W. R. HARPER.

ROTARY STEAM ENGINE.

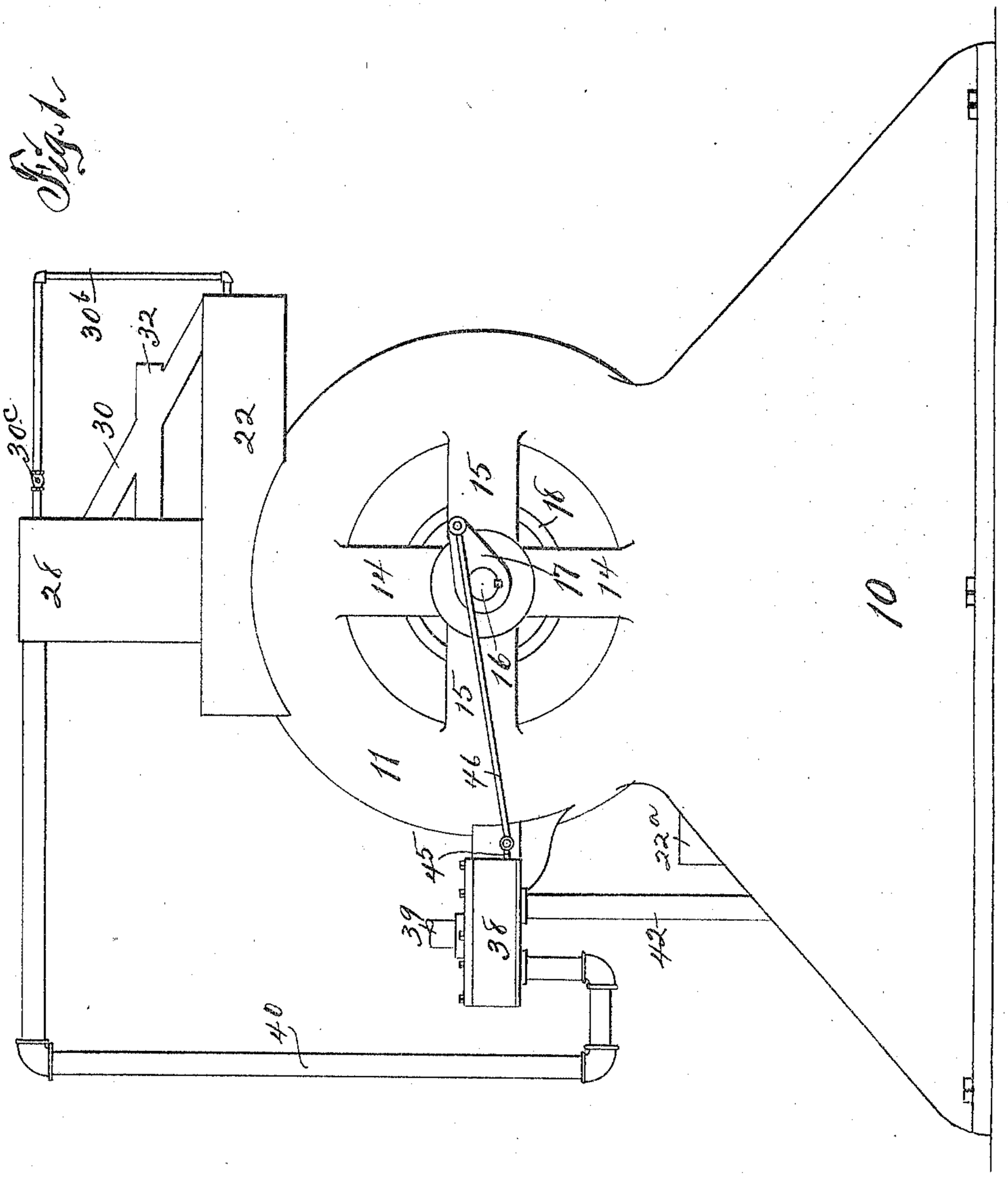
APPLICATION FILED AUG. 3, 1908.

951,607.

Patented Mar. 8, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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A. Anderson

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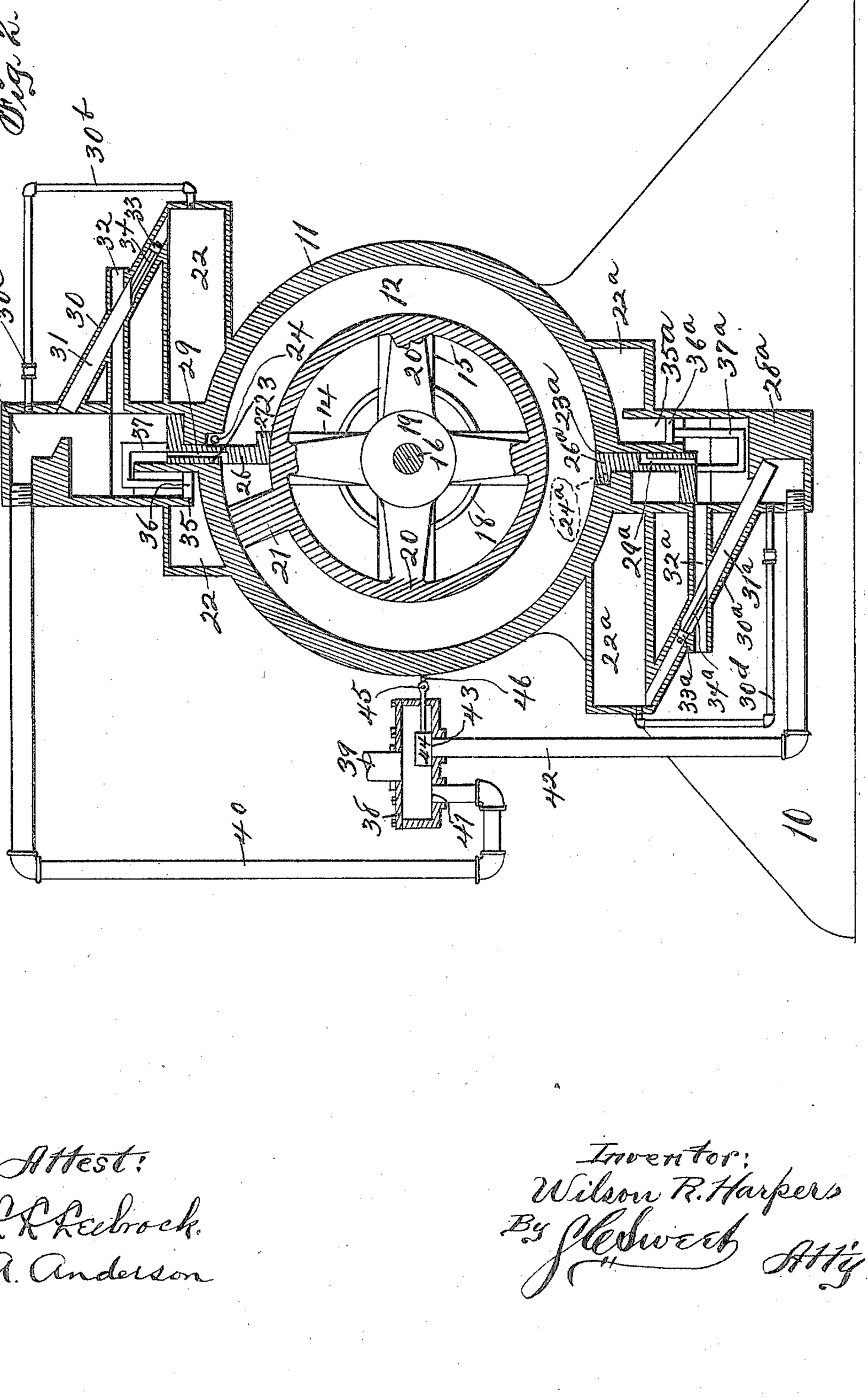
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

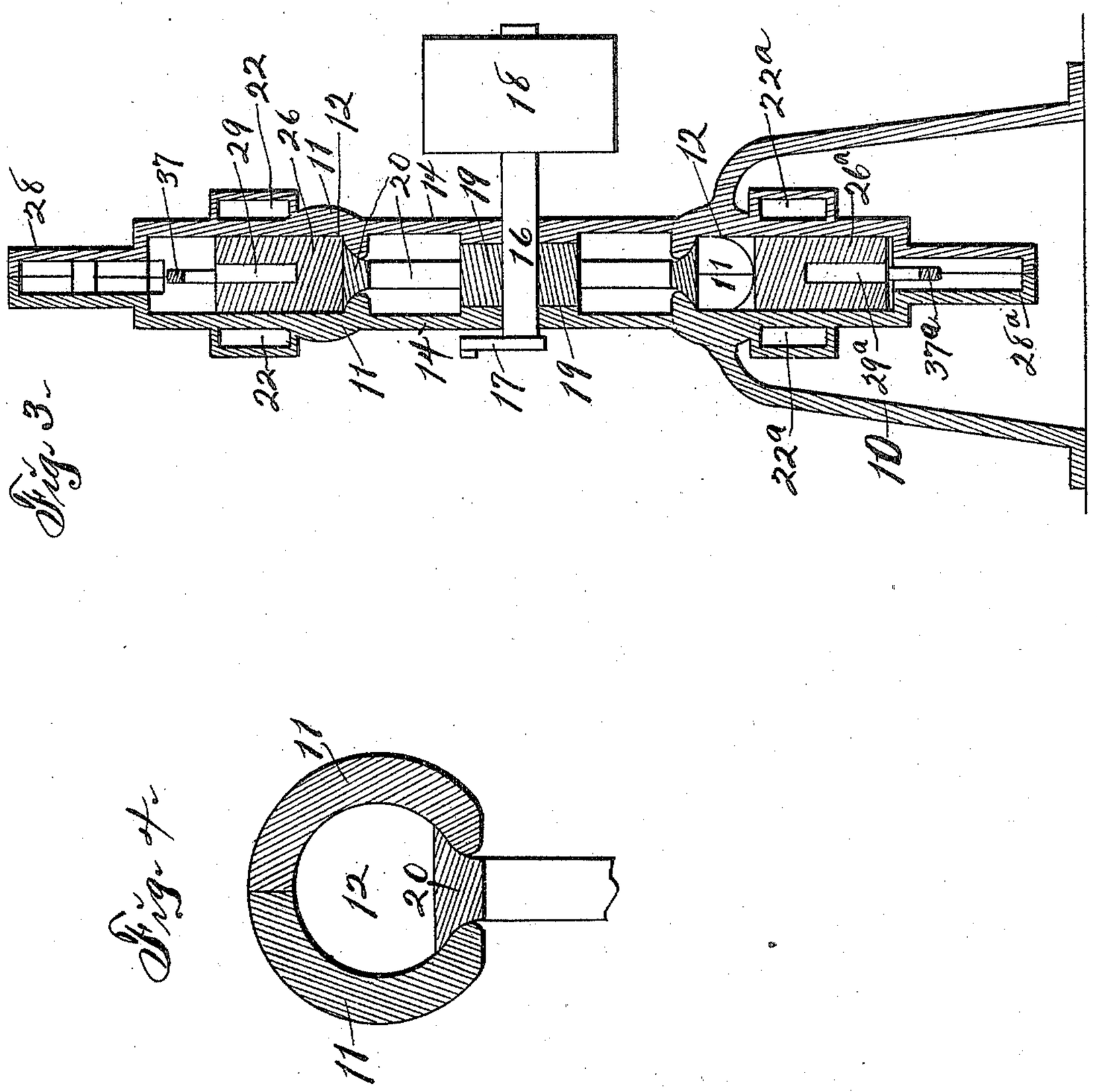

Fig. 4.

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UNITED STATES PATENT OFFICE.

WILSON R. HARPER, OF VINTON, IOWA.

ROTARY STEAM-ENGINE.

951,607. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed August 3, 1908. Serial No. 446,571.

To all whom it may concern:

Be it known that I, WILSON R. HARPER, a citizen of the United States of America, and resident of Vinton, Benton county, Iowa, have invented a new and useful Rotary Steam-Engine, of which the following is a specification.

The object of this invention is to provide improved construction for rotary steam engines.

My invention consists in the construction, arrangement and combination of elements hereinafter set forth, pointed out in my claims and illustrated by the accompanying drawing, in which—

Figure 1 is a side elevation of the complete engine. Fig. 2 is a vertical section of the engine transversely of the shaft thereof. Fig. 3 is a vertical section of the engine longitudinally of the shaft thereof. Fig. 4 is a detail section of part of the engine.

In the construction of the engine as shown the numeral 10 designates a base. The base 10 preferably is formed in mating halves and the mating halves of an annular cylinder 11, having an annular steam chamber 12, are formed on or fixed to and rise from said base. The mating halves of the cylinder 11 are provided with integral cross-bars 14, 15 crossing at their centers diametrically of the cylinder and formed with journal bearings at their centers. A shaft 16 is mounted for rotation in the journal bearings at the center of the cylinder and a crank 17 is mounted on one end portion of said shaft while a power-transmitting device, such as a pulley 18, is mounted on the opposite end portion of said shaft. A hub 19 is fixed to the shaft 16 between the journal bearings and a web 20 is formed on or fixed to and extends radially of said hub. A piston 21 is fixed to or formed on the rim portion of the web 20 and is shaped and arranged for travel in the annular steam chamber 12. A pressure chamber 22 is mounted on the upper portion of the cylinder 11 and a slide seat 23 is formed in the top of said cylinder and extends vertically across the upper portion of the annular steam chamber 12. A port 24 affords communication between the annular steam chamber 12 and the atmosphere. A gate 26 is mounted for vertical reciprocation in the slide seat 23 and a boss 27 on the rear of said gate is adapted to close the port 24 at times. A steam chest 28 is mounted on the pressure chamber 22 and communicates with the steam chamber 12 through a port 29 in the gate 26 at times. The port 29 extends from the top of the gate 26 to a point midway of the length of the gate and discharges forwardly into the chamber 12 when the gate is in its lowermost position and is closed when the gate is raised. The central portion of the steam chest 28 is restricted and a tube 30 is mounted in inclined position and connects the pressure chamber to the steam chest. A valve 31 is slidingly mounted in the tube 30 and the upper end portion of said valve is adapted to cut off and close communication through the restricted central portion of the steam chest at times. A passage 32 leads laterally from the lower portion of the steam chest to the atmosphere and crosses and intersects the tube 30. The lower end portion of the valve 31 is adapted to close and intercept the passage 32 at times. A piston 33 of less area than the valve 31 is mounted in the reduced lower end portion of the tube 30 and is connected to the valve 31 by a stem 34.

A cylinder 35 affords communication between the pressure chamber 22 and the lower portion of the steam chest 28. A piston 36 is mounted in the cylinder 35 and is attached to the gate 26 by a yoke 37. A by-pass 30^b connects the pressure chamber 22 to the upper end of the steam chest 28 and is controlled by a check valve 30^c. A pressure chamber 22^a is mounted beneath the cylinder 11 and a slide seat 23^a is formed in the bottom of the cylinder and extends vertically across the lower portion of the annular steam chamber 12. A port 24^a affords communication between the annular steam chamber 12 and the atmosphere. A gate 26^a is mounted for vertical reciprocation in the slide seat 23^a and a boss 27^a on the rear of said gate is adapted to close the port 24^a at times. A steam chest 28^a is mounted beneath the pressure chamber 22^a and com-

municates with the steam chamber 12 through a port 29ª in the gate 26ª at times. The port 29ª extends from the top of the gate 26ª to a point midway of the length of the gate and discharges forwardly into the chamber 12 when the gate is in its uppermost position and is closed when the gate is lowered. The central portion of the steam chest 28ª is restricted and a tube 30ª is mounted in inclined position and connects the pressure chamber 22ª to the steam chest. A valve 31ª is slidingly mounted in the tube 30ª and the lower end portion of said valve is adapted to cut off and close communication through the restricted central portion of the steam chest at times. A passage 32ª leads laterally from the lower portion of the steam chest to the atmosphere and crosses and intersects the tube 30ª. The upper end portion of the valve 31ª is adapted to close and intercept the passage 32ª at times. A piston 33ª of less area than the valve 31ª is mounted in the reduced upper end portion of the tube 30ª and is connected to the valve 31ª by a stem 34ª. A cylinder 35ª affords communication between the pressure chamber 22ª and the upper portion of the steam chest 28ª. A piston 36ª is mounted in the cylinder 35ª and is attached to the gate 26ª by a yoke 37ª. A by-pass 30ª connects the pressure chamber 22ª the lower end of the steam chest 28ª and is controlled by a check valve. A valve chamber 38 is provided and a steam-supply pipe 39 leads from a boiler (not shown) to the central portion of said chamber. A pipe 40 leads from a port 41 in the bottom of the valve chamber 38 to the steam chest 28. A pipe 42 leads from a port 43 in the bottom of the valve chamber 38 to the steam chest 28ª. A slide valve 44 is mounted within and on the bottom of the chamber 38 and a stem 45 on said valve extends outside the chamber and is connected by a pitman 46 to the crank 17 on the shaft 16.

The operation of the engine is as follows: The valve 44 being in the position shown steam passes through the pipe 39, chamber 38, port 41 and pipe 40 to the steam chest 28 and moves the valve 31 downward to a position closing the passage 32. The pressure of steam in the chest 28 moves the piston 36 and gate 26 downward and across the annular chamber 12. Steam passes through the port 29 into the annular steam chamber 12 between the gate 26 and piston 21 and moves said piston away from said gate. The impulse of the steam is sufficient to move the piston 21 beyond the slide seat 23ª, at which time the crank 17 and pitman 46 have shifted the slide valve 44 from the port 43 to the port 41, cut off the supply of steam from the chest 28 and given it to the chest 28ª. When the piston 21 passes beyond the slide seat 23ª it forces air from the annular chamber 12 through the port 24 into the atmosphere. The pressure in the chamber 22 raises the valve 31 to close passage through steam chest 28 and open passage 32 to the atmosphere which relieves the pressure on the top of the piston 36. Then pressure from the chamber 22 through the port 35 lifts the piston 36 and gate 26 in advance of the piston 21 and causes said gate or the boss 27 thereon to close the port 24. Pressure of steam entering through the pipe 42 and chest 28ª is sufficient to drive the piston from the gate 26ª beyond the slide seat 23. The duplicate elements designated by the subordinate index "a" operate in like manner to and alternately with the major elements above described.

I claim as my invention—

1. A rotary steam engine, comprising, in combination, an annular cylinder, axially journaled shaft having a web mounted within the annulus of said cylinder, a piston carried by said web and projected into said cylinder, air-ports provided in said cylinder, gates mounted to be reciprocated across said cylinder, said gates having bosses which are adapted to close and air-ports in said cylinder, and steam ports extending therethrough, steam chambers mounted over said gates, pressure chambers mounted in communication with said steam chambers, and means whereby steam is admitted to said gates to close the latter across said cylinder and to enter steam through said steam-ports, and to then direct steam through said pressure chambers to open said gates.

2. A rotary steam engine, comprising, in combination, an annular cylinder, an axially journaled shaft having a web mounted within the annulus of said cylinder, a piston carried by said web and projected into said cylinder, air-ports provided in said cylinder, gates mounted to be reciprocated across said cylinder, said gates having bosses which are adapted to close and air-ports in said cylinder, and steam ports extending therethrough, steam chambers mounted over said gates, pressure chambers mounted in communication with said steam chambers, and valve mechanism adapted to be steam opened to admit steam to reach said gates to close the latter and adjust said piston, and to then have access to said valve to close the latter from said pressure chambers to cut off the steam supply.

3. A rotary steam engine, comprising an annular cylinder, a piston arranged for travel therein, sliding gates mounted for reciprocation transversely of the cylinder at diametrically opposite points, steam chests on opposite sides of the cylinder, means of communication between the steam chests and cylinder through ports in the gates, pressure chambers communicating with the steam

chests at times, valves controlling the entrance of steam to the chests, said valves steam operated in one direction and pressure operated in the opposite direction, and pistons between the pressure chambers and steam chests whereby pressure from said chambers may move the gates outwardly.

Signed by me at Des Moines, Iowa, this 24″ day of August, 1907.

WILSON R. HARPER.

Witnesses:
S. C. SWEET,
J. J. STUCKEY.