A. E. HALL.

MOTOR.

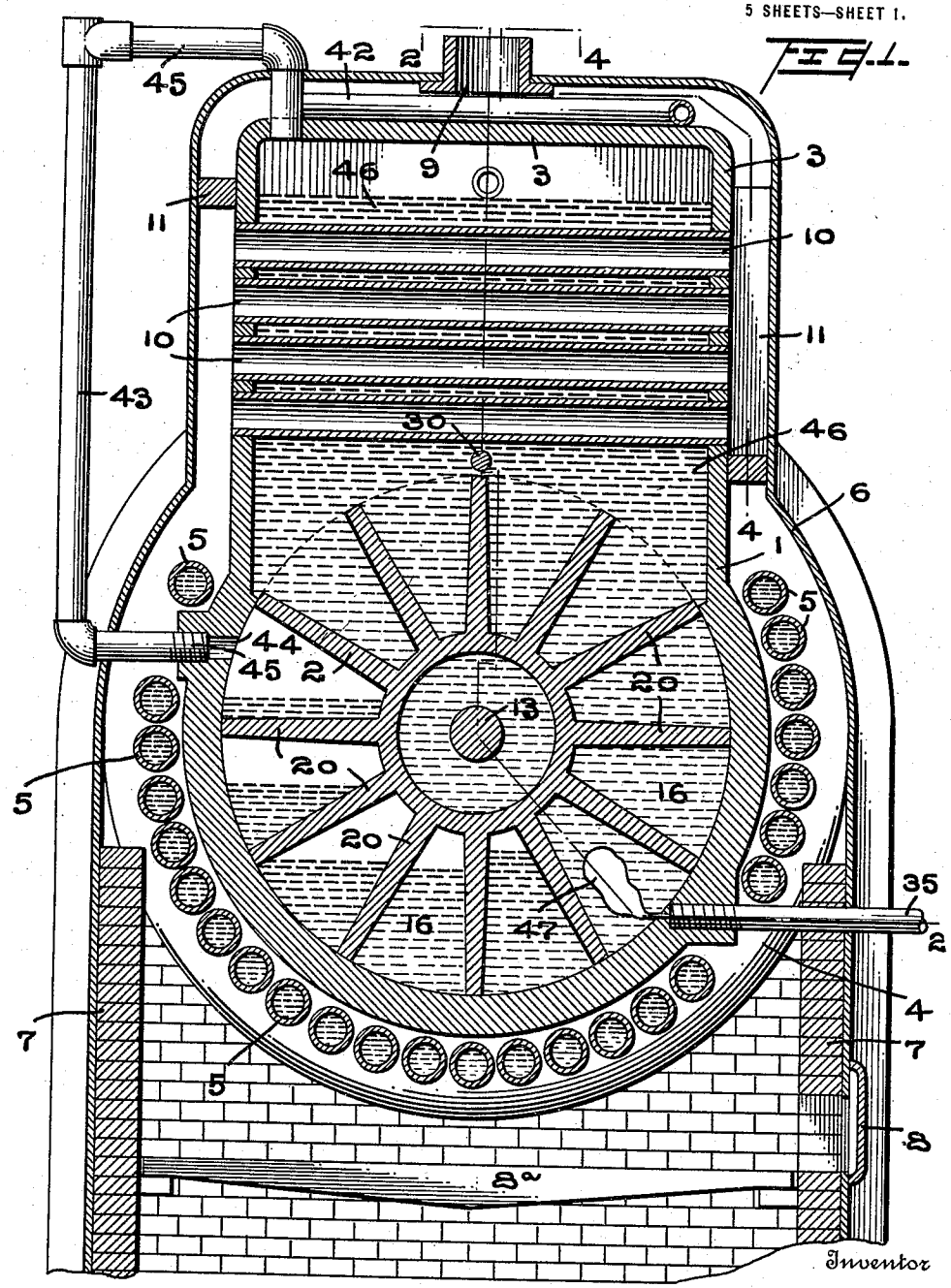
APPLICATION FILED FEB. 6, 1915.

1,162,052.

Patented Nov. 30, 1915.

5 SHEETS—SHEET 1.

FIG. 1.



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5 SHEETS—SHEET 2.

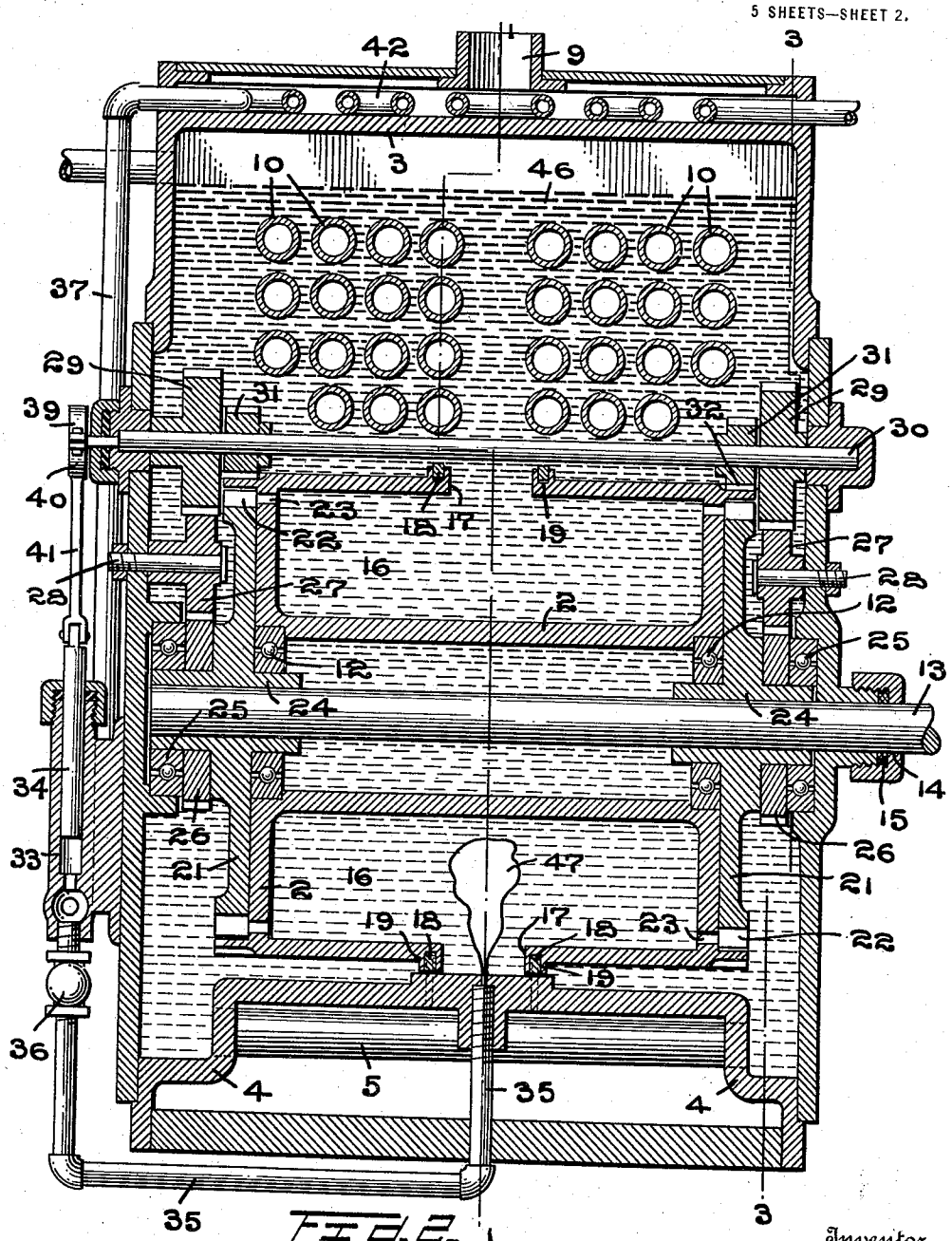


FIG. 2.

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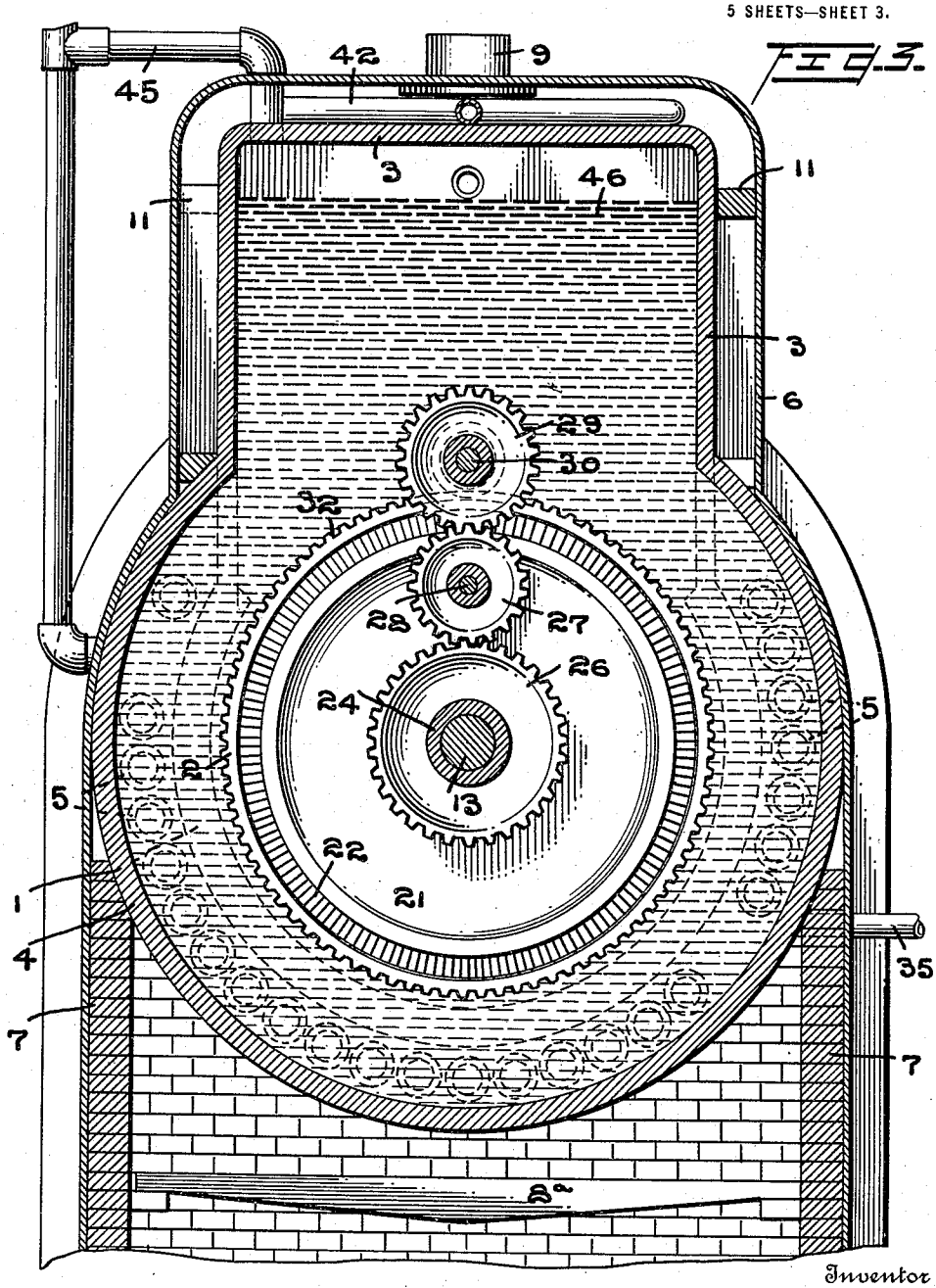
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5 SHEETS—SHEET 3.

FIG. 3.



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5 SHEETS—SHEET 4.

FIG. 4.

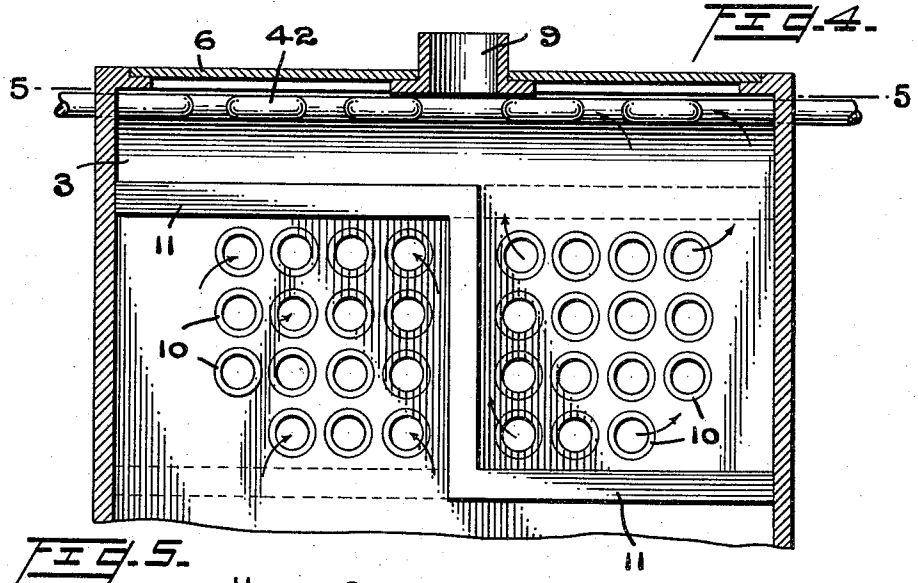
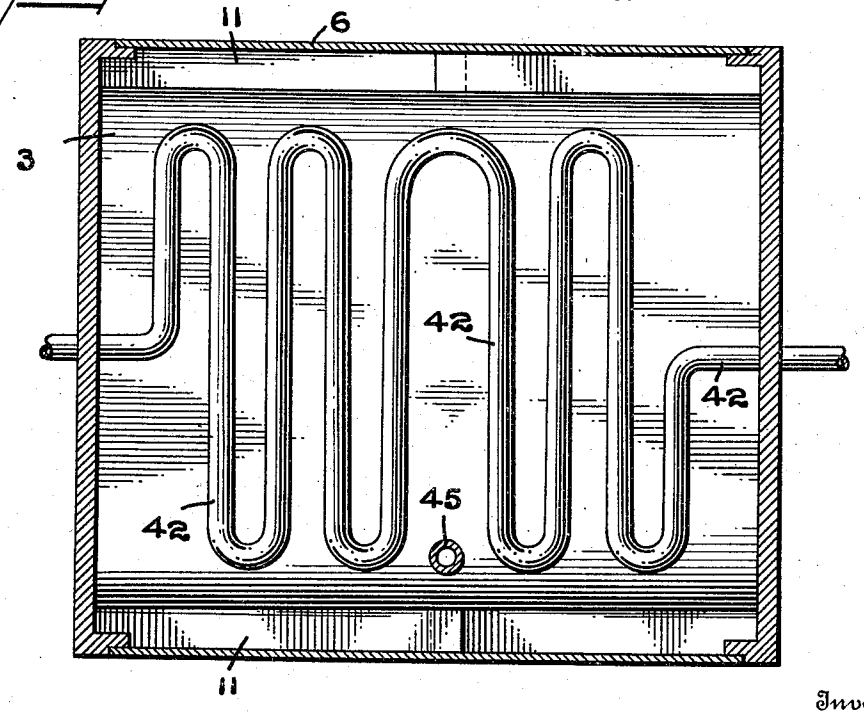


FIG. 5.



Witnesses

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5 SHEETS—SHEET 5.

FIG. 6.

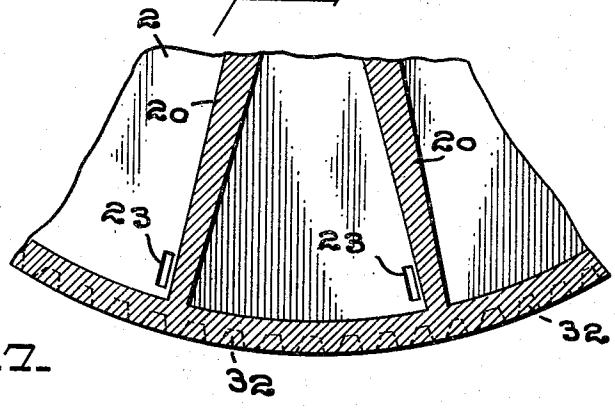


FIG. 7.

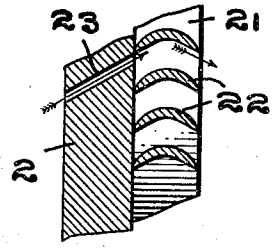


FIG. 8.

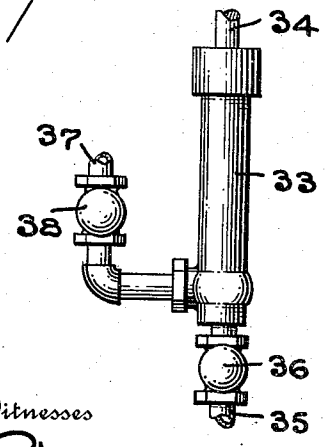
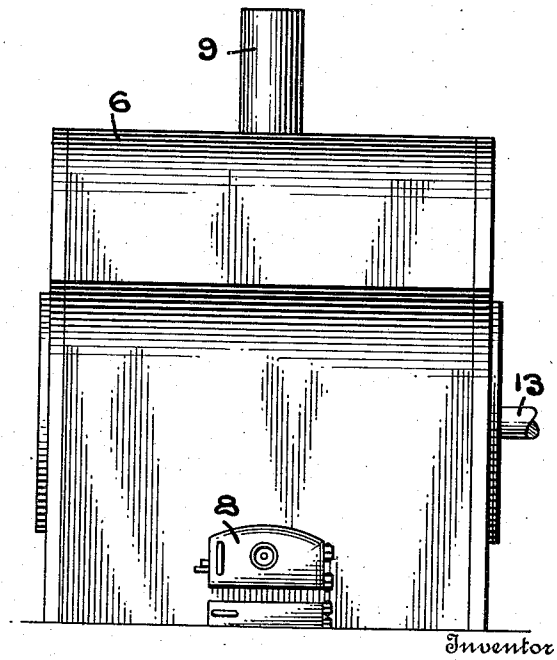


FIG. 9.



Witnesses

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1,162,052. Specification of Letters Patent. Patented Nov. 30, 1915.

Application filed February 6, 1915. Serial No. 6,436.

To all whom it may concern:

Be it known that I, ALLEN E. HALL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Motors, of which the following is a specification.

My invention relates to improvements in motors, the object of the invention being to provide a motor in which a fluid is heated to a high temperature, and into which a second fluid having a low boiling point is discharged to generate steam to cause the movement of the highly heated fluid and generate power.

A further object is to provide a motor in which a fluid of high boiling point is highly heated, and into which a fluid of low boiling point is discharged, and provide a turbine wheel against which the first-mentioned fluid is discharged by the expansion of the last-mentioned fluid to cause the turning of the turbine wheel.

A further object is to provide a motor in which a rotary member having a circular series of pockets containing fluid of a high boiling point, and provided with nozzles at opposite sides adapted to discharge against the blades of turbine wheels, and provide improved means for discharging fluid of a low boiling point into the several pockets in regular succession, so that the said last-mentioned fluid is quickly turned to steam, and the pressure utilized to force the first-mentioned fluid through the nozzles and turn the turbine wheels.

A further object is to provide a motor of the character stated which requires but a small fluid consumption which is relatively light and simple, and which is designed to run without noise or vibration, and generate any desired horse power in accordance with the relative proportions of the operative parts.

With these and other objects in view, the invention consists in certain novel features of construction and combinations and arrangements of parts as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in vertical transverse section taken on the staggered line 1—1 of Fig. 2. Fig. 2 is a view in vertical longitudinal section taken on the staggered line 2—2 of Fig. 1. Fig. 3 is a view in vertical transverse section taken on the staggered line 3—3 of Fig. 2. Fig. 4 is a fragmentary view in vertical section on the line 4—4 of Fig. 1. Fig. 5 is a view in horizontal section on the line 5—5 of Fig. 4. Fig 6 is a fragmentary view in longitudinal section illustrating a portion of the rotary member. Fig. 7 is a fragmentary sectional view showing the relative positions of the turbine blades, and a nozzle of the rotary member. Fig. 8 is a fragmentary view in elevation illustrating the pump, and Fig. 9 is a view in side elevation of my improved motor.

1 represents the casing of my improved motor, which is of cylindrical form at its lower portion to accommodate a rotary member 2. The casing has an upward extension 3, so that a sufficient amount of fluid can be maintained in the casing to perform the best results.

The casing 1, at both ends, is provided with enlargements 4, which are connected by tubes 5 to increase the radiating surface, and also increase the fluid space in the casing. The casing may be heated in any approved manner. I have shown the casing inclosed in an outer shell 6, and supported on walls 7 above a grate 8^a, so that the space between the bottom of the casing and the grate constitutes a combustion chamber in which any available fuel may be burned to heat the liquid in the casing. A door 8 is provided for the admission of such fuel, and a stack 9 is located at the upper end of the shell for the outlet of smoke and gases.

The extension 3, on casing 1, is provided with a plurality of transversely positioned tubular flues 10, and baffles 11 are located at opposite sides of the casing to compel the smoke and gases to flow through the flues in the directions indicated by the arrows. In other words, the smoke and gases flow through one-half of the flues in one direction, and through the other half in the opposite direction, so that the draft of smoke and gases is equalized at both sides of the casing and the walls of the casing uniformly heated, whereby the maximum of heat is imparted to the fluid in the casing.

The rotary member 2 is of general cylindrical form, and is mounted to turn on ball bearings 12 on a drive shaft 13. This drive shaft extends through one end of the casing, and is centrally located in the cylindrical portion 14 of the casing, and pro-

vided with a packing 15 to prevent leakage around the shaft. The rotary member 2 is made with a circular series of pockets 16 which are cut off by the circular portion of casing 1, and are open to the fluid in the casing when in communication with the extension 3. These pockets 16 are open at the center as shown at 17, and packing strips 18 secured to casing 1 are positioned in grooves 19 in the rotary member at opposite sides of the openings 17 so as to prevent the flow of fluid past the packing.

While I have described the pockets as having openings 17, it is to be understood that the rotary element has an annular opening at its center which is in constant communication with the fluid in the casing, except where cut off by the casing and by the radial partitions 20 between the pockets 16.

Turbine wheels 21 are secured to shaft 13, and are located in close proximity to the ends of the rotary member 2. These turbine wheels 21 have an annular series of blades or pockets 22 which are adapted to receive fluid forced through nozzles 23 in the ends of the rotary member 2. Each of the pockets 16 of the rotary member is provided with a single nozzle at both ends of the pocket or rather at both ends of the rotary member at opposite sides of the pocket, so that the fluid forced through the nozzles against the blades is designed to turn the turbine wheels as will be hereinafter explained.

The turbine wheels 21 are preferably formed with extended bearing sleeves 24 secured to the shaft 13, and around these bearing sleeves, the ball bearings 12 above referred to are positioned. Other ball bearings 25 are positioned around the sleeves 24 and assist in maintaining the shaft in proper position to withstand the strains to which it is necessarily subjected.

Gear wheels 26 are secured to the sleeves 24, and mesh with pinions 27 on stubs 28 secured in the ends of the casing. The pinions 27 mesh with gear wheels 29 on a countershaft 30, and this countershaft 30 carries pinions 31 in mesh with circular racks 32 on the rotary member 2.

The trains of gearing above described compel the rotary member to turn in a direction opposite to the direction of movement of the turbine wheels, and at an appreciably lower speed. The ratio of difference in speed may be varied to suit conditions, but it is to be understood that there will be a very appreciable difference and that the rotary member will turn in a direction opposite to the direction of movement of the turbine wheels.

On the outside of the casing, at one end, I locate a pump casing 33 having a plunger 34 therein adapted to force water through a pipe 35 into the pockets 16 of the rotary member 2. This pipe 35 discharges through the wall of casing 2 as shown clearly in Figs. 1 and 2, and a check valve 36 is located between the pump and the discharge end of the pipe 35 to prevent any back pressure on the pump.

37 represents a water supply pipe which is provided with a check valve 38 adjacent the pump, and as it is desirable to heat the water or other fluid passing through the pipe 37, this pipe communicates with a coil 42 located above the upper end of the extension 3, but inside of the shell 6, so that the products of combustion of the motor are utilized to heat the water, and it is of course, to be understood that this water supply may be heated in any desired manner.

While the plunger of the pump may be operated in various ways, I have indicated a simple means of operating the same, consisting of an eccentric 39 secured to the countershaft 30, and operating an eccentric strap 40 connected by a link 41 with the plunger 34 of the pump.

43 represents a steam exhaust pipe which communicates with an opening 44 in the cylindrical portion of casing 1 as shown clearly in Fig. 1, and is provided with a branch pipe 45 communicating with the upper end of extension 3, so that the exhaust steam which may percolate through the fluid in the casing, may find an outlet through the branch pipe 45.

While my invention is not limited to the particular fluids employed, it is to be understood that the fluid in the casing is to have a high boiling point, and the fluid discharge through the pipe 35 is to have a low boiling point.

For purposes of description, we will assume the fluid 46 in casing 1 to be "oil", and the fluid 47 discharged through pipe 35 to be "water", and while I shall hereinafter refer to these terms as "oil" and "water", it is to be understood that the invention is in no wise limited to these particular fluids.

The operation of the motor is as follows: As each successive pocket 16 reaches the discharge end of pipe 35, it will receive the necessary amount of water discharged under pressure by the pump 33. It is to be understood that the oil is heated to a high degree of temperature, which we will assume to be four or five hundred degrees Fahrenheit, and the water will receive such a temperature as may be desirable for best results. As soon as the water mixes with the oil, it will be instantly turned to steam, and will exert a high pressure in the pocket to discharge the oil through the nozzles 23 against the blades 22 of the turbine wheels, causing the turbine wheels to revolve and through the medium of the trains of gearing above described, impart a rotary movement to the rotary member 2. As seen clearly in

Fig. 1, the steam moves to the top or inner portion of the pocket, and as it expands, it forces out the oil in the lower or outer portions of the pocket.

I would have it understood that the nozzles 23 are located only in the rear portions of the pockets, so that no steam escapes through the nozzles. As the rotary member causes the oil to gradually change its position relative to the partitions of the rotary member, as shown clearly in Fig. 1, it will be seen that the nozzles are always covered by the oil, and that as soon as the oil reaches a low level in the pocket, the pocket will communicate with the exhaust pipe 43, allowing the steam to exhaust therethrough or else through the oil in the casing and out through the branch pipe 45.

While I have illustrated a motor of a particular type, I would have it understood that my invention is not limited to the particular form of motor shown and described, but consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A motor comprising a movable casing containing a heated fluid, means for discharging a second fluid into the casing, whereby the second fluid is generated into gas by the first-mentioned fluid, and means for utilizing the pressure thus obtained, substantially as described.

2. A motor comprising a movable casing containing hot fluid, means for discharging a second fluid into the casing whereby the second fluid is generated into gas by the first fluid, and a turbine wheel caused to turn by the movement of the first fluid due to the expansion of the second fluid, substantially as described.

3. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, and a turbine wheel communicating with the pockets of the rotary member, substantially as described.

4. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, said rotary member having nozzles in its pockets, and a turbine communicating with the nozzles, substantially as described.

5. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, said pockets having nozzles in their ends, and turbine wheels at both ends of the rotary member having blades in line with the nozzles, substantially as described.

6. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, turbine wheels located at the ends of the rotary member, said rotary member having nozzles in its ends communicating with the turbines, and a train of gearing connecting a turbine gear with the rotary member, whereby the rotary member is caused to turn at a slower speed than the turbine wheel, substantially as described.

7. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, turbine wheels located at the ends of the rotary member, said rotary member having nozzles in its ends communicating with the turbines, and a train of gearing connecting a turbine gear with the rotary member, whereby the rotary member is caused to turn at a slower speed and in an opposite direction to the turbine wheel, substantially as described.

8. A motor comprising a casing containing hot fluid, a rotary member mounted to turn in the casing and having a circular series of pockets therein, normally full of hot fluid, a pipe communicating with the side of the casing, a pump constructed to force a given quantity of fluid of low boiling point into the pockets of the rotary member to generate gas in the pockets, said rotary member having nozzles in the ends of the pockets through which the first-mentioned fluid is discharged by the gas, and turbine wheels at the ends of the rotary member having their blades in communication with the nozzles, substantially as described.

9. A motor comprising a casing containing hot fluid, a rotary member mounted to turn in the casing and having a circular series of pockets therein, normally full of hot fluid, a pipe communicating with the side of the casing, a pump constructed to force a given quantity of fluid of low boiling point into the pockets of the rotary member to generate gas in the pockets, said rotary member having nozzles in the ends of the pockets through which the first-mentioned fluid is discharged by the gas, turbine wheels at the ends of the rotary member having their blades in communication with the nozzles, a drive shaft on which said turbines and rotary member are mounted, and a train of gearing connecting one of the turbines with the rotary member, whereby the rotary member is caused to turn at a slower rate of speed and in an opposite direction to the

direction of movement of the turbine wheels, substantially as described.

10. A motor comprising a casing of general cylindrical form having an upwardly projecting extension and having enlargements at its ends, fluid tubes connecting the enlargements around the outside of the cylindrical portion of the casing, tubular flues extending through the upwardly projecting extension, a shell positioned around the casing, a combustion chamber in the lower portion of the shell, an outlet stack at the top of the shell, baffles between the shell and the upwardly projecting extension of the casing, whereby the products of combustion are compelled to pass in opposite directions through the flues of the extension, a rotary member in the casing, containing a circular series of pockets, said casing adapted to contain a fluid of high boiling point, means for discharging a fluid of low boiling point into the pockets, and turbine wheels in the casing operated by the movement of the first-mentioned fluid by the expansion of the last-mentioned fluid, substantially as described.

11. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets, said member having an annular opening communicating with all of the pockets, said casing having packing material between the same and the rotary member at both sides of the annular opening, means for discharging a second fluid into the pockets through said opening, and means for utilizing the expansion of said last-mentioned fluid in its movement of the first-mentioned fluid, substantially as described.

12. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets, said member having an annular opening communicating with all of the pockets, said casing having packing material between the same and the rotary member at both sides of the annular opening, means for discharging a second fluid into the pockets through the said opening, said rotary member having nozzles in the ends of the pockets, and turbine wheels located at the ends of the rotary member and having blades or vanes communicating with the nozzles, substantially as described.

13. A motor comprising a movable casing containing a heated fluid, means for discharging a determined quantity of a second fluid into the casing, whereby the second fluid is generated into gas within and by the first-mentioned fluid, and means for utilizing the pressure thus obtained, substantially as described.

14. A motor comprising a movable casing containing hot fluid, means for discharging a determined quantity of a second fluid into the casing, whereby the second fluid is generated into gas within and by the first fluid and a turbine wheel caused to turn by the movement of the first fluid due to the expansion of the second fluid, substantially as described.

15. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into each of the pockets of the rotary member in regular succession, and a turbine wheel communicating with the pockets of the rotary member, substantially as described.

16. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, said rotary member having nozzles in its pockets, and a turbine located at the end of the rotary member and communicating with the nozzles, substantially as described.

17. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, said pockets having nozzles in their ends, turbine wheels at both ends of the rotary member having blades in line with the nozzles, a drive shaft in the casing to which said turbine wheels are secured and around which shaft the rotary member freely turns, substantially as described.

18. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, turbine wheels located at the ends of the rotary member, said rotary member having nozzles in its ends communicating with the turbines, a train of gearing connecting a turbine gear with the rotary member, whereby the rotary member is caused to turn at a slower speed than the turbine wheel, a drive shaft in the casing to which said turbine wheels are secured, and around which shaft the rotary member freely turns, substantially as described.

19. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, turbine wheels located at the ends of the rotary member, said rotary member having nozzles in its ends communicating with the turbines, a train of gearing connecting a turbine gear with the rotary member, whereby the rotary member is caused to turn at a slower speed and in an opposite direction to the turbine wheel, a drive shaft

in the casing to which said turbine wheels are secured, and around which shaft the rotary member freely turns, substantially as described.

20. A motor comprising a casing containing hot fluid, a rotary member mounted to turn in the casing and having a circular series of pockets therein, normally full of hot fluid, a pipe communicating with the side of the casing, a pump constructed to force a given quantity of fluid of low boiling point into the pockets of the rotary member to generate gas in the pockets, said rotary member having nozzles in the ends of the pockets through which the first-mentioned fluid is discharged by the gas, turbine wheels at the ends of the rotary member having their blades in communication with the nozzles, a drive shaft in the casing to which said turbine wheels are secured, and around which shaft the rotary member freely turns, substantially as described.

21. A motor comprising a movable casing containing a heated fluid, means for discharging a second fluid into the casing, whereby the second fluid is generated into gas by the first-mentioned fluid, means for utilizing the pressure thus obtained, a gas exhaust pipe communicating with the casing and into which exhaust gas from the casing is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

22. A motor comprising a movable casing containing hot fluid, means for discharging a second fluid into the casing whereby the second fluid is generated into gas by the first fluid, a turbine wheel caused to turn by the movement of the first fluid due to the expansion of the second fluid, a gas exhaust pipe communicating with the casing and into which exhaust gas from the casing is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

23. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, a turbine wheel communicating with the pockets of the rotary member, a gas exhaust pipe communicating with the casing and into which exhaust gas from the pockets is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

24. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, said rotary member having nozzles in its pockets, a turbine communicating with the nozzles, a gas exhaust pipe communicating with the casing and into which exhaust gas from the pockets is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

25. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, said pockets having nozzles in their ends, and turbine wheels at both ends of the rotary member having blades in line with the nozzles, a gas exhaust pipe communicating with the casing and into which exhaust gas from the pockets is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

26. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, turbine wheels located at the ends of the rotary member, said rotary member having nozzles in its ends communicating with the turbines, and a train of gearing connecting a turbine gear with the rotary member, whereby the rotary member is caused to turn at a slower speed than the turbine wheel, a gas exhaust pipe communicating with the casing and into which exhaust gas from the pockets is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

27. A motor comprising a casing containing hot fluid, a rotary member in the casing having a circular series of pockets containing hot fluid, means for discharging a second fluid into the pockets of the rotary member, turbine wheels located at the ends of the rotary member, said rotary member having nozzles in its ends communicating with the turbines, a train of gearing connecting a turbine gear with the rotary member, whereby the rotary member is caused to turn at a slower speed and in an opposite direction to the turbine wheel, a gas exhaust pipe communicating with the casing and into which exhaust gas from the pockets is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

28. A motor comprising a casing containing hot fluid, a rotary member mounted to turn in the casing and having a circular series of pockets therein, normally full of hot fluid, a pipe communicating with the side of the casing, a pump constructed to force a given quantity of fluid of low boiling point into the pockets of the rotary member to generate gas in the pockets, said rotary member having nozzles in the ends of the pockets through which the first-mentioned fluid is discharged by the gas, turbine wheels at the ends of the rotary member having

their blades in communication with the nozzles a gas exhaust pipe communicating with the casing and into which exhaust gas from the pockets is discharged, and an exhaust gas pipe communicating with the top of the casing, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALLEN E. HALL.

Witnesses:
C. R. ZIEGLER,
S. W. FOSTER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."