P. J. DARLINGTON.

FLUID PRESSURE MOTOR.

APPLICATION FILED NOV. 23, 1908.

919,326.

Patented Apr. 27, 1909.

2 SHEETS—SHEET 1.

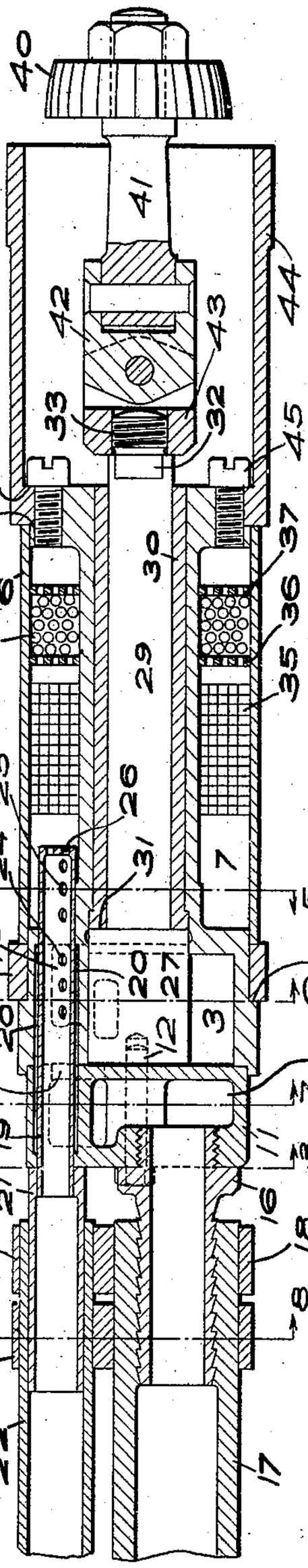

FIG. 1.

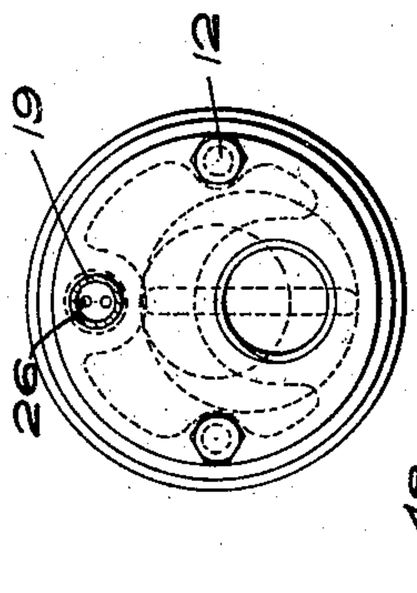

FIG. 3.

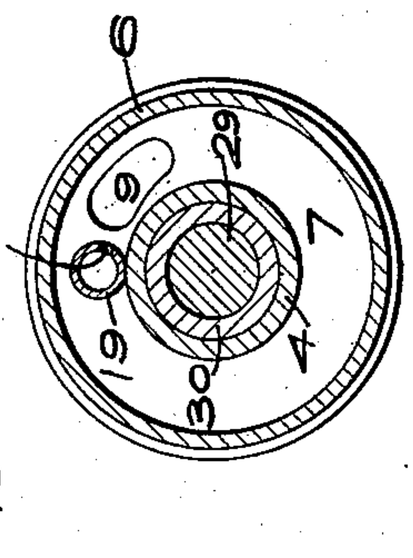

FIG. 5.

WITNESSES

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2 SHEETS—SHEET 2.

FIG. 8.

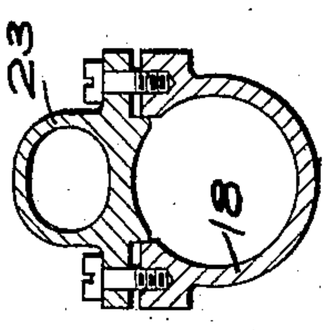


FIG. 7.

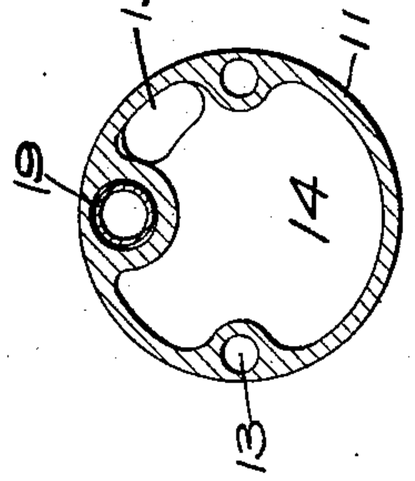


FIG. 2.

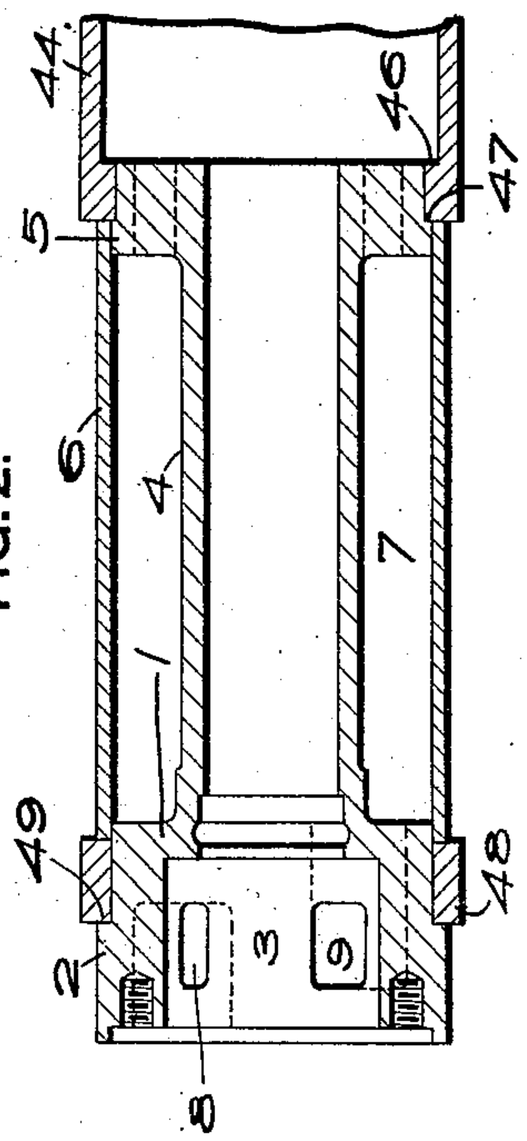


FIG. 6.

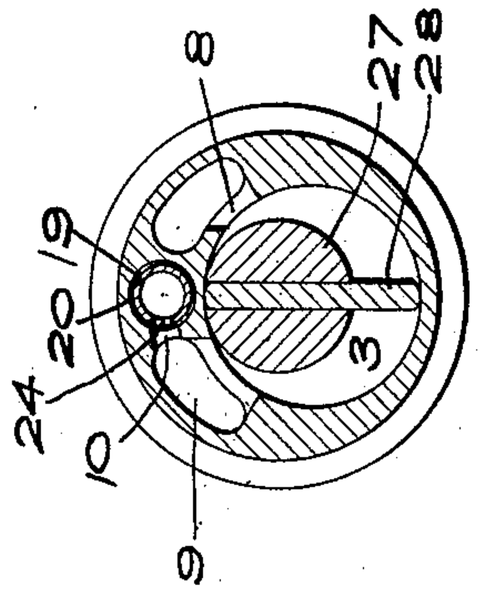
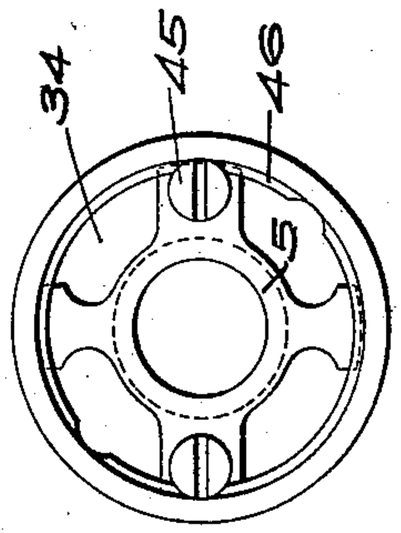


FIG. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE MOTOR.

No. 919,326. Specification of Letters Patent. Patented April 27, 1909.

Application filed November 23, 1908. Serial No. 464,141.

To all whom it may concern:

Be it known that I, PHILIP J. DARLINGTON, a resident of Plainville, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Fluid-Pressure Motors, of which the following is a specification.

This invention relates to rotary fluid pressure motors and more particularly to motors arranged to be passed through boiler tubes, flues and the like for the purpose of driving tools to remove scale and incrustation therefrom, although it may be used for various other purposes.

The special object of the invention is to provide a steam operated motor which does not subject the tubes being cleaned to injurious expansion, and which is not subject to over-heating of the bearings of the motor and a consequent difficulty of lubrication.

A further object is to provide a motor which is powerful, compact, cheap to make and easy to take apart and repair and which is also easy to fit exactly to any slight difference in size of the tube, and one in which the wear is confined to parts which are easily replaced.

With this and other objects in view the invention consists in the novel construction, arrangement and combination of parts as hereinafter described and claimed.

In the accompanying drawings Figure 1 is a longitudinal section through a motor embodying the invention; Fig. 2 is a longitudinal section of the frame alone, said section being taken at right angles to the section of Fig. 1; Fig. 3 is a rear end view of the motor with the supply pipes removed; Fig. 4 is a front end view of the motor with the piston removed; and Figs. 5, 6, 7 and 8 are transverse sections taken respectively on the lines 5—5, 6—6, 7—7 and 8—8, Fig. 1 looking in the direction of the arrows in connection with said lines.

The specific motor shown in the drawings has as its main element a frame 1 which is circular in cross section at all points and comprising the enlarged cylinder portion 2 which is provided with a longitudinal and eccentric piston chamber 3, an intermediate journal portion 4 of reduced external diameter, an enlarged flanged forward end portion 5, and a shell 6 which surrounds the part 4 and extends between and is seated on the enlarged end portions 2 and 5, inclosing between itself and the journal portion 4 an annular condensing space 7. As shown, the parts 2, 4 and 5 are formed integral with each other while the shell is a separate piece, but obviously these parts could be formed as a single casting or built up from a greater number of pieces than two.

The cylinder portion 2 is formed with a longitudinal admission port 8 extending from its rear face and communicating with the piston chamber 3, and a longitudinal exhaust port 9 leading from the piston chamber 3 to and communicating with the condensing space or chamber 7. The longitudinal exhaust port 9 is provided for a portion of its length with a circumferential extension 10 for a purpose hereinafter described.

The rear end of the piston chamber 3 is closed by means of a head 11 of cylindrical exterior contour and concentrically secured to the end of frame 1, as by means of screws 12 passing through holes 13 in said head and into the rear end of frame 1. The head 11 is provided with a steam receiving space 14 and with a delivery port 15 registering with the admission port 8 leading to the piston chamber 3.

16 is a pipe shank threaded into the head 11 and communicating with the steam receiving space 14 therein and adapted to have connected thereto a steam supply pipe, preferably a flexible hose 17, which is clamped to said shank in any suitable way, such as by means of a split hose clamp 18.

Communicating with the condensing chamber 7 is a suitable passage or pipe for supplying a cooling medium to said chamber. This is shown as a pipe 19 extending through the head 11 and cylinder portion 2 of the frame 1, said pipe being located between the admission port 8 and exhaust port 9 and having a loose fit inside the head and cylinder portion so as to leave an air space 20 to somewhat insulate said pipe. At its rear or outer end this pipe is connected to a shank 21 to which in turn is connected a water supply hose 22, the latter being supported in a ring 23 forming a part of the hose clamp 18. The shank 21 is arranged to telescope on the hose 22 but normally is telescoped forward on the pipe 19. The forward end of pipe 19 forms a nozzle to inject the cooling medium into the exhaust port 9 from piston chamber 3 and into the condensing chamber 7. It is provided with a series of radial holes 24 communicating with the extension 10 of the exhaust port 9, a series of radial spray holes 25

in the portion thereof which projects into the condensing chamber 7, and with axial end spray holes 26 directed forwardly into the space or chamber 7 to direct jets of the cooling or condensing medium into said space or chamber.

The rotary piston comprises an enlarged portion 27 contacting with the curved wall of the cylinder chamber 3 between the admission port 8 and exhaust port 9, and provided with a diametrical slot in which is mounted the piston blade 28 arranged to slide freely in the slot and contacting at both sides and both edges with the walls of the chamber 3 so as to receive motion from fluid entering through admission port 8 and discharging through exhaust port 9. The piston has the reduced concentric portion 29 which is journaled in a bushing 30 located concentrically in the reduced portion 4 of frame 1, said bushing forming a thrust shoulder at 31 with the enlarged portion 27 of the piston. The piston is extended forwardly beyond the bushing 30 and is there formed with flat faces 32 for the engagement of a wrench and with a threaded end 33 to receive the attaching means for a tool.

The enlarged flange portion 5 of the frame is cut away to form longitudinal openings, ports or passages 34 communicating with the condensing space of chamber 7 and forming the outlet from said chamber behind the tool. In the condensing chamber or space 7 are suitable baffles, those shown comprising a coil 35 of woven or perforated metal loosely filling the chamber for a part of its length, and beyond the same a pair of perforated metal rings or baffle plates 36 and 37 arranged transversely across said space or chamber, and between the same are small metallic pieces 38 forming a loose filling at this point. These baffles serve to break up the streams of water and steam and bring them into intimate mixture to insure the complete condensation of the steam. The exhaust is through the passages or ports 34 behind the tool 40 carried on a stem 41 pivoted on the inner jaw 42 which in turn is pivoted at right angles to the outer jaw 43 which is secured on the threaded projection 33 of the piston. By this connection the tool 40 is rotated but is free to swing in all directions on a transverse joint. A shoe ring or sizing shield 44 of an external diameter to fit freely in the cleaned portion of the tube is separately attached to the frame 1, such as by means of screws 45 entering the frame 1 and having their heads overlying an internal shoulder 46 on the shoe ring. This shoe ring extends into close proximity to the tool 40 and prevents the latter from passing beyond or missing any scale obstructing the forward movement of the motor and insuring the tool striking effectively against scale instead of destroying an already clean portion of the tube in case an intermediate obstruction prevents the progress of the motor. The shoe ring 44 fits over the end of the flange portion 5 of frame 1 against an external shoulder 47 and is of larger diameter than the shell 6 against which it bears axially to hold the latter in place. A rear shoe ring 48 of the same diameter as the forward shoe ring fits over an external seat of the cylinder portion 2, bearing against a shoulder 49 and is held axially in place by the shell 6. These shoe rings are readily removable and can be replaced by shoe rings of other sizes to fit boiler tubes of various sizes. They take practically all of the external wear on the motor. The cooling medium preferably is cold water, but if desired it may be cold air.

The operation of the motor is as follows. Cold condensing water is forced through the hose 22 and out of all the nozzle holes in pipe 19. Steam under pressure enters through hose 17 into receiving chamber 14 and thence through ports 15 and 8 into the cylinder chamber 3 where it acts against the blade 28 and rotates the piston 27 and passes out through exhaust port 9 where it meets jets of cold water from the nozzle openings 24 and is partly condensed. It then enters the condensing space or chamber 7 and here meets jets of water from the nozzle holes 25 and is further condensed and cooled. The jets of water from the end nozzle holes 26 strike the coil 35 and the mixture of steam and water passes through said coil and through the baffle plates 36 and 37 and among the metallic filling pieces 38. These various baffles break up the streams of steam and water and bring the two into intimate contact so that the steam is all condensed and cooled to such a temperature that when the mixture escapes through the openings or ports 34 it does not expand or loosen the tubes of the boiler being cleaned. The shoe ring or shield 44 directs this stream of slightly warm water directly onto the tool to soften, dislodge and wash away the scale. The cool condensing water passing through the space 7 cools the piston journal and prevents the same from heating and makes it easy to keep said journal properly lubricated. The consequence is that a motor such as described can be safely used for cleaning boiler tubes and the like without danger of expanding and loosening the tubes being cleaned and without excessive wear on the motor. The motor is compact and strong, and is composed of a minimum number of simple pieces which can be readily manufactured and assembled or taken apart. The motor externally is of cylindrical form at all points so that it readily enters a boiler tube and can freely rotate therein if necessary.

While a specific construction has been illustrated and described it is evident that the same can be materially modified without de-

parting from the principle of the invention. Obvious modifications are where two or more parts are made integral or in which any of the parts illustrated is made in a separate part, these being matters of convenience in manufacture and depending upon choice of material to meet different conditions of use and operation. Also in place of having a nozzle pipe 19 extending through the head and into the cylinder frame it is obvious that the water could be admitted through a passage cored or formed directly in the head 11 and frame 1. While specific constructions and arrangements of baffle members in the condensing space 7 are illustrated and described it is evident that the invention applies to any other arrangement or device for bringing the steam and water into intimate contact.

While the construction illustrated includes a shell forming the outer circular wall of the condensing chamber it is evident that this shell may be omitted when the tube being cleaned is smooth and uniform in diameter of bore and closely fits over the end portions of the motor.

What I claim is:—

1. A motor comprising a cylinder of circular cross-section, a piston therein, said cylinder being supplied with means for the attachment of a fluid pressure supply pipe in an axial direction from one end and said piston being supplied with tool attaching means at the other end, and means intermediate the two ends for condensing the fluid pressure medium.

2. A motor comprising a piston, a cylinder therefor of circular external form having a steam inlet and a condensing water inlet at one end, longitudinal steam and water passages and a water outlet at the other end.

3. A motor comprising a piston, a cylinder of cylindrical external form having steam inlet and a condensing water inlet at one end, longitudinal steam and water passages, and a water outlet at the other end, and means for mixing the exhaust steam and water to insure complete condensation.

4. A motor comprising a piston, a cylinder therein of cylindrical external form having a steam inlet and a condensing water inlet at one end, parallel longitudinal steam and water passages, and a water outlet at the other end, and a baffle between said inlets and said outlets and arranged to mix the exhaust steam and water.

5. A motor comprising a piston, and a cylinder therefor of circular external cross-section having a steam inlet and a water inlet at one end, an outlet at the opposite end, and a condensing chamber intermediate said ends.

6. A motor comprising a piston, a cylinder therefor of circular external cross-section having a steam inlet and a water inlet at one end, an outlet at the opposite end, and a condensing chamber intermediate said ends, and baffles in said condensing chamber extending across the path of the steam and water.

7. In a motor, a cylinder having a steam inlet and a condensing water inlet at one end, a condensing space and an outlet therefrom at the opposite end, and parallel longitudinal steam and water passages for a part of its length communicating with said condensing space.

8. In a motor, a cylinder having a steam inlet and a condensing water inlet at one end, a condensing space and an outlet therefrom at its opposite end, and parallel longitudinal steam and water passages communicating with said condensing space, and a baffle of permeable material placed transversely of said condensing space.

9. A motor comprising a piston, a cylinder therein of cylindrical external form having separate steam and water inlets at one end, a tool carried by said piston at the other end, and means intermediate said inlets and outlet for mixing the exhaust steam and water and condensing said steam.

10. A rotary motor comprising a cylinder, a piston therein, a ported admission head for said cylinder, and a supply passage for a cooling medium extending through said head and through the cylinder to the exhaust opening from the cylinder.

11. A rotary motor comprising a cylinder, a piston therein, admission and exhaust ports for said cylinder, and a passage through said cylinder for supplying a cooling medium, said passage communicating with the exhaust port of the cylinder.

12. A steam driven rotary motor comprising a piston, and a cylinder therefor of circular outline in cross-section and supplied with parallel steam and water inlets at one end, with parallel longitudinal steam and water passages in its walls, and a water outlet at the other end communicating with the steam exhaust port of said cylinder.

13. A motor comprising a cylinder of circular cross-section provided with a piston chamber and having a fluid pressure inlet to said chamber, and a fluid pressure outlet therefrom, said cylinder being provided with a cooling medium supply passage entering through one end of the cylinder and discharging from the other end in proximity to said pressure outlet.

14. A rotary motor comprising a cylinder, a piston therein, a condensing chamber connected to the exhaust port of the cylinder, and a cooling medium supply passage extending through said cylinder, and communicating with the cylinder, exhaust port and with the condensing chamber.

15. A rotary motor comprising a cylinder, a piston therein, an admission opening through one end of the cylinder an exhaust

leading through the other end of the cylinder, and a supply pipe for a cooling medium projecting through the admission end of the cylinder and leading to the exhaust end.

16. A motor comprising a cylinder of external circular cross-section provided with separate steam and water inlets through one end and separate steam and water passages for a part of its length combining into a common discharge outlet at the opposite end, and a baffle of permeable construction extending across the opening of said common discharge outlet.

17. A motor comprising a cylinder provided with a pressure fluid inlet, a cooling medium inlet, a chamber communicating with the cooling medium inlet and with the exhaust from said cylinder, and an outlet from said chamber, and a baffle placed transversely across said outlet.

18. In a rotary motor, a cylinder of circular external cross-section provided with a longitudinal piston chamber and with a longitudinal cooling medium supply passage formed in its walls and extending from one end to the other to conduct the cooling medium longitudinally past said piston chamber, said piston chamber being provided with a fluid pressure inlet at one end and an exhaust at the other.

19. A rotary motor comprising a cylinder, a piston therein, a condensing chamber connected with the exhaust port from the cylinder, a fluid pressure supply pipe connected to the end of the cylinder, and a cooling medium pipe connected to the same end of the cylinder and communicating with a passage which communicates with the exhaust port of the cylinder and with the condensing chamber.

20. A rotary motor comprising a cylinder, a piston therein, a condensing chamber connected to the exhaust port of said cylinder, a baffle in said condensing chamber, a fluid pressure supply pipe connected to the end of the cylinder, and a cooling medium pipe also connected to the end of the cylinder and communicating with a passage opening into the condensing chamber and projecting fluid medium against the baffle.

21. A rotary motor comprising a cylinder, a piston therein, a ported head closing the one end of the cylinder, a nozzle projecting from said head for receiving a fluid pressure pipe, and a cooling medium pipe projecting through said head and through the cylinder and opening near the exhaust port of the cylinder.

22. A rotary motor comprising a cylinder, a piston therein, a supply shank connected to one end of the cylinder for receiving a fluid pressure hose, a hose clamp, and a cooling medium supply pipe supported by said hose clamp and communicating with a passage extending through the cylinder.

23. A rotary motor comprising a cylinder, a piston therein, a ported admission head closing one end of the cylinder, and a cooling medium pipe extending through said head and cylinder and insulated therefrom.

24. A rotary motor comprising a cylinder, a piston therein, a ported admission head closing one end of the cylinder, and a cooling medium pipe extending through a passage in said head and cylinder, said passage being larger than said pipe to provide an insulating space.

25. A rotary motor comprising a frame including a cylinder and a reduced journal portion, a piston journaled in said reduced portion and provided with a blade in the cylinder, the inlet to the cylinder being through one end and the exhaust being into the space outside of the reduced journal portion, and means for projecting a cooling medium into the space around said reduced journal portion.

26. A rotary motor comprising a frame including a cylinder and a reduced journal portion, a piston journaled in said reduced portion and provided with a blade in the cylinder, the inlet to the cylinder being through one end and the exhaust being into the space outside of the reduced journal portion, a shell surrounding said reduced journal portion, and means for projecting a cooling medium into the space between said shell and reduced journal portion.

27. A rotary motor comprising a body of cylindrical form, a cylinder in one end of said body, a piston in said cylinder, an axial portion of reduced size in which said piston is journaled and providing an annular chamber between itself and the outer shell into which chamber the exhaust opens, and means for projecting a cooling medium into said chamber.

28. A rotary motor comprising a frame containing a cylinder and a reduced journal portion, a piston journaled in said reduced portion and provided with a blade in the cylinder, a shell surrounding the reduced portion and inclosing a space communicating with the exhaust from the cylinder, and a cooling medium passage opening into said chamber.

29. A rotary motor comprising a frame containing a cylinder and a reduced axial portion, a piston journaled in said axial portion, a shell surrounding said reduced portion and inclosing an annular chamber with which the cylinder exhaust communicates, baffles in said chamber, and a cooling medium supply pipe projecting into said chamber.

30. A rotary motor comprising a cylindrical body containing a piston chamber, an axial bore communicating therewith, and an annular chamber around said axial bore, the exhaust from the cylinder opening into said

annular chamber, a piston journaled in said axial bore, a fluid pressure inlet connected to the cylinder end of said body, and a cooling medium supply pipe also connected to said end and communicating with a passage extending through the cylinder and opening into the annular chamber.

31. A rotary motor comprising a body of circular cross section at all points and including at one end a cylinder having an axial bore communicating therewith and having a chamber surrounding said axial bore and opening through one end of the body and in communication with the exhaust of the cylinder, a piston journaled in the axial bore, an admission port opening through the end of the cylinder, a cooling medium supply pipe connected to said end of the cylinder and communicating with a passage extending through the cylinder and opening into the annular chamber, and baffles in said chamber.

32. A rotary motor comprising a cylinder, a condensing space connected to the exhaust thereof and located at one end of the cylinder, a piston in said cylinder, the outlet from said condensing space being at one end of the motor, a tool carried by the piston, and a shield carried by the motor and projecting into proximity to the tool.

33. A rotary motor comprising a cylindrical body provided at one end with a cylinder and having a longitudinal journal portion projecting there-from and having an annular condensing space surrounding said journal portion and opening at the opposite end of the body, a piston journaled in said journal portion, a tool carried by the piston, a shield projecting from the end of the body into proximity to the tool, and means for supplying a cooling medium to said condensing space.

34. A fluid pressure motor comprising a body having a cylinder portion and a reduced journal portion with a flange at its outer end, a piston in said cylinder and journaled in said reduced journal portion, and a shell seated on said cylinder and said flange and inclosing a space communicating with the exhaust from the cylinder.

35. A fluid pressure motor comprising a body having a cylinder portion and a reduced axial portion with a flange at its outer end, a piston in said cylinder and journaled in said reduced axial portion, the exhaust from the cylinder opening into the space around the reduced axial portion and the outer flange being provided with an opening for the escape of the exhaust, and means for supplying a cooling medium to the space around the reduced axial portion.

36. A fluid pressure motor comprising a body having a cylinder portion and a reduced axial portion with a flange at its outer end, a piston in said cylinder and journaled in said reduced axial portion, the exhaust from the cylinder opening into the space around the reduced axial portion and the outer flange being provided with an opening for the escape of the exhaust, and a cooling medium supply passage through the cylinder portion and opening into the space around the reduced axial portion.

37. A rotary motor comprising a frame provided with a cylinder portion at one end and with a reduced axial portion projecting therefrom and provided on its outer end with a flange, a piston in said cylinder and journaled in said reduced axial portion, a shell seated on said cylinder and said flange and inclosing a chamber with which the cylinder exhaust port communicates, and a cooling medium supply passage opening into said space.

38. A rotary motor comprising a frame provided at one end with a cylinder chamber and with a reduced axial portion projecting therefrom and provided at its outer end with a flange, a piston in said cylinder chamber and journaled in said reduced axial portion, a shoe ring surrounding said cylinder, an outer shoe ring seated on the flange, means for securing said outer shoe ring to said flange, and a shell between said shoe rings and seated on said cylinder and flange.

39. A rotary motor comprising a longitudinally slotted piston and a cylindrical frame, said frame having an intermediate portion, an enlarged cylindrical rear end flange and an enlarged cylindrical front end flange, said end flanges forming an annular space surrounding said intermediate portion, said end flanges being formed with longitudinal passages communicating from outside the motor to said annular space.

40. A rotary motor comprising a longitudinally slotted piston and a cylindrical frame, said frame having an intermediate portion, an enlarged cylindrical rear end flange and an enlarged cylindrical front end flange, said end flanges forming an annular space surrounding said intermediate portion, said end flanges being formed with longitudinal passages communicating from outside the motor to said annular space, and said frame being formed with a cylinder chamber and an exhaust port communicating therefrom to said annular space.

41. A rotary motor comprising a longitudinally slotted piston and a cylindrical frame, said frame having an intermediate portion, an enlarged cylindrical rear end flange and an enlarged cylindrical front end flange, said end flanges forming an annular space surrounding said intermediate portion, said end flanges being formed with longitudinal passages communicating from outside the motor to said annular space, said frame being formed with a cylinder chamber and an exhaust port communicating therefrom to said

annular space, and said annular space being partly filled with a baffle.

42. A rotary motor comprising a slotted piston and a cylindrical frame, said frame having a central portion, an enlarged rear end flange and an enlarged front end flange and being formed with a piston chamber and an exhaust port communicating therefrom to between said end flanges, said end flanges having longitudinal passages communicating from outside the motor to the space between said end flanges exterior to said central portion of said frame.

43. A rotary motor comprising a slotted piston and a cylindrical frame, said frame having a central portion, an enlarged rear end flange and an enlarged front end flange and being formed with a piston chamber and an exhaust port communicating therefrom to between said end flanges, said end flanges having longitudinal passages communicating from outside the motor to the space between said end flanges exterior to said central portion of said frame, and a baffle between said flanges.

44. A rotary motor comprising a piston and a cylindrical frame having enlarged end flanges, a piston chamber with an exhaust port communicating therefrom to the space between said end flanges, and means for injecting a jet of condensing medium into said space between said end flanges.

45. A motor comprising a piston, and a cylinder therefor of circular external cross-section and provided with external rings or flanges to support it on a limited area of contact with a tube, said cylinder being provided with separate steam and water inlets at one end and an exhaust and passage opening at the other end.

46. A motor comprising a cylinder, a piston therein, a tool carried by said piston, and condensing means, said cylinder being provided with external rings or flanges whereon the motor and condensing means are supported and whereon said parts can be passed through a tube with a limited area of heat conducting contact therewith.

47. A rotary motor comprising a cylinder of circular cross-section provided with a longitudinal piston chamber, and a steam inlet and steam exhaust for said chamber, said cylinder being also provided with a longitudinal cooling medium supply passage thermally insulated from the walls of said piston chamber and extending past said piston chamber and discharging near the exhaust outlet therefrom.

48. A motor comprising a cylinder, a longitudinal piston therein, means for attaching a fluid pressure supply pipe to one end thereof, and means for attaching a cooling medium supply pipe to the same end thereof.

49. A motor comprising a cylinder, a longitudinal piston therein, means for attaching separate fluid pressure and cooling medium supply pipes to said cylinder, and means for supporting one of said pipes from the other.

50. A rotary motor comprising a cylindrical cylinder, a longitudinal piston therein, means for attaching parallel supply pipes to one end of said cylinder, and means on the piston for the attachment of a tool at the other end.

51. A rotary motor comprising a cylinder, a piston therein, a stem actuated by said piston, a tool on the far end of said stem, and an annular guide member carried by the motor and lying in close proximity to said tool.

52. A rotary motor comprising a cylinder, a piston therein, a stem flexibly connected to said piston, a tool on the far end of said stem, and a tubular guide member projecting forwardly from the motor and into proximity to the tool.

53. A rotary motor comprising a cylinder, a piston therein, a stem flexibly connected to said piston, a tool on the far end of said stem, and an annular guide member extending from the motor beyond the pivotal connection of the stem with the piston and into close proximity to the tool.

In testimony whereof, I have hereunto set my hand.

PHILIP J. DARLINGTON.

Witnesses:
C. D. Bishop,
Harold F. Ryder.