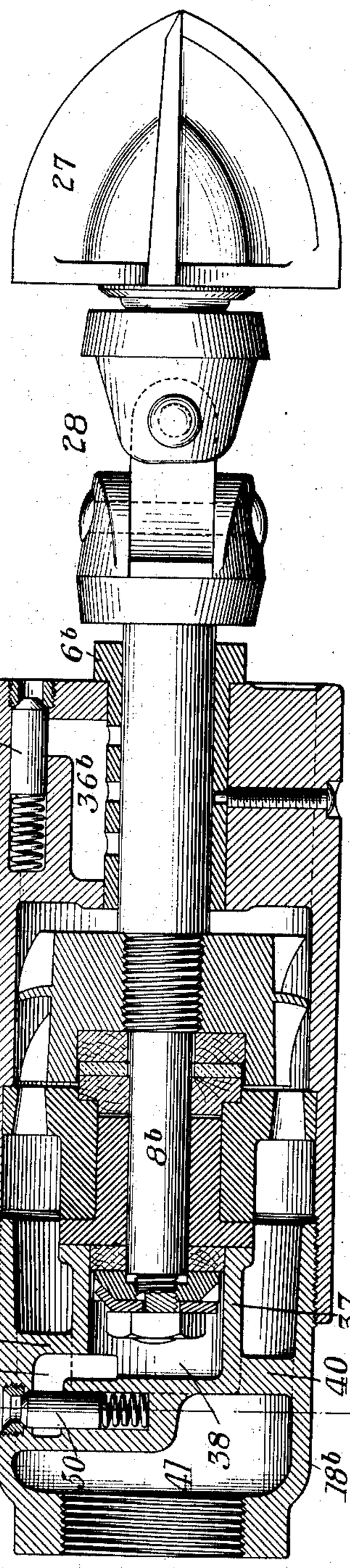
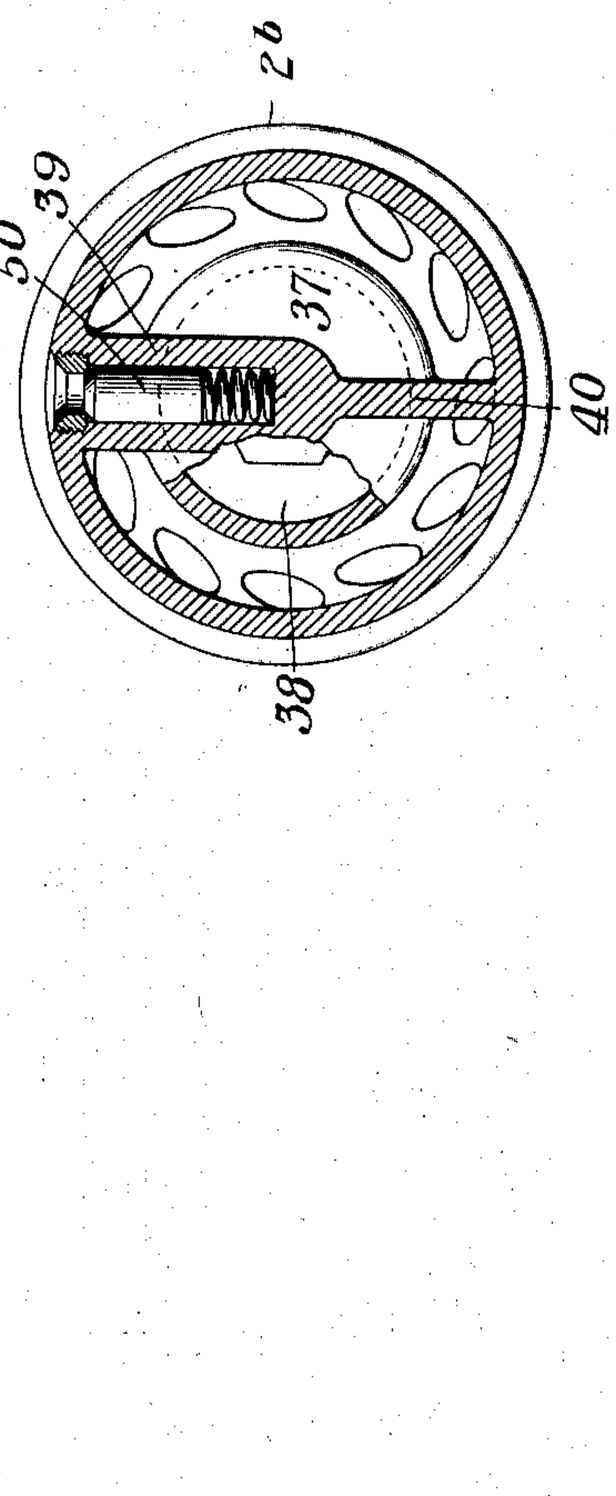


Fig. 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

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TURBINE.

No. 874,174. Specification of Letters Patent. Patented Dec. 17, 1907.

Application filed May 4, 1905. Serial No. 258,779.

To all whom it may concern:

Be it known that we, WILLIAM S. ELLIOTT and FRANK M. FABER, both of Pittsburg, Allegheny county, Pennsylvania, 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. Figs. 2 and 3 are cross-sections on the lines II—II and III—III respectively of Fig. 1. Fig. 4 is a view similar to Fig. 1 showing another form of the invention. Fig. 5 is a cross-section on the line V—V of Fig. 4. Fig. 6 is a view similar to Fig. 1 showing a further form of the invention. Fig. 7 is a cross-section on the line VII—VII of Fig. 6.

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

The object of the invention is to provide a simple and efficient turbine and shaft which will be longer lived than formerly, and in which the shocks upon the cutting head are largely absorbed or cushioned before they can reach the turbine wheel.

Heretofore in this class of devices when used in connection with cutting heads the shocks and jars upon the head have caused rapid deterioration of the turbine driving device, making the turbine short-lived. Our invention greatly reduces this difficulty, and consists in the construction and arrangement of parts as hereinafter more fully described and claimed.

In the drawings, referring to the form of Figs. 1, 2 and 3, 2 represents the cylindrical turbine casing having an inner concentric shell 3, which is preferably cast integrally with the casing to which it is connected by the opposite webs or ribs 4 and 5 as shown in Fig. 3. Within the inner shell 3 we preferably place a bushing or lining 6 having a rear shouldered portion 7 which fits against the rear end of the inner shell, this shell being shorter than the casing and projecting beyond the front end of the casing in this form. Within the bushing 6 fits the turbine shaft 8, the rear end of which is screwed or otherwise secured to the turbine wheel 9. This turbine wheel is preferably provided with a circular recess in its front portion, forming an annular flange 10 within which is seated the ring 11 of lignum-vitæ. This lignum-vitæ bears against a ring 12 which fits against the rear end of the shoulder of the bushing.

At the rear end of the turbine wheel it is provided with a shallow circular recess containing a plate 13 fitting upon a circular lignum-vitæ block 14, which is fitted into a recess in the stationary portion 15 of the turbine. This stationary portion 15 is provided with the usual ports 16 and is preferably of ring form, fitting against a shoulder 17 in the rear end portion of the casing, and pressed against said shoulder by the screw coupling 18 which is secured into the rear end of the casing.

The bushing 6 is held against rotation by any suitable means, such as the screw 19 extending through one of the webs and entering a hole in the bushing, or it may be pressed in.

I preferably provide means for supplying oil or a lubricant to the long shaft extending through the out-bored bearing for the turbine shaft. In the form shown an oil chamber 20 is formed by boring or coring a hole longitudinally into the web or partition 4 and inserting a hollow plug 21 in its outer end. The plug is chamfered on its inner side to form a seat for a ball-valve 22 which is normally held closed by the spring 23 extending through the oil chamber. Holes 24 connect the oil chamber with annular recesses 25 in the inner shell of the casing, from which holes 26 lead through the bushing to the shaft 8. Oil is inserted by pressing the valve back with the tube of the oil can and forcing oil into the chamber. When the valve is released it immediately closes the oil chamber and the oil gradually works through the holes onto the shaft.

Any suitable cleaning tool may be attached to the turbine, and I have shown a drill-shaped device 27 connected to the shaft by universal coupling 28.

It will be noted that in Figs. 4 and 6 the turbine wheel is provided with journals at both sides, the front journal being long and which takes up the shocks on the tool. By unscrewing the rear coupling the stationary part of the turbine may be pulled out and the wheel unscrewed from the shaft and also drawn out.

In Figs. 4 and 5 we show a shorter form of the turbine, in which the casing 2^a is provided with webs 4^a and 5^a as before. In this

form the rear coupling 18^a is screwed in to clamp the stationary portion 15^a of the turbine, which is forced against the shoulder 17^a in the casing. The turbine wheel 9^a is not provided with a thrust bearing in front thereof, but thrust bearings are provided for the shaft 8^a on each side of the stationary turbine portion. Thus, we show this stationary portion as having a rear annular extension 29 forming a chamber which is normally closed by a screw-cap 30. Within this chamber a bottom-ring 31 of lignum-vitæ is seated, next to which is a brass washer 32 held by a nut and lock nut within the chamber. At the front of the stationary turbine portion a lignum-vitæ washer 33 is seated in a recess in the stationary portion, while a lignum-vitæ ring 34 is seated in a recess in the turbine wheel. A brass ring 35 is placed between these lignum-vitæ rings, thus forming a thrust bearing for the shaft on both sides of the stationary turbine portion. In this case the oil valve 22^a is in the form of a plug instead of a ball, and the oil flows into a chamber 36 extending along the removable bushing 6^a, through holes in which the oil flows to the enlarged portion of the shaft 8^a.

In Figs. 6 and 7 I show a form similar to that of Figs. 4 and 5, except that the closure at the rear end of the casing is of different form. In this case the screw-coupling 18^b is made in the form of a plug with a central hub 37 containing the chamber 38 for the rear bearing of the shaft 8^b. This central hub portion is carried on radial webs 39 and 40, which allow the water entering the rear end chamber 41 to flow around the hub to the ports in the stationary portion of the turbine. The chamber 38 is in this case an oil chamber having a feed way 42 leading through the web 39 and normally closed by the spring-plug 50 which is similar to the plug 22^b at the front end of the casing.

I do not claim herein specifically the forms of Figs. 4, 5, 6 and 7, as the same are claimed in another co-pending application No. 350,246 filed December 31st, 1906.

The advantages of my invention result from the simplicity and solidity of the construction. A long out-bored bearing is provided between the external tool and the turbine wheel, which cushions the jars and shocks, thus greatly saving the wear of the turbine. The thrust bearings absorb the end thrust of the shaft, and the lignum-vitæ and metal washers are long-lived and give little friction. The oiling device affords a steady supply of oil to the long shaft bearing, and the device is compact and strong. The washers may be metal or wood, and may be varied in size, shape and number.

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

We claim:—

1. In a turbine, a barrel or casing having inwardly projecting longitudinal webs integral therewith, and a removable bushing or bearing supported by said webs; substantially as described.

2. In a turbine, a barrel or casing having inwardly projecting longitudinal webs integral therewith, a removable bushing or bearing supported by said webs, and a movable turbine member in the rear of the webs having a shaft extending through the bushing; substantially as described.

3. In a turbine, a barrel or casing having inwardly projecting longitudinal webs supporting a bearing, said bearing having a removable bushing; substantially as described.

4. In a turbine, a barrel or casing having inwardly projecting longitudinal webs supporting a bearing, said bearing having a removable bushing, and a movable turbine member in the rear of the webs having a shaft extending forwardly within the removable bushing; substantially as described.

5. In a turbine, a barrel or casing having inwardly projecting integral webs supporting a bearing, said bearing having a removable bushing, a movable turbine member having a forwardly extending shaft within the removable bushing, and means for lubricating said shaft; substantially as described.

6. In a turbine, a barrel or casing having inwardly projecting webs supporting a bearing, a removable bushing in said bearing, a rear turbine wheel having a shaft extending forwardly within the bushing, and supply channels arranged to supply a lubricant to the shaft; substantially as described.

7. 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, a stationary turbine member secured within the casing at the rear of the turbine wheel, and rear nozzle or supply chamber secured at the rear end of the casing; substantially as described.

8. 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, 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.

9. In a turbine, a barrel or casing having inwardly projecting webs, a bearing supported thereby, a removable bushing for the bearing having oil holes, and a turbine wheel having a shaft extending within the bushing; substantially as described.

10. 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; substantially as described.

11. 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 projecting forwardly within the bushing, and a spacing washer between the turbine wheel and the rear end portion of the bushing; substantially as described.

12. 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, and a removable stationary turbine member having a thrust bearing; substantially as described.

13. 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, and a rear supply chamber removably attached to the casing; substantially as described.

14. 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, means for lubricating 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.

15. 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 means for lubricating 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, the turbine wheel having a washer between it and the rear end portion of the removable bushing; substantially as described.

16. A turbine having a casing with inwardly extending radial webs for a part of its length, a removable bushing carried by the webs, a turbine shaft fitting within the bushing, a turbine wheel in the rear of the radial webs, and a removable stationary turbine portion clamped against a casing shoulder in the rear of the turbine wheel; substantially as described.

17. In a turbine, a casing having an inwardly projecting web or rib containing a liquid reservoir, and an outlet extending from the said reservoir to a bearing; substantially as described.

18. A turbine casing having inwardly projecting ribs, an inner concentric bushing carried thereby, and a turbine wheel having a shaft extending within the bushing, one of the ribs containing an oil reservoir; substantially as described.

19. A turbine comprising a casing having inwardly projecting ribs, one of said ribs containing an oil reservoir, a bushing carried by said rib portions, and a turbine wheel at the rear end of the ribs or webs having a shaft fitting within the bushing; substantially as described.

20. A turbine having a casing with integral inwardly projecting webs or ribs extending for a part only of its length, a removable concentric bushing supported by the ribs or webs, and a turbine at the rear of the bushing and having a shaft fitting therein, said parts having a feed channel to supply a lubricant to the shaft; substantially as described.

21. A turbine comprising a casing having inwardly projecting ribs, a bushing carried thereby, a turbine wheel at the rear of the bushing having a shaft extending within the bushing, thrust bearings at the rear of and in front of the turbine wheel, and a stationary turbine portion at the rear of the turbine wheel, the rear thrust bearing being between the stationary and rotary parts of the turbine; substantially as described.

22. A turbine comprising a casing having inwardly projecting ribs, a removable concentric bushing carried thereby, a turbine at the rear of the bushing having a shaft extending forwardly within the bushing, a thrust bearing in front of said wheel, a removable stationary turbine portion secured in the rear of the turbine wheel, and thrust bearings between the stationary turbine portion and the turbine wheel; substantially as described.

23. A turbine comprising a casing having inwardly projecting ribs, a removable concentric bushing carried thereby, a turbine at the rear of the bushing having a shaft extending forwardly within the bushing, a thrust bearing in front of said wheel, a removable stationary turbine portion secured in the rear of the turbine wheel, thrust bearings between the stationary turbine portion and the turbine wheel, and means for supplying a lubricant to the shaft within the bushing; substantially as described.

24. A turbine comprising a casing having inwardly projecting ribs, a bushing carried

by said ribs, a turbine wheel secured to a shaft at the rear of the bushing, a thrust bearing between the wheel and bushing in combination with a stationary turbine member at the rear of the wheel, and a thrust bearing between the wheel and the stationary turbine member; substantially as described.

In testimony whereof, we have hereunto set our hands.

WILLIAM S. ELLIOTT.
FRANK M. FABER.

Witnesses:
JOHN MILLER,
H. M. CORWIN.