

May 19, 1931.

W. M. THOMAS

1,806,133

POWER MECHANISM

Filed Oct. 4, 1926

3 Sheets-Sheet 1

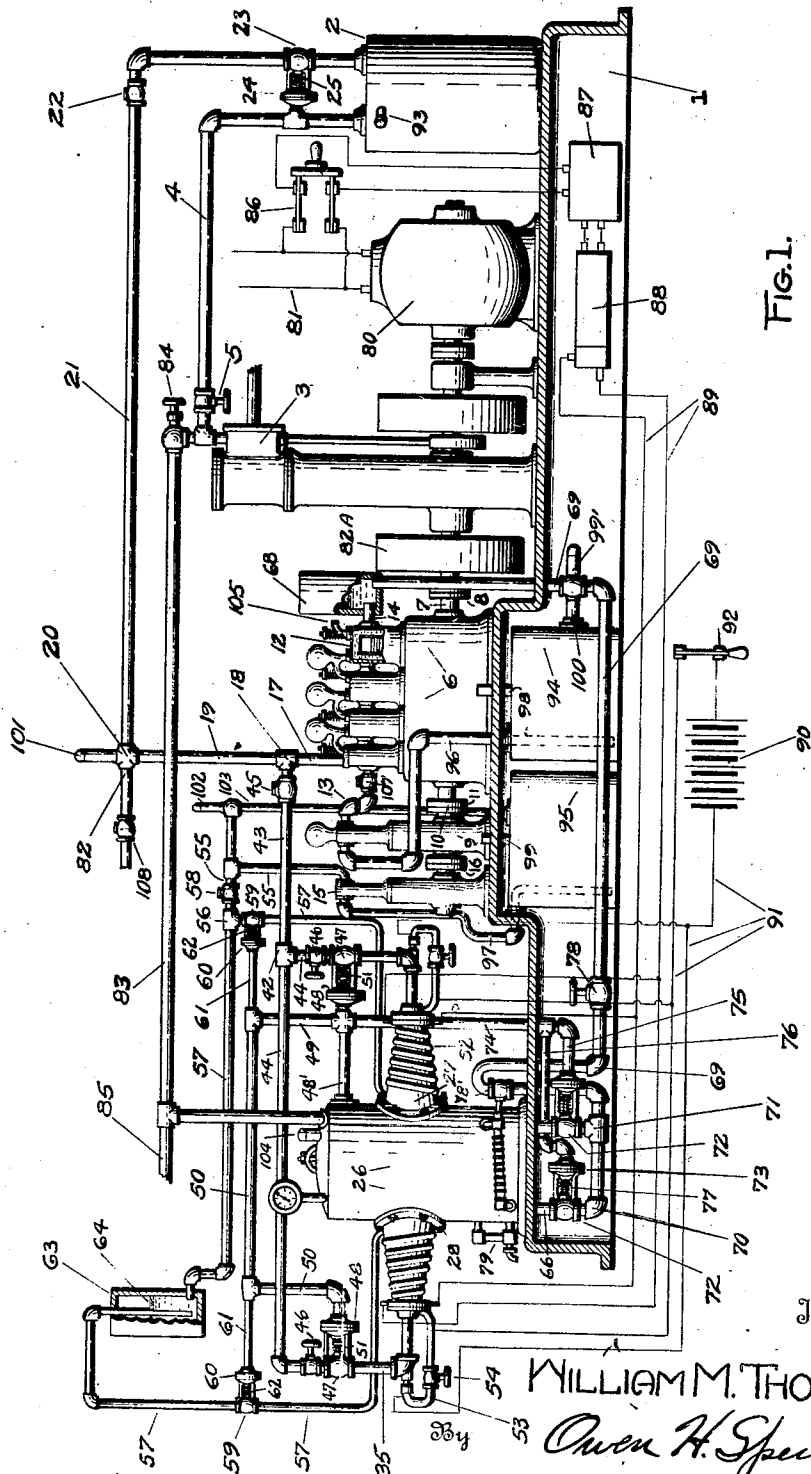


FIG. 1.

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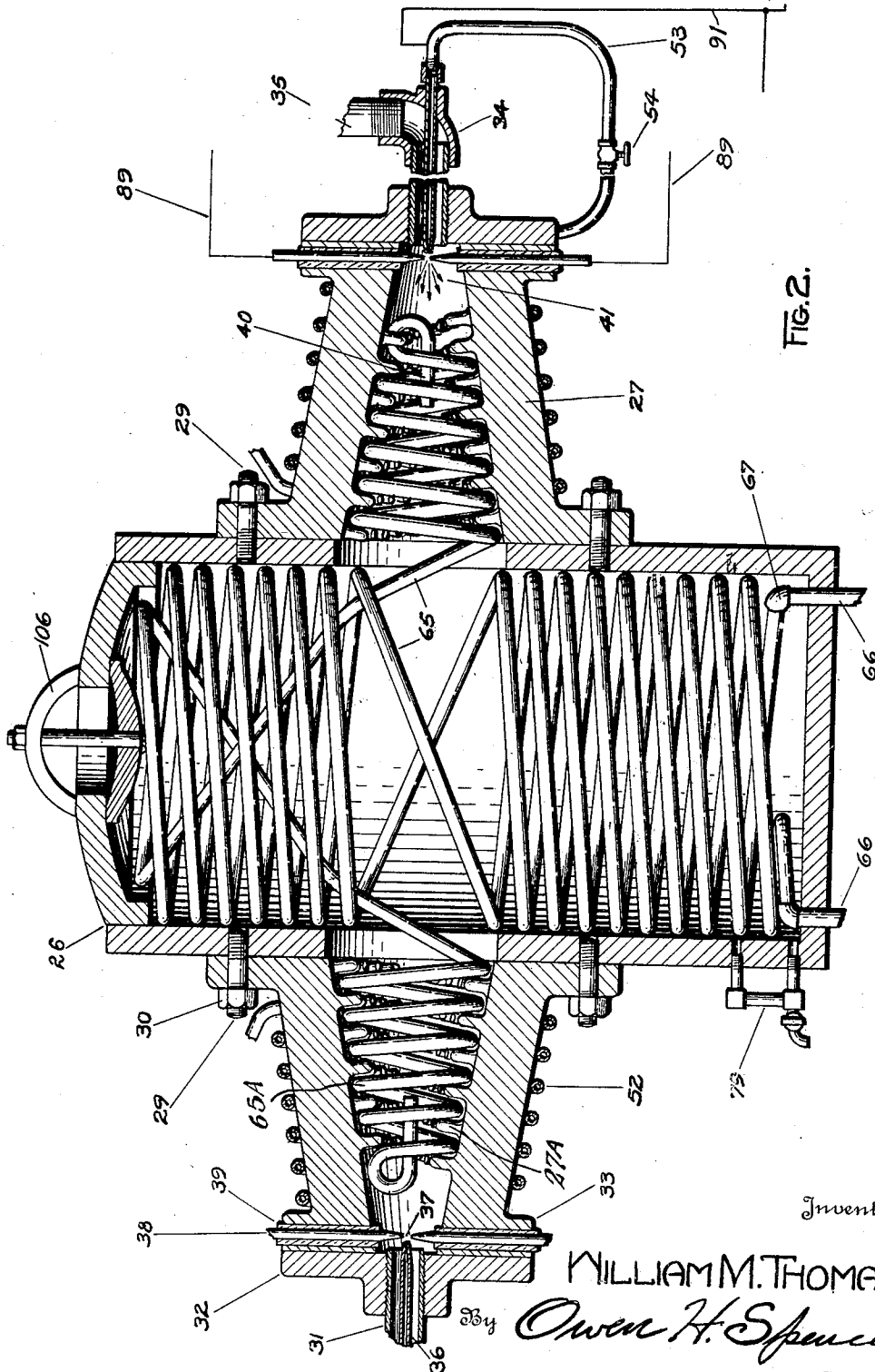
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

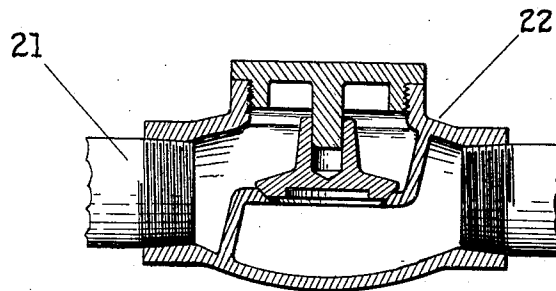


FIG. 3.

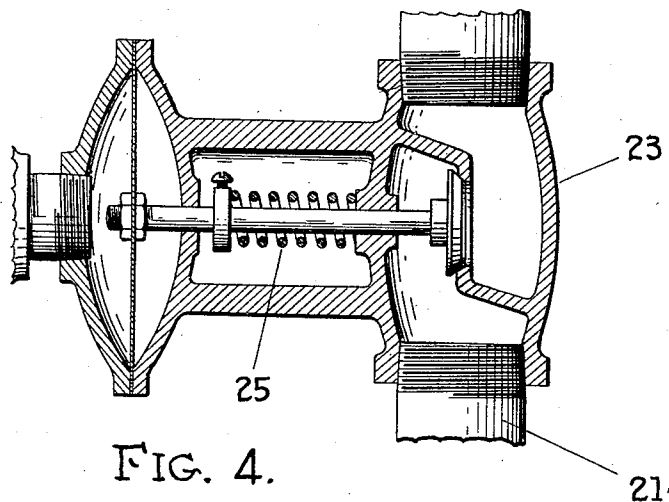


FIG. 4.

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UNITED STATES PATENT OFFICE

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POWER MECHANISM

Application filed October 4, 1926. Serial No. 139,457.

My invention relates to basic prime movers and more particularly to mechanisms in which mechanical motion is attained by gaseous expansion against movable parts, from which motion is transmitted to external use and to the mechanical control of the mechanism itself; and consists substantially in the construction, combination and arrangement of parts hereinafter set forth and pointed out more particularly in the claims.

An object of my invention is to provide a means of igniting a liquid or gaseous fuel and air mixture, in a combustion chamber means constantly, the outlets from said chamber means being in communication with pressure operated devices, which furnish external power and at the same time serve to force a continuous supply of fuel and air into said combustion chamber in efficient proportions and at a suitable rate to maintain a continuous expansion.

It is one of the main objects of my invention to introduce into the active products of combustion of the aforesaid combustion chamber, a water or steam stream, or both, by which contact of said products will cause an intense gaseous expansion, perhaps correctly termed a continuously fed secondary expansion.

It is a further object of my invention to provide a mechanism of this class in which is introduced a water or steam stream thru coils disposed within the combustion compartments, by which such stream is preheated and in an actively expanding state before discharging into the explosive flame, by which the efficiency of the invention is greatly increased.

It is a further object to provide in conjunction with the aforeindicated mechanisms, automatic controllers for the supply of fuel, air and water, although I am aware that such automatic devices are for the most part old in themselves; novelty depending upon the particular combination of same with other appliances.

The above and other objects are attained by the structure illustrated in the accompanying drawings, in which: Figure 1 is a greatly reduced part sectional side view of an illus-

trative example of my invention and is partly diagrammatic; Fig. 2 is a side sectional view showing the interior of the combustion chambers and combustion products storage chamber drawn to a larger scale than used in Fig. 1; Fig. 3 is an enlarged sectional view of one of a number of similar check valves employed in connection with the invention; and Fig. 4 is a similar view of one of a number of automatic pressure controlled valves used with the invention.

Similar characters of reference designate similar parts thruout the different views. Referring to Figure 1 the numeral 1 designates the base upon which I have chosen to mount the different units of my invention. To begin operation of same, the starting tank 2 is supplied with air under pressure by external means, as will be explained. A conventional steam type engine 3 is first started in motion by air conveyed from said starting tank thru the conduit 4 and controlled by the starting throttle 5 which is a part of said conduit.

A typical four-cylinder four stage air pump 6 is secured to the base 1, adjacent the engine 3 with its drive shaft 7 in axial alignment with said engine, being connected in driving relation thereto by means of the typical flexible coupling 8.

Water is supplied to the apparatus as will be understood, by means of the water pump 9, the drive shaft 10 of which is arranged coaxially with the air pump 6, and which is driven thereby thru the flexible coupling 11.

The cylinders of the air pump 6 have water cooling jacket means 12, and water from the water pump 9 is first directed by way of the conduit 13 to said jacket means, thru which circulation is carried to the jacket outlet 14, it being understood that while the air pump cylinders are being thus cooled, the water thus used in preheated for further use in the apparatus.

Liquid or gaseous fuel for the apparatus is supplied, as will be understood, by the fuel pump 15 which is co-axially related with the water pump 9, being driven thereby thru the flexible shaft coupling 16.

Air from the air pump 6 is pumped thru

the conduit 17 to the T coupling 18, then thru the conduit 19 to the four-way fitting 20, and thence thru the conduit 21 to the starting tank 2, a check valve 22 in reverse position from that shown in Fig. 3, being provided as a part of the conduit 21, to prevent the return of air from said tank; and a pressure controlled valve 23 is also made a part of the conduit 21, which valve has an automatic pressure operated diaphragm means 24 in communication with the conduit 4, by which arrangement the valve 23 will be automatically closed when the desired pressure per square inch is attained in said starting tank, it being understood that air thus supplied to said tank is used in again starting the engine 3, but if the pressure per square inch within said starting tank should become reduced for any reason during the operation of the apparatus, the spring means 25 of said valve 23 will act to open same.

The distinguishing features of my invention reside principally in the cylindrical combustion products storage chamber 26, which conveniently rests in a vertical position on the base 1; and in the horn shaped combustion chambers 27 which feed said storage chamber, they being communicated at their larger ends thru the vertical walls of same to the interior thereof, said large chamber ends having outwardly disposed saddle flanges 28, which are removably secured to said storage chamber by means of the studs 29 and the nuts 30.

Air is supplied within the small ends of said combustion chambers thru the inlets 31 which are threaded thru the end plates 32 of said combustion chambers concentrically with said chambers, being secured by means of said plates to the corresponding end flanges 33 of said chambers.

The air inlets 31 are fed thru special elbows 34 which unite same with the conduits 35. The fuel nozzles 36 are securely disposed thru said elbows so as to stand concentrically within said air inlets, and discharge fuel in the midst of the air discharged from same.

Directly in front of said fuel nozzles are the spark gaps 37 between the electrodes 38, said electrodes being disposed in insulating bushings 39 thru the walls of the combustion chambers 27, transversely to said fuel nozzles, by which arrangement the fuel from same and air from the air inlets 31 are ignited as they are unitingly discharged.

In advance of said electrodes the steam nozzles 40 are disposed co-directionally and coaxially with the said fuel nozzles, and are thus in the path of the explosive flames 41, which continuously discharge thru said combustion chambers in blow torch manner from the electrode gaps 37. Steam being thus constantly discharged in the path of said flames, is instantly expanded by being suddenly superheated; and cooperates with the gaseous

expansion of the flames themselves to supply the combustion products storage chamber 26 with highly expanded gaseous elements, at a very high pressure.

Air is furnished to the inlets 31 by the air pump 6 thru the T fitting 18 which communicates with branch fitting 42 by means of the conduit 43 from whence air is directed by means of the conduits 44 to the conduits 35 and the elbows 34. A check valve 45 positioned as shown in Fig. 3 is made a part of the conduit 43 which prevents return of air to said air pump.

The air throttle valves 46 are made a part of the conduits 44, by which the rate of air flow at the inlets 31 may be determined or cut off, as desired. The automatic pressure controlled valves 47 (see Fig. 4) are also made a part of the conduits 44, their pressure operated diaphragm means 48 being in communication with the combustion products storage chamber 26 thru the conduits 48', 49 and 50, by which arrangement sufficient pressure within said storage chamber will automatically shut off the air supplied thru the valves 47, it being understood that the spring means 51 of said valves serves to open the same when the pressure within said storage chamber becomes lower again, which increases the size and intensity of the flames 41 and thus correspondingly increases the storage pressure.

The fuel nozzles 36 are fed from heating coils 52 which snugly encircle the combustion chambers 27, with an ample number of turns to absorb external heat from the same for preheating the fuel thus conveyed. The conduits 53 serve to unite said heating coils with said nozzles, the fuel throttle valves 54 being placed between said coils and said conduits.

The heating coils 52 are in turn fed by the fuel pump 15 which discharges thru the conduit 55 to the branch fitting 56 from whence liquid or gaseous fuel is conveyed separately thru the conduits 57 to the said heating coils. A check valve 58 positioned as shown in Fig. 3, is made a part of the conduit 55, and serves to prevent the return of fuel to said fuel pump. Automatic pressure operated valves 59 are made a part of the conduits 57, their pressure operated diaphragm means 60 being communicated with the combustion products storage chamber 26 by means of the conduits 49, 50 and 61, by which arrangement sufficient pressure in said combustion products storage chamber will close the valves 59 and reduce the flames 41, it being also understood that when the storage pressure is again lowered, the spring means 62 of the valves 60 will again open the same and increase the expansion of said flames, until the pressure within the combustion storage 26 has been thus built up, whereupon the valves 47 and 59 will be

automatically actuated to a more nearly closed position, as will be understood by those familiar with the art.

A pressure tank means 63 is made a part of the conduit 57 which serves as an auxiliary fuel storage tank. Said conduits 57 communicate with said pressure tank at its lower regions, by which arrangement air confined in the upper portion of same is compressed by the liquid fuel 64 which accumulates in said pressure tank from said conduit 57 and the air thus confined serves as a pneumatic cushion to the fuel thus conveyed under compression from the fuel pump 15, which not only steadies the flow of the same to the nozzles 36, but serves as a temporary supply of fuel for said nozzles during the starting of the apparatus until said fuel pump is put well in motion by means of the engine 3, it being understood that said pressure tank is situated sufficiently above the said nozzles to make use of gravity in supplying fuel to the same in first starting the operation of the apparatus.

The steam nozzles 40 are fed by the preheating coils 65 which are extensively coiled within the combustion chambers 27 and the storage chamber 26, whereby the intense heat from the flames 41, creates steam from water introduced thru the conduits 66 which are united with said preheating coils by means of the elbows 67.

The parts of the coils 65 within the combustion chambers 27 are more or less in a cork screw formation and these coils 65A gradually decrease in diameter, coincident to the decrease in diameter of the interior of the chambers 27, the extreme outer ends of these coiled portions being bent inwardly to form the nozzles 40.

In order to hold the coiled portions 65A in substantially fixed relation with the chambers 27, the interior of each of said chambers is provided with spirally arranged studs 27A, which project between the coils 65A, so that said coils cannot move bodily endwise. These studs 27A are spaced apart and not only retain the coils in position, but aid in heating said coils and the contents thereof, as well as superheating the thickened walls of the chambers 27, and increasing the temperature thereof to such a degree that the coils 52 will be heated to such an extent that the contents thereof will be more or less vaporized before reaching the nozzles 36.

The conduits 66 are in turn fed with water from the water pump 9, which communicates with the water jacket discharge 14, by means of the water pressure tank 68 and the conduit 69, which is united with the conduits 66 by means of the pipe fittings 70 and 71. The pressure operated valves 72 are made a part of the conduits 66, the pressure operated diaphragm means 73 of the same communicating with the combustion products storage

chamber 26 by means of the conduits 48', 74, 75 and 76, by which arrangement sufficient pressure within the said storage chamber will automatically close the valves 72 and lack of pressure within said storage will permit their spring means 77 to open the same and admit more water at the nozzles 40 in accord with the amount of fuel and air automatically fed to the nozzles 36 and inlets 31, by the valves 60 and 47, respectively, as aforementioned. The water supply to the nozzles 40 may be also manually varied as desired by means of the water throttle 78, which is made a part of the conduit 69.

It is understood that in some instances the lack of full operation of the fuel nozzles 36, the inlets 31 or the electrodes 38, will permit an amount of unevaporated water to be discharged from the nozzles 40 which accumulates in the bottom of the combustion products storage chamber 26. This is not seriously objectionable unless water should thus accumulate to the extent that the electrode gaps 37 would be submerged. With this in mind, however, I have provided near the lower regions of said combustion products storage chamber, an automatic valve means 78' of standard design, having parts which automatically expand and contract by the water level (not shown) within said storage chamber, for opening and closing the valve, said valve being suitably communicated with the interior of said storage chamber at its lower regions. This valve is made a part of the conduit 69, by which arrangement the water level rising within the storage chamber 26 automatically shuts off the water to the nozzles 40, and prevents further rising of same. In this connection a conventional glass water gauge means 79 is installed at the lower region of said storage chamber, whereby the operator can observe the rising water, in conjunction with the automatic control of the same, as will be understood by those familiar with the art. When water accumulates in said storage chamber, the same will be eventually evaporated by heat from the flames 41 and become a regular part of the expanded gaseous mixture within said storage chamber.

In this example of my invention the engine 3 is used to drive the dynamo 80 which is conveniently disposed co-axially with same on the other side thereof from the air pump 6. Said dynamo is used to furnish current to external destinations (not shown) thru the regular conductors 81, although it is understood that power may be transmitted direct from the engine shaft or the fly wheels 82A. Compressed air may also be directed to external uses by properly extending the conduit 82, which is conveniently threaded into the four-way fitting 20.

As before mentioned, the engine 3 is first started in motion by air compressed in the

starting tank 2, but after the apparatus has been set in operation as above explained and described, the expanded gases being under compression within the combustion products storage chamber 26 are directed to said engine thru the conduit 83, the main engine throttle valve 84 being made a part of same, it being understood that the starting throttle valve 5 would be ordinarily closed as soon as operation of said engine is maintained thru said main throttle valve.

Steam or gas expanded by combustion may be conveyed from the storage chamber 26 thru the conduit 85 which communicates with the conduit 83, to external use in driving piston operated machinery or the like, or for heating purposes as desired.

Electrical current for the electrodes 38 is normally supplied from the dynamo 80 thru switch means 86, the transformer 87, the induction vibrator coil 88 and the conductors 89, in order as stated.

In starting the operation of the invention for the first time, the starting tank 2 must be first filled with air under compression from external sources, thru the closable entrance 93.

The base 1 is of hollow construction and is not only adapted to support the different mechanisms of the apparatus, but is also adapted to conceal the water supply tank 94 and the fuel tank 95. The conduit 96 extends from the intake of the water pump 9 thru the adjacent wall of said base within the lower region of said water tank and the conduit 97 extends from the intake of the fuel pump 15 to within the lower region of the fuel tank 95, by which said water and fuel pumps are supplied with water and fuel, respectively. The water tank 94 is supplied with water thru the filler means 98 and fuel is supplied to the fuel tank 95 thru the filler means 99, as needed.

The lower region of the water pressure tank 68 joins the water jacket outlet 14, and conduit 69 as above mentioned. In the lower region of said pressure tank a varying amount of water accumulates, air being compressed thereby in the above region of same, which acts as a pneumatic cushion to protect the water handling parts of the invention from any irregular movements of water thru same, due to sudden failure of the invention to function or over action of the water pump 9. To further protect the said water handling parts, I have made the conventional relief valve 99' a part of the conduit 69, said valve discharging water back into the water tank 94 thru the conduit 100 when water pressure within the conduit 69 becomes greater than desired. In like manner a conventional air safety valve 101 is made a part of the four-way fitting 20 which yields to an over amount of air pressure within the conduits 19, 21 or 82, allowing surplus air to

discharge into space, as will be understood by those familiar with the art. In like manner, I have also provided a relief pressure valve 102 in communication with the conduits 55 and 57 which serve to discharge over supplied fuel back into the fuel tank 95 thru the conduit 103 when the pressure of such fuel is compressed beyond a suitable amount per square inch, due to over action of the fuel pump 15, or other reasons. In addition to the above recited relief valves, I have also provided the safety valve 104 in the upper head of the combustion products storage chamber 26 which automatically relieves expanded gases from said storage chamber into the open when the pressure of the same reaches an undesired high amount.

It is understood that the engine 3, the air pump 6, the water pump 9, and the fuel pump 15, may be varied as to number and size of cylinders, and may be otherwise modified with the other units and details of the invention without departing from the scope and spirit of the invention.

The air pump intake 105 serves as a means of supplying air to said air pump from the surrounding atmosphere.

While the highest efficiency of the invention is reached by the proper introduction of water or steam at the nozzles 40, it must also be understood that the invention will operate efficiently without the same in which instance the gaseous expansion of the flames 41 will amply supply the combustion products storage chamber 26 for operating the engine 3, etc.

By removing the nuts 30 the combustion chambers 27 may be removed from the storage chamber 26, by which convenient access may be had to the interior of same for various repairs; and a hand hole means 106 is provided in the upper extremity of said storage chamber for interior access to the same in carrying out inspection and repairs.

As above indicated the horn shaped combustion chambers 27 attach to the combustion products storage chamber 26, at their large ends, by which arrangement said chambers serve as amplifiers for the gaseous expansion with same.

The check valve 107 in reverse position from that shown in Fig. 3, is made a part of the water conduit 13 and prevents reversal of the flow of water transmitted thru the same.

A check valve 108 positioned as shown in Fig. 3, is made a part of the conduit 82, which prevents air returning thru the same.

It has been found desirable to explain the invention by the particular example shown, in which liquid fuel is said to be supplied to the nozzles 36 from the tank 95 by the fuel pump 15; although combustible gaseous fuel may also be supplied to said nozzles in like manner. Having in view, however, that the

invention depends for novelty, to a great extent, upon the combustion chamber 27 and the adjacent parts, it seems that the illustration will suffice in claiming the invention broadly without regard for the minor distinctions between similar use of liquid or gaseous fuel, considering also that Fig. 1 is a somewhat diagrammatic representation.

While I have illustrated in a general way, certain instrumentalities which may be employed in carrying my invention into effect, it is evident that many modifications may be made in the various details, without departing from the scope of the appended claims.

I claim as my invention:

1. In a power mechanism, a combustion products storage member, combustion chambers on opposite sides of said storage member, said chambers being tapered, a plurality of studs on the inner surfaces of said chambers, arranged in spiral formation, coiled water carrying members within said storage member and combustion chambers, the coils within said combustion chambers being spirally arranged for receiving said studs therebetween, nozzles in the said combustion chambers formed at the terminus of said spirally arranged coils, means for conveying fuel into the ends of said combustion chambers, and means for igniting said fuel as it enters said combustion chambers.

2. In a power mechanism, a combustion products storage member, a tapered combustion chamber on each side of said storage member and communicating therewith, a plurality of spirally arranged and spaced studs on the interior of said combustion chambers, coiled water carrying pipes within said storage member, said pipes having spirally arranged sections within said combustion chamber and in spaces between said studs, nozzles in said combustion chamber on the ends of said water pipes, coils encircling said combustion chambers for conveying fuel thereto, and means for igniting said fuel as it enters said combustion chambers.

In testimony whereof, I have hereunto set my hand on this the 30th day of September, 1926, A. D.

WILLIAM M. THOMAS.