Aug. 26, 1952 L. J. GEERAERT 2,608,058

COMBUSTION CHAMBER WITH SLIDING VALVE CONTROLLING FUEL, AIR, AND WATER ADMISSION

Filed June 10, 1946 4 Sheets-Sheet 1

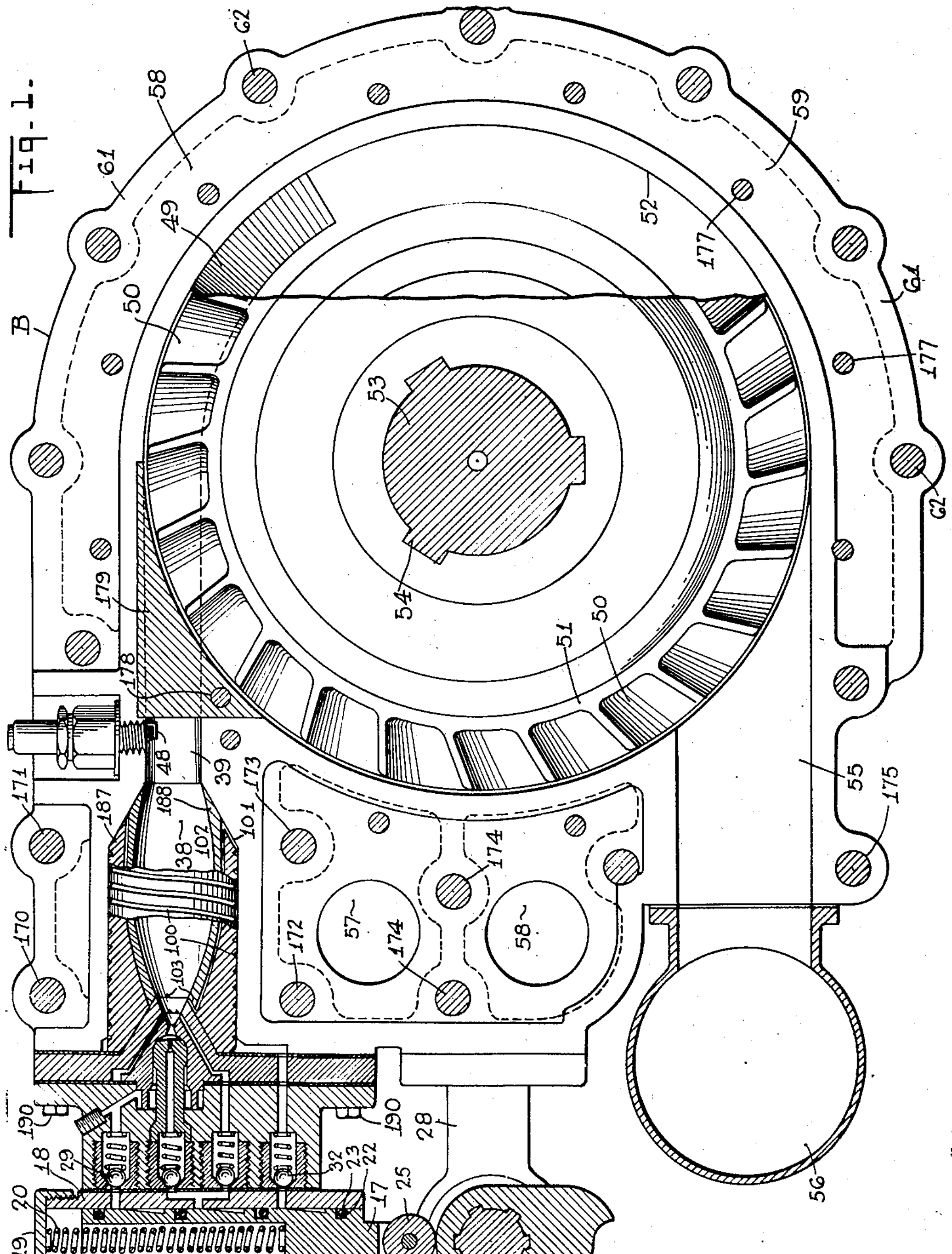

Fig. 1.

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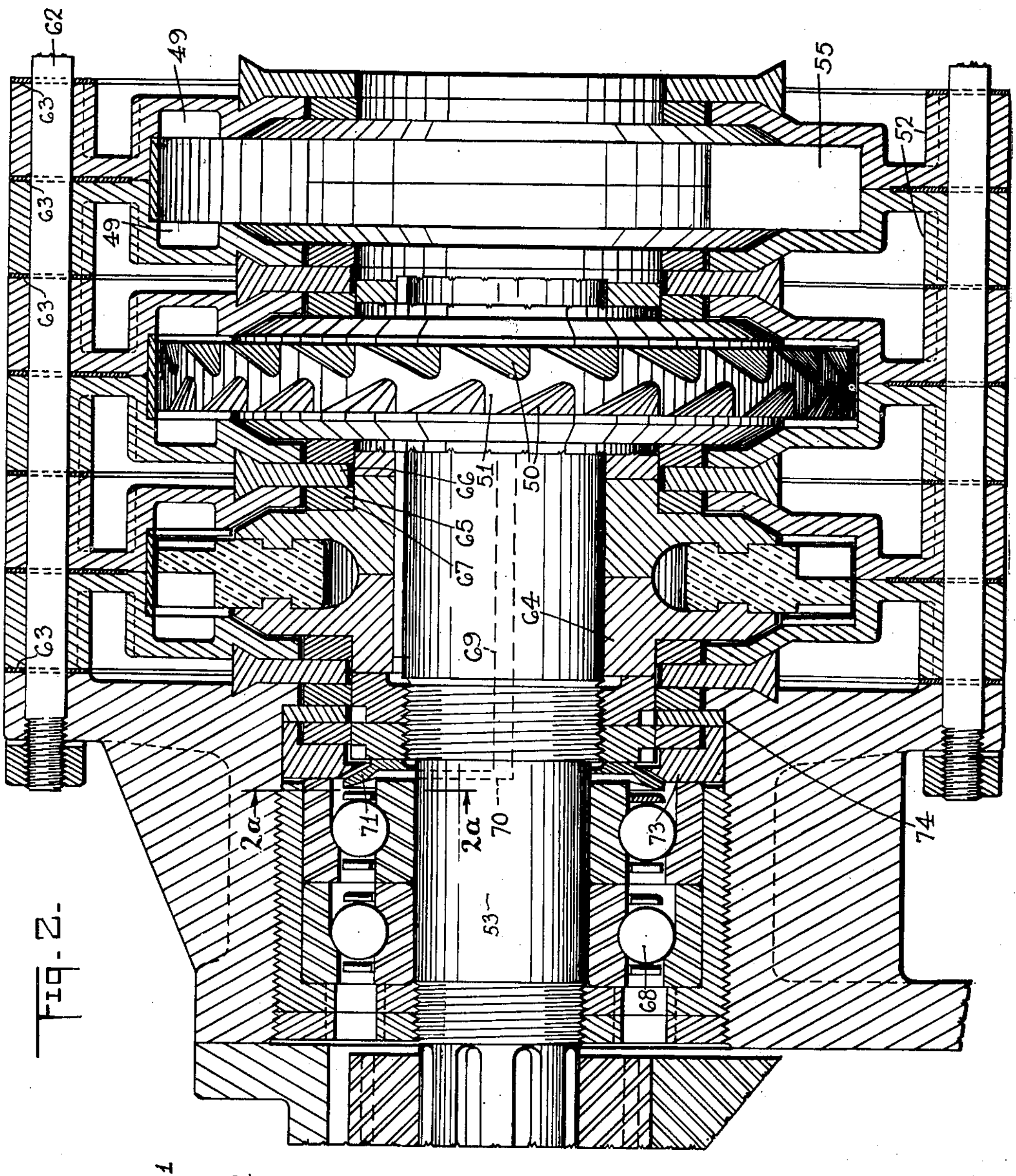

Fig. 2.

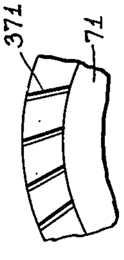

Fig. 2a.

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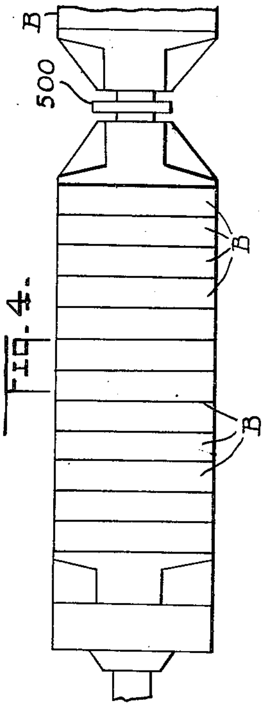

Fig. 4.

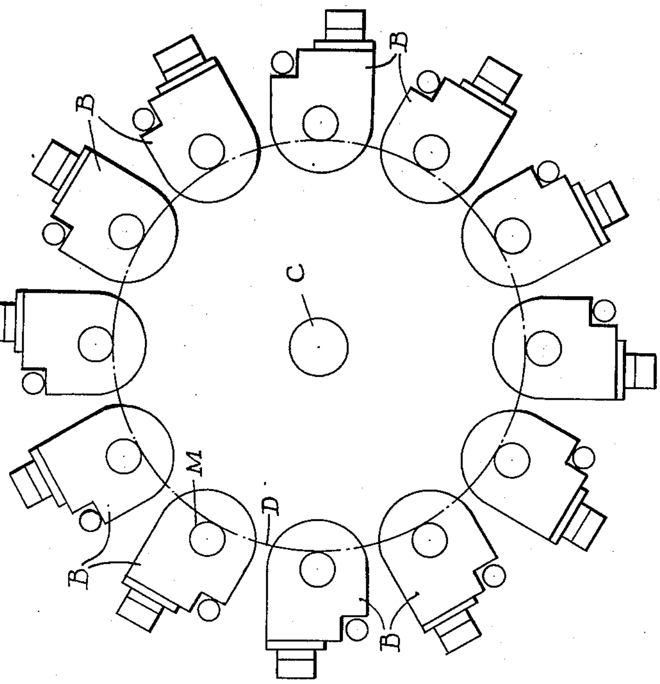

Fig. 6.

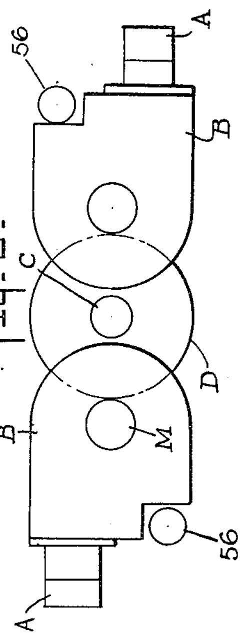

Fig. 3.

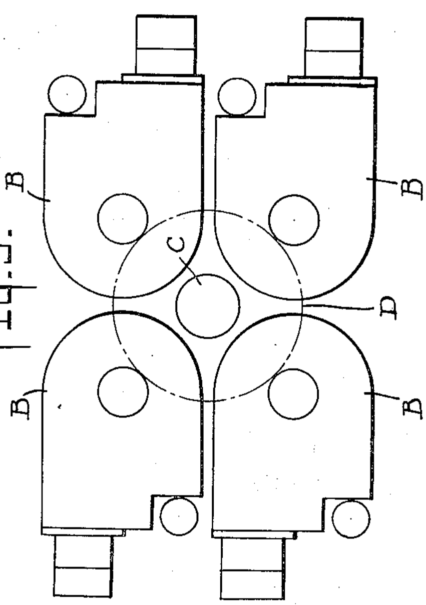

Fig. 5.

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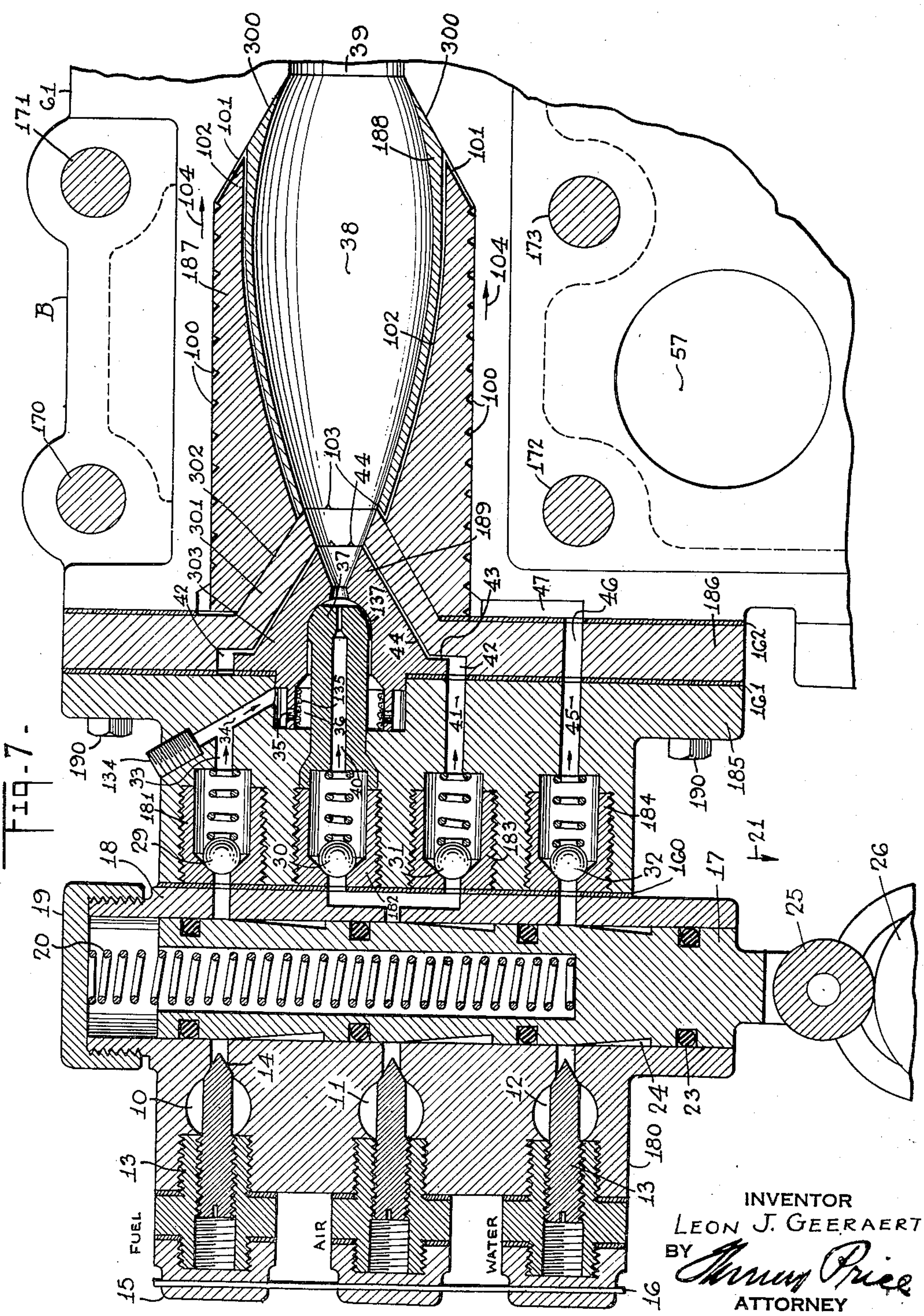

Fig-7-

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COMBUSTION CHAMBER WITH SLIDING VALVE CONTROLLING FUEL, AIR, AND WATER ADMISSION

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Application June 10, 1946, Serial No. 675,604

2 Claims. (Cl. 60—39.55)

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The present invention relates to a jet motor and it particularly relates to a jet turbine which is driven by a combined jet of ignited fuel and steam.

It is among the objects of the present invention to provide a highly efficient, self starting, vibration-less jet or turbine motor which will be operated in one or more stages directly by a jet of combustion gases and steam.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

A particular feature of the present invention resides in the use of one or more blasts or high pressure jets of liquid fuel combustion gases and water vapor or steam, which are caused to drive one or more rotors or turbine wheels at a high speed.

In the drawings, which show several embodiments of the invention by way of illustration and not by way of limitation,

Fig. 1 is a side sectional view showing the jet inlet, the turbine wheel and the outlet of one of the units which may be arranged in banks,

Fig. 2 is a transverse sectional view showing a plurality of the turbine wheel units arranged side by side,

Fig. 2A is a fragmentary detailed side view showing the ribbed oil flinger upon line *2a*—*2a* of Fig. 2,

Figs. 3, 4, 5 and 6 show arrangements of the multi-rotor units positioned in different groupings to supply power,

Fig. 7 is a sectional view upon an enlarged scale as compared to Fig. 1 of the jet unit shown at the upper left hand corner of Fig. 1.

Figs. 1 and 7, the liquid hydrocarbon fuel or fuel gas under pressure which may be gasoline, kerosene, natural gas or heavy fuel oils, the water and the air are fed into valve unit A having the body **180**. The body **180** has an inlet **10** for fuel. The air and/or oxygen are fed under pressure through the inlet **11** and water under pressure through the inlet **12**. The needle valves **13** hav-

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ing seats at **14** may be regulated after removal of the cap by nuts **15** to control and regulate proportionment of fuel, air and water. When the adjustment is proper, the cap nuts **15** may be replaced and the pin or lock rod **16** may be inserted. In Figs. 1 and 7 the valves **13** are shown closed.

The main control valve **17** reciprocates in a casing **18** having a cap **19**. The return spring **20** normally presses the valve **17** in the direction **21**. The valve has a plurality of grooves **22** receiving the synthetic rubber sealing rings **23**, which separate the reduced diameter portions **24**.

The reduced diameter portions **24**, when opposite the valve seats **14**, will permit passage of fuel, air and water. When the valve **17** is in position as shown in Figs. 1 and 7, the flow of fuel, air and water will be cut off. The valve **17** is moved against the spring **20** to open position through the roller **25** by the cam **26**. The cam **26** may be rotated through the shaft **27** supported by the bracket **28**.

The body member **185** is held against the body member **180** with the intervening gasket **160**. The body member **185** has tapped recesses receiving the threaded valve seat members **181**, **182**, **183** and **184**. These valve members **181** to **184** respectively receive the spring seated ball checks **29**, **30**, **31** and **32**. At the bottom of the recess for the ball check **30** is positioned the nozzle **37**.

From the valve **17**, the fuel passes the spring pressed ball check **29**; the air splits and passes the spring pressed ball checks **30** and **31**; and the water passes the spring ball check **32**.

The fuel (see Fig. 7) will then pass through the passages **33** and **34**, the ports **35**, the strainer **135**, the chamber **36** and around the tip of the nozzle **37** through three grooves **137** into the curved chamber **38** and then into the ignition chamber **39**. Part of the air will pass through the center passage **40** in the nozzle **37** and then into the chamber **38**. The balance of the air will pass by the passageway **41** and the annular chamber **42**, the annular passageway **43** and the six converging passageways **44** into the chamber **38**. The water will pass through the bores **45** and **46**, the annular chamber **47**, the circuitous passageway **100**, the space **101**, and the passageways **102** and **103** into the chamber **38**.

In the chamber **38** a violent turbulence will be set up and the mixed jet of fuel, air and water will be continuously ignited by the spark plug 48 in the chamber 39 (see Fig. 1). The combustion mixer will be split by the separator 179 and will then pass into the unit B through the turbine inlet 49 where it will impinge upon the cup-shaped receptacles on each side of the turbine wheel 51 (see also Fig. 2) giving a balanced effect. The turbine wheel 51 rotates in a chamber 52 upon a shaft 53 having the splines 54. The turbine wheel 51 is desirably made of a high pressure heat resistant porcelain.

The gases after driving the turbine wheel 51 are exhausted through the channel 55 and the external exhaust conduit 56. Each casing section 52 is provided with a cooling liquid inlet 57 and a cooling liquid outlet 58 and the channels 59 and 60 to form a water jacket 61.

As shown best in Fig. 2 desired number of units or casings 52 may be provided, attached together by bolts 62, 170, 171, 172, 173, 174, 175, 177 and 178 and separated by gaskets 63. Each rotor or turbine member 51 is clamped between the steel carrying plates 64 which are keyed to the shaft 53 by the keys 54. The plates are shouldered at 67 to carry the carbon rings 65. The rings 65 are separated by the steel disks 66. In Fig. 2, the turbine wheel 51 and side steel members 64 are shown in section at left, in front elevational view at the center and the turbine wheel 51 is removed at the right.

The shaft 53 is provided with a ball bearing 68. The oil passages 69 and 70 are provided in the shaft 53 and the shaft 53 is encircled by the lubricant shield 71 which causes lubricant passing into the space 72 to be thrown onto the ball bearings 68. The steel ring elements 73 and 74 serve as spacers. As shown in Fig. 2*a* the shield 71 has the fins or vanes 371 on its face which serve to fling out the lubricant upon the ball bearings 68. This will create an oil fog in the ball bearing structure.

In Figs. 3 to 6 are shown arrangements in which units B of twelve rotors 51 each are positioned to drive a mechanism. In Fig. 3, the inlet and jet atomizer units A are positioned to the outside and the turbine units B, each including 12 rotor or turbine elements are positioned closely adjacent the main shaft C of the mechanism to be driven. The reduction gear box D will reduce the turbine speed to that desired for the mechanism to be driven.

Fig. 4 shows in side view twelve rotor elements positioned side by side forming a complete unit B. The reduction gear box C is positioned at the left and at the right there is provided a coupling 500 to another unit B.

In Fig. 5, four of the units B are positioned around the reduction box D driving the shaft C.

In Fig. 6, twelve of the units B are arranged circularly around a shaft C with intervening reduction gear boxes D.

In the preferred construction with 8 inch outside diameter rotors, each rotor may develop 20 H. P. with 14 rotors in each bank and with 12 banks, a total horsepower of 6000 may readily be developed. With 6 inch outside diameter rotors each developing 12 H. P., a bank of 12 will develop 144 H. P. The speed of the tip of the rotor should not exceed 750 to 1000 feet per second.

Normally the rotor speed will not be permitted to exceed 25,000 R. P. M. and this is reduced first 10 to 1 and then 2 to 1 so that the final R. P. M. is in the neighborhood of 1200 R. P. M. in some cases.

The hydrocarbon or other fuel and water may be injected through passages 10 and 12 under an air pressure of 30 to 150 pounds per square inch or more which air pressure is also directly connected at 11 to the jet nozzle and these pressures are maintained even during idling of the turbine or rotors. The turbine is started merely by opening the main valve 17 after adjustment of the valves 13. The air pressure is maintained by a compressor driven by turbines, and the air pressure tank will store air pressure into valves between operation.

Upon starting of the turbine, there will be a lag in the water or steam supply due to the fact that the flow of water will be retarded a fraction of a second by passage of water through the circuitous passageway 100 and the air-fuel mixture will have been previously ignited and will build up a temperature of 700° F. in the chamber 38. When the water reaches the chamber 38 after travelling through the passageways 100, 101, 102 and 103 it will flash out as steam. The temperature at the tip 197 of the nozzle 37 will not be in excess of 100° F.

Referring to Fig. 7, the combustion chamber 38 is formed by the central annular element 188 encircled by the element 187. The element 188 abuts the body B at the face 300 while the element 187 abuts the nose 301 of the element 186 at the face 302. The inner end of the chamber 38 is formed by the nose members 301 and 303, the latter having a central recess receiving the tip of the nozzle 37. The rearwardly extending skirt of the element 303 encircles the nozzle 37. The element 303 is clamped between the body member 185 and element 186 by the bolts 190. The gaskets 161 and 162 are positioned between the body member 185 and element 186 and the body B.

The pockets 50 are offset, as shown in Fig. 2, and by being positioned on each side of the wheel 51 and being acted upon by the separated jet after passing separator 179 and through the passageways 49 will result in a balanced driving effect on each rotor without side thrust.

Instead of porcelain, the rotors 51 may be made of high tensile steel.

The walls of the chamber 38 will be of a nickel steel alloy, while the adjacent parts may be bronze or steel.

As many changes could be made in the above fuel-steam jet motor and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A combustion chamber arrangement to receive and mix air, fuel and water and feed the same to a turbine comprising a plurality of feed connections for the air, fuel and water respectively, adjustable needle valves controlling and proportioning the feed of the air, fuel and water into each of said feed connections, a valve mechanism to open and close said connections having a valve chamber extending transversely across and communicating with said connections, an elongated valve in said chamber having packing rings to separate said connections and form separate flow chambers for the air, fuel and water, a casing having a central elongated combustion chamber convergent toward the inlet and outlet ends thereof and having a maximum diameter in-

termediate its ends, a central nozzle to feed the air and fuel from the valve chamber into the inlet end of said chamber, inlet feed means to feed the water from the valve chamber into the chamber at a point removed from the central nozzle and at a point adjacent the maximum diameter intermediate portion, said inlet feed means forming a circuitous passageway extending spirally around the chamber substantially the full length thereof to obtain heating and vaporization of the water before admission to the chamber.

2. The arrangement of claim 1 in which there is an additional feed means for the air to receive air from said valve chamber and to conduct it into said combustion chamber at a point between said nozzle and said water inlet feed means.

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