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POWER FLUID GENERATOR.

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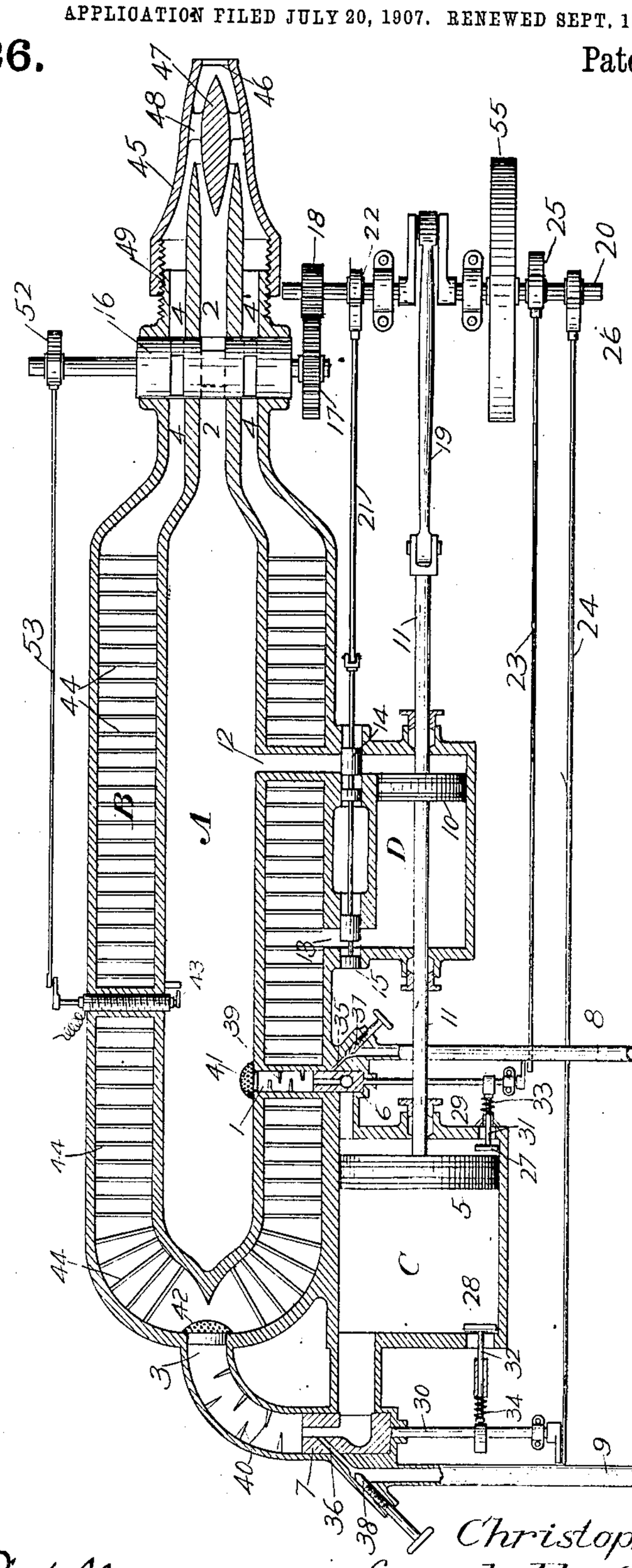

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POWER-FLUID GENERATOR

No. 916,726. Specification of Letters Patent. Patented March 30, 1909

Application filed July 20, 1907, Serial No. 384,738. Renewed September 18, 1908. Serial No. 453,622.

To all whom it may concern:

Be it known that I, CHRISTOPHER JOHN LAKE, (formerly JOHN CHRISTOPHER LAKE,) a citizen of the United States, and resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Power-Fluid Generators, of which the following is a specification.

My present invention relates to apparatus for generating power fluid for use in connection with prime movers either stationary or locomotive, or to produce locomotion by direct discharge of the power fluid from a movable body into the surrounding atmosphere or other medium, or for use in producing an air blast, or for any other use in which the rapid generation and discharge of gaseous fluid is required.

One object of my invention is to provide for the charging and discharging of a power fluid generator.

A further object is to provide for charging a power fluid generator by means of a pump or compressor actuated by the power fluid produced.

A further object is to produce a power fluid generator having a charging or compressing apparatus operated by the power fluid produced in the generator without any loss of said fluid from the generator by exhaust from said charging apparatus.

A further object is to produce a power fluid generator having means for producing alternately two unlike power fluids and to utilize part of the energy of each of said fluids for charging the retort in which the other is produced.

A further object is to produce a power fluid generator for producing alternately two unlike power fluids and having means whereby part of the energy of each fluid is in turn utilized in an apparatus for charging the retort in which the other is produced and is also utilized for operating a device for controlling the alternate discharges of said power fluids in proper relation to the charging apparatus.

A further object is to provide for the generation of two unlike power fluids and means for discharging them alternately into a single conduit in such manner that the discharge of either of the fluids from the retort in which it is produced will aid in exhausting residual matter from the retort in which the other fluid is produced.

A further object is to provide adjustable means for commingling the two power fluids produced and controlling their velocity of exit into a common conduit.

A further object is to provide for the generation and discharge of two unlike power fluids in such manner that the excessive heating of the various parts of the apparatus by one fluid will be prevented by the relative coolness of the other fluid.

With the above objects in view and further objects which will appear as the operation and details of my invention are more fully disclosed, I have invented the improved generating device one example of which will be hereinafter specifically described and illustrated by aid of the accompanying drawing which forms a part of this specification and which is a sectional view of a complete apparatus embodying the various features of my invention.

Referring to the drawing, A represents an inner chamber into which an explosive mixture such as air and finely divided oil or other hydrocarbon is admitted through the port 1 and ignited by the sparker 43, and from which the resulting gases are discharged through the conduit 2.

B is a surrounding outer chamber into which a mixture of air and finely divided water is introduced through the port 3 and heated by contact with the exterior of chamber A and the perforated or corrugated plates or rods 44 secured thereon. From chamber B the superheated mixture is discharged at a high temperature and tension through the conduit 4 concentric with conduit 2 of the inner chamber.

C is an air pump or compressor cylinder in the right and left ends of which air is compressed by the piston 5 to form the charges for chambers A and B respectively through the ports 1 and 3 the entrances to which are controlled by the valves 6 and 7 through which are also admitted the desired quantities of oil and water by way of pipes 8 and 9.

D is a power cylinder containing a piston 10 for actuating the piston 5 of the compressor through the common rod 11.

The various valves in connection with cyl-

inders C and D are operated by cams or eccentrics on the shaft 20 which is provided with a fly wheel 55 to insure steadiness of action. The piston 10 is actuated by power fluid admitted from chambers A and B through the ports 12 and 13 respectively, the opening and closing of these ports being controlled by valves 14 and 15. The discharge of the power fluids from the chambers A and B is controlled by the valve 16. This valve is operated by the piston in cylinder D through the toothed gears 17 and 18 which are rotated by the crank-shaft 20 connected to the piston rod 11 by the connecting rod 19. The valve 16 being of the plug cock pattern requires but one half turn from full open to full open or between any two corresponding positions, and the toothed gearing is therefore used to give this valve the same period of operation as the pistons 5 and 10 in order that there may be but one discharge of each generating chamber for each charging thereof. The valves 14 and 15 of the cylinder D are operated by the rod 21 deriving motion from the eccentric 22 on the shaft 20. Valves 6 and 7 are each operated in a similar manner by the rods 23 and 24 and eccentrics 25 and 26.

In addition to the valves 6 and 7 the cylinder C is provided with air inlet valves 27 and 28. These valves are actuated by cams on the stems 29 and 30 which open the valves by contact with the rods 31 and 32, these air valves being closed by the springs 33 and 34. The valves 6 and 7 are provided with the passages 35 and 36 for the admission of oil and water respectively when the valve is in such position that these passages register with corresponding passages leading from the oil and water pipes 8 and 9, the flow of oil and water being regulated by the hand valves 37 and 38. The oil and water passages in the valves 6 and 7 respectively are so arranged with reference to the air passages that the oil or water will be drawn into the air passages on the jet-nozzle principle but the oil or water may be supplied under pressure if preferred. In any case a more intimate mixture of the two fluids is secured by contact with the baffle plates or projections 39 and 40 and the vaporizers 41 and 42.

The ports in the valve 16 which controls the discharges from the cylinders A and B are so arranged that the ports from one chamber begin to open somewhat before the closing of the ports from the other chamber. During the interval when the ports from both chambers are thus partly open, the residual matter in the chamber that is just closing is largely or wholly withdrawn by the initial force of the fluid from the chamber that is just opening. This result is secured in efficient degree by the form of the throttling nozzle 45 which leads the two fluids gradually into a single passage 46. This nozzle contains an interior directing portion 47 tapered at both ends and secured centrally in the outer shell of the nozzle by the webs 48. The shell 45 has a screw connection 49 where it joins the discharge conduits from the valve 16 by means of which the nozzle may be moved toward or away from the passages 2 and 4 leading thereto. This varies the openings through which the power fluids must pass and allows of adjustment to obtain the proper area of passage from each chamber to insure the proper exhaustion of one by the discharge from the other when there is an alteration in the rate of production of the power fluids. Stated differently, the nozzle 45 is made adjustable so that for different rates of power fluid production the converging passages from the two chambers may be given that degree of opening which will give the fluid from each chamber the most effective impulsive discharge and the best velocity for withdrawing residual matter from the other chamber.

The operation of the apparatus is as follows: The oil and water valves 37 and 38 are opened. The crank-shaft 20 is turned until piston 5 makes a stroke toward the right. This will force a charge of air and finely divided oil through port 1 into chamber A. At this point valve 6 closes and ignition takes place through the action of eccentric 52 and rod 53. The valve 16 now opens the discharge passage 2. During the discharge of chamber A, valve 14 opens port 12 leading to cylinder D. The pressure in chamber A exerts a pressure in cylinder D to impel piston 10 toward the left. Piston 5 has a corresponding motion which forces a charge of air from cylinder C and water from pipe 9 into chamber B by way of valve 7 and port 3. Valve 7 now closes and heat from chamber A expands the air and water in the surrounding chamber B and valve 16 moves to a position that will open passage 4. When chamber A and cylinder D are completely discharged passage 2 closes and passage 4 opens at the same time. One passage is opening while the other is closing. During this time the initial discharge from B will aid in clearing chamber A and cylinder D by the action of the nozzle 45. While the expanded air and water (which has now become steam) are discharging from chamber B, the valve 15 opens port 13 leading to cylinder D. Both pistons now move again toward the right, causing another charge of oil and air to enter chamber A by way of valve 6 and port 1. The fluid which entered cylinder D by way of port 12 during the early part of the discharge from chamber A is now exhausted from cylinder D by the same action that exhausts chamber A. It is thus apparent that there is no loss of fluid to operate cylinder D as it enters only long enough to impel piston 10 toward the left and then passes out with

the discharge from chamber A. Ignition now occurs in chamber A as before. Passage 2 opens during the closing of passage 4. Piston 10 again moves to the left, resistance on that side having been removed by discharge of chamber B, in the same manner as previously described for chamber A. This causes piston 5 to force another charge of air and water through valve 7 and port 3 to chamber B. Cylinder C at every stroke is charged with air by way of the cam-actuated valves 27 and 28 which are timed and set so as to admit the requisite amount of air as needed. It is, of course understood that the igniter and various valves are so designed and operated by the eccentrics and gears shown or by other suitable devices that they will act with the necessary relation to each other to carry out the operations above described.

The advantages of a power fluid generator operating as I have described are numerous and apparent: By using heated air and steam in conjunction with gases from explosions, I am able to prevent undue heating of the apparatus and at the same time conserve and utilize all the energy abstracted in the cooling process. By the use of concentric discharge outlets and a single discharge valve for both fluids the valve and passages are kept properly cool, the excess of heat from each explosive discharge being taken up by the succeeding discharge of air and steam.

By my system of driving the air pump, valves and charging devices, the fluid used in the motor cylinder is not lost by exhaust or otherwise, but passes again to the volume of fluid produced and available for power purposes. At the same time I dispense with independent compressors, engines, storage tanks etc., and the apparatus becomes readily portable and conveniently self-contained, it being necessary to carry only a small quantity of water in addition to the hydrocarbon fuel supply. Also by the use of the products of explosion in one end of the motor cylinder to drive the air pump or compressor and heated air and steam in the other end, excessive heating is again avoided.

It is to be understood that the foregoing description is offered only as an example and as an illustration of the best mode in which I have contemplated applying the principle of my invention and that many modifications may be made within the scope of the claims without departing from the principle thereof.

What I claim is:

1. The combination in a power fluid generator of two generating chambers; and apparatus for charging one chamber with air and a hydrocarbon and the other chamber with air and water, said apparatus being driven by pressure derived alternately from each chamber when charging the other chamber.

2. The combination in a power fluid generator of an inner combustion chamber for producing gas by explosions; an outer chamber for heating air and finely divided water by heat from the inner chamber; an air pump or compressor for charging said chambers; and a motor cylinder for driving said air pump or compressor by pressure derived alternately from said inner and outer chambers in opposite ends of said motor cylinder.

3. The combination in a power fluid generator of an inner combustion chamber; an outer cooling chamber; a motor cylinder and piston for charging said chambers; and ports connecting said inner chamber with one end of said motor cylinder and said outer chamber with the opposite end of said motor cylinder.

4. The combination in a power fluid generator of an inner combustion chamber; an outer cooling chamber; a motor cylinder and piston for charging said chambers; and valve-controlled ports connecting said inner chamber with one end of said motor cylinder and said outer chamber with the opposite end of said motor cylinder.

5. The combination in a power fluid generator of an inner combustion chamber; an outer cooling chamber; a motor cylinder and piston for charging said chambers; ports connecting said inner chamber with one end of said motor cylinder and said outer chamber with the opposite end of said motor cylinder; valves in said ports operated by motion derived from the piston in said cylinder; an air compressor and charging cylinder containing a piston driven by the motor cylinder; air inlet ports to said charging cylinder; ports leading from opposite ends of said charging cylinder to the inner and outer chambers; valves in said ports; and means for mingling a hydrocarbon fuel with the air passing to the inner chamber and water with the air passing to the outer chamber.

6. The combination of separate chambers for generating power fluids of different temperatures; a double-acting motor operated in opposite directions by the separate fluids whereby the fluid of lower temperature prevents overheating of the motor by the fluid of higher temperature; an air compressor driven by the motor; and supply connections between the compressor and said separate chambers.

7. The combination of separate chambers for generating power fluids of different temperatures; a double-acting motor operated in opposite directions by the separate fluids whereby the fluid of lower temperature prevents overheating the motor by the fluid of higher temperature; an air compressor driven by the motor; supply connections between the compressor and said separate chambers; means for introducing water into one supply connection to mix with the air passing

therethrough; and means for introducing a hydrocarbon into the other air connection to mix with the air passing therethrough.

8. The combination of a power fluid generator; a motor supplied therefrom; a charging device for the generator driven by the motor; and means for conducting the fluid used in the motor to mix with the fluid discharged from the generator.

9. The combination of separate fluid generating chambers; a double-acting motor driven alternately by fluids from each of said chambers; and means for returning the fluids used in the motor to mix with the fluids remaining in the chambers.

10. The combination with a power fluid generator of means for controlling the discharge of fluid therefrom, said means being operated by part of the fluid from the generator, and means for returning the fluid thus used to mix with the fluid discharged from the generator.

11. The combination in a power fluid generator of separate generating chambers for unlike power fluids; a pump for charging the chambers; and independent connections between the pump and the several chambers.

12. The combination of separate generating chambers for unlike power fluids; a pump for charging the chambers; independent connections between the pump and the several chambers; and a motor for driving the pump, said motor being operated by fluid from the chambers.

13. The combination of separate generating chambers for unlike power fluids; a pump for charging the chambers; independent connections between the pump and the several chambers; valves in said connections; a motor operated by fluid from the chambers; and connections between the motor and said valves.

14. The combination of separate generating chambers for unlike power fluids; a pump for charging the chambers; independent connections between the pump and the several chambers; valves in said connections; a motor operated by fluid from the chambers; connections between the motor and said valves; a valve for controlling the discharge of fluids from the chambers, and connections between said valve and the motor.

15. The combination of separate generating chambers for unlike power fluids; a pump for charging the chambers; independent connections between the pump and the several chambers; valves in said connections; a motor operated by fluid from the chambers; connections between the motor and said valves; a valve for controlling the discharge of fluids from the chambers; connections between the said valve and the motor, and an ignition device operated by the motor for firing the charges in one of the chambers.

16. The combination with a power fluid generator of a conducting device for fluid of high temperature; a conducting device for fluid of relatively low temperature; and a common valve for both devices which is prevented by the fluid of low temperature from becoming overheated by the fluid of high temperature.

17. The combination in a power fluid generator of means for producing two unlike power fluids of different temperatures in separate chambers; adjacently arranged outlets from said chambers; and an adjustable nozzle attached to said outlets whereby the openings of the outlets may be enlarged or diminished.

18. The combination in a power fluid generator of means for producing power fluids in separate chambers; adjacently arranged outlets from said chambers; means for producing alternate discharges from said chambers, and an adjustable nozzle forming converging passages from said outlets to a common conduit, the walls of said passages being so formed that the discharge from each chamber will aid in exhausting the contents of the other.

19. The combination in a power fluid generator of means for producing unlike power fluids of different temperatures in separate chambers; adjacently arranged outlets from said chambers; means for producing alternate discharges from said chambers; and an adjustable nozzle forming converging passages from said outlets to a common conduit, the walls of said passages being so formed that the discharge from each chamber will aid in exhausting the contents of the other.

20. The combination in a power fluid generator of means for producing unlike power fluids of different temperatures in separate chambers; and adjacent exhaust conduits leading from said chambers and so arranged that the discharge from each chamber will in turn aid in exhausting the contents of the chamber having an adjacent exhaust conduit.

21. The combination in a power fluid generator of two generating chambers having adjacent exhaust conduits; means for charging one chamber with an explosive mixture; means for introducing air and water into the other chamber; means for exploding the charge in one chamber so as to heat the air and water in the other chamber; and means for releasing alternately the products of explosion from one chamber and the heated air and water from the other chamber in such manner that the discharge from each chamber will in turn aid in exhausting the other.

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