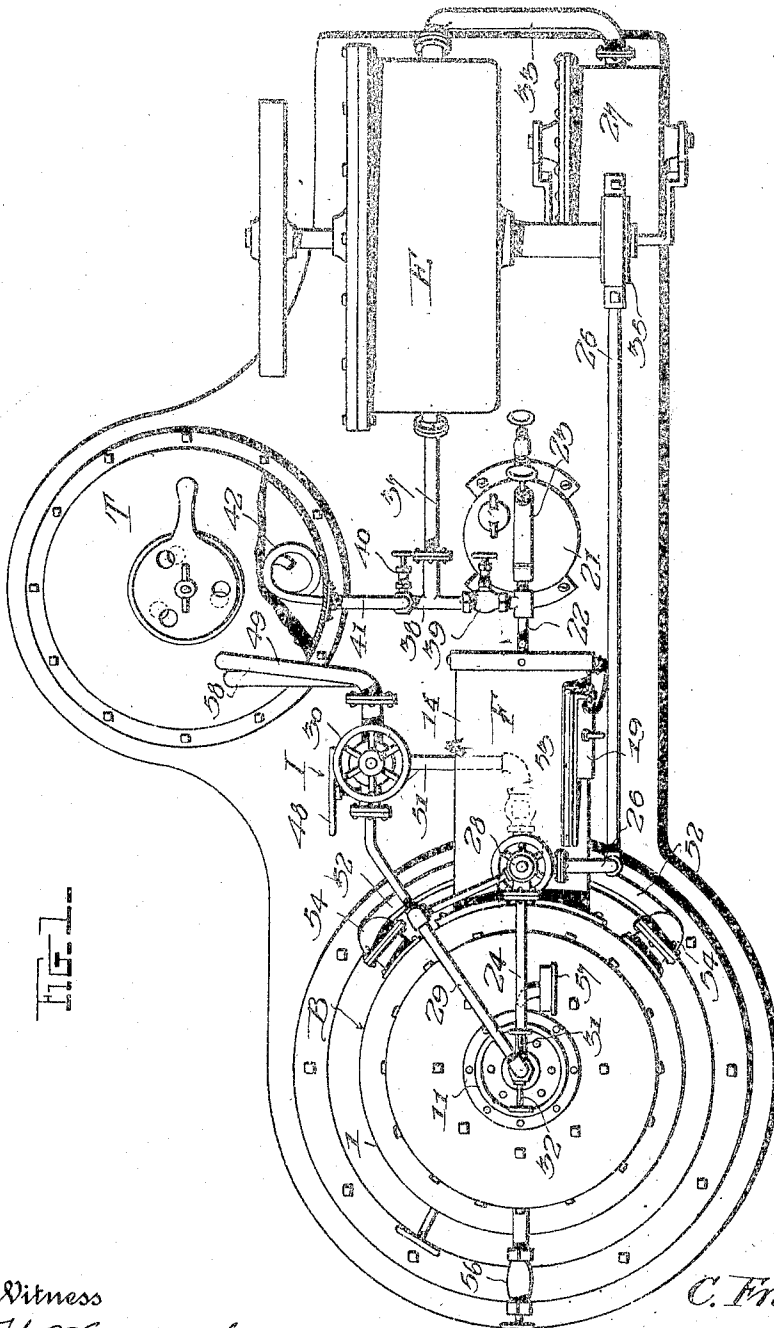


C. FRANCO.
POWER DEVELOPING MACHINE.
APPLICATION FILED JUNE 1, 1910.

1,304,298.

Patented May 20, 1919.
5 SHEETS—SHEET 1.



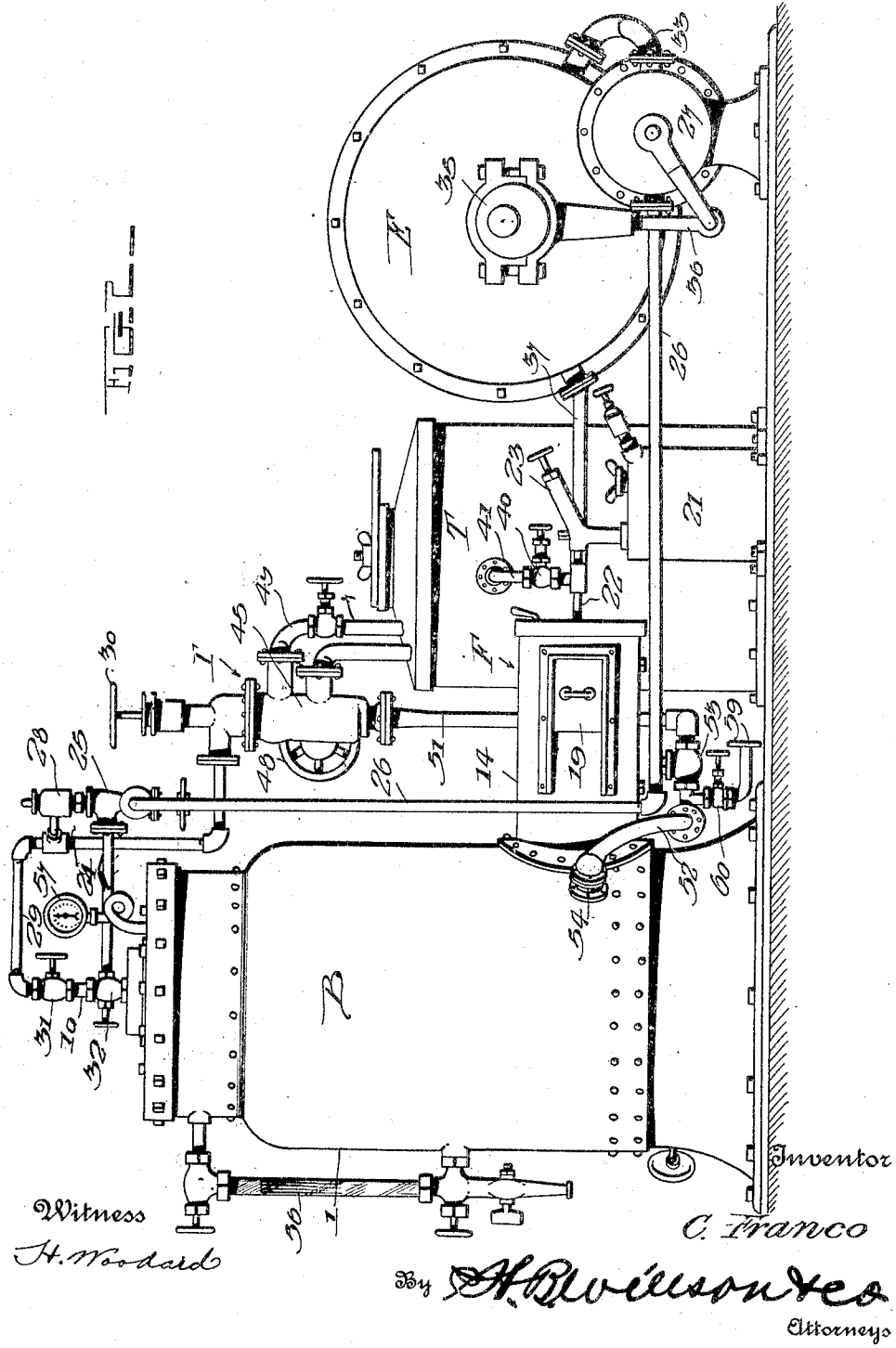
Witness
H. Woodard

Inventor
C. Franco
By *H. B. Wilson*
Attorneys

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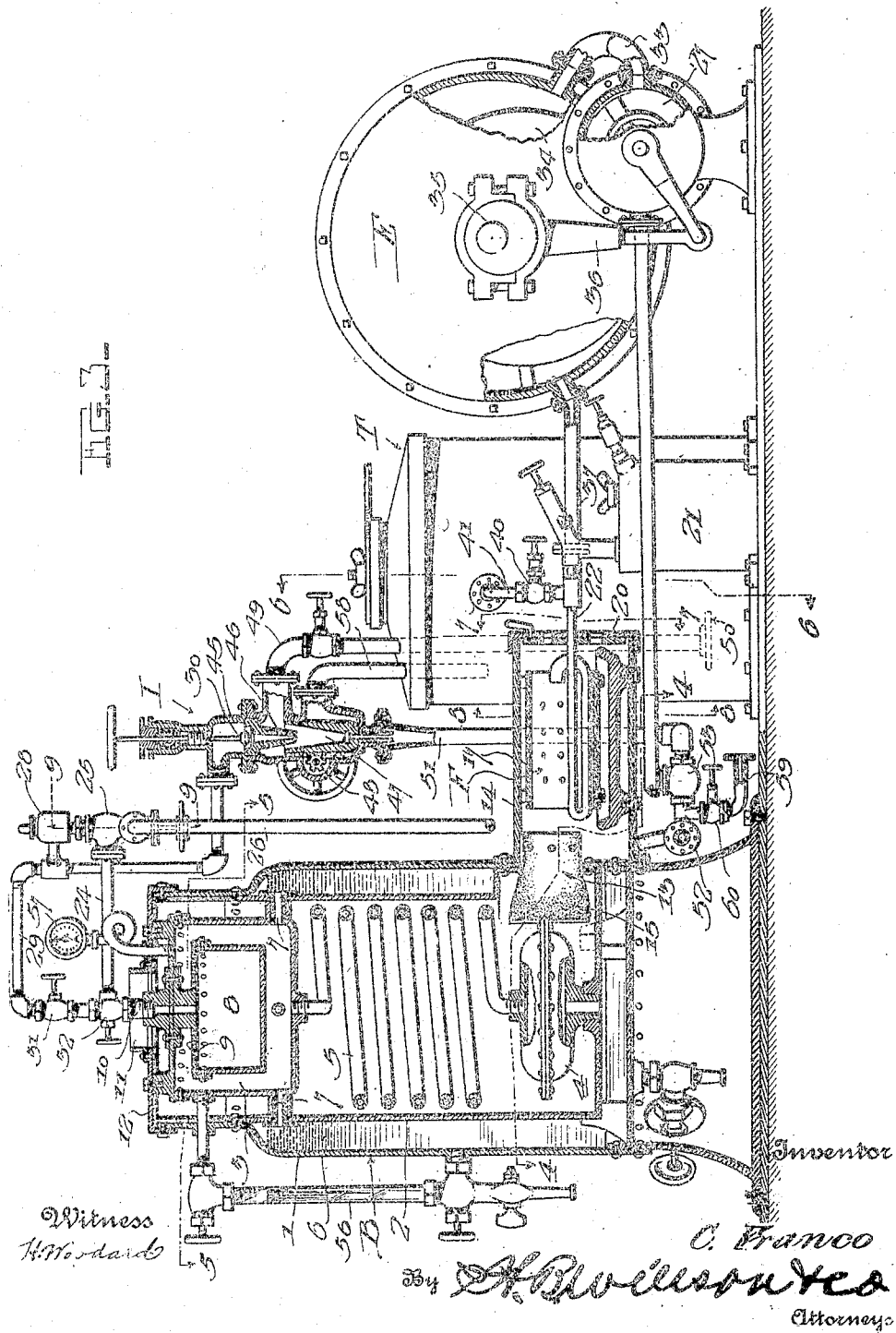
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5 SHEETS—SHEET 2.



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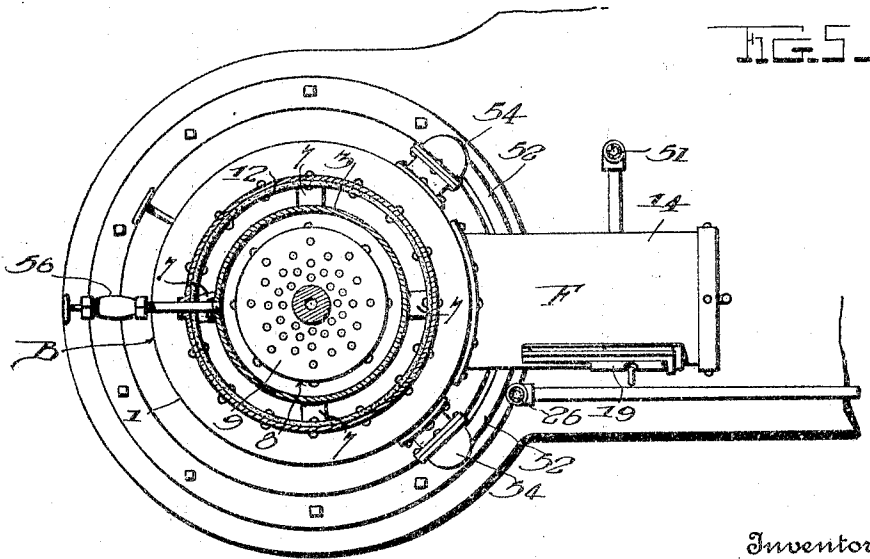
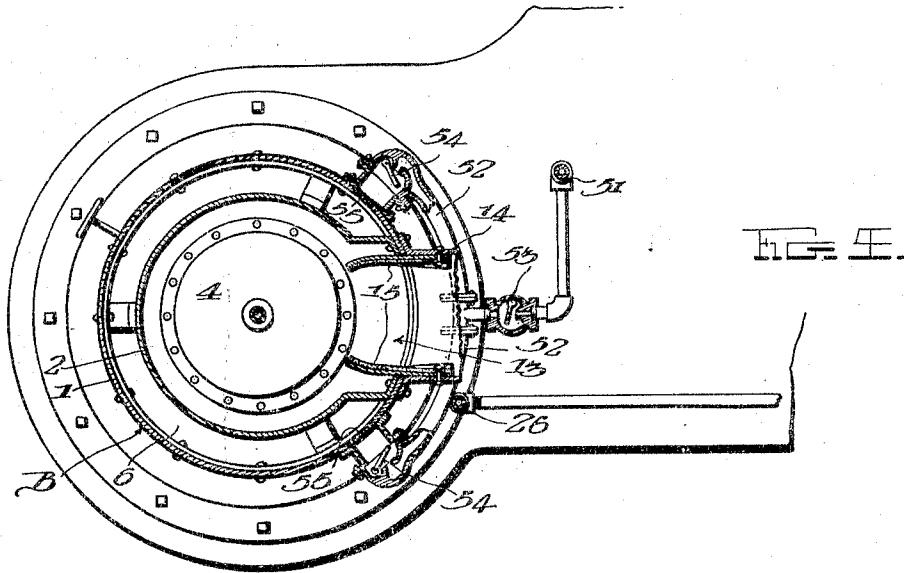
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5 SHEETS—SHEET 3.



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5 SHEETS—SHEET 4.



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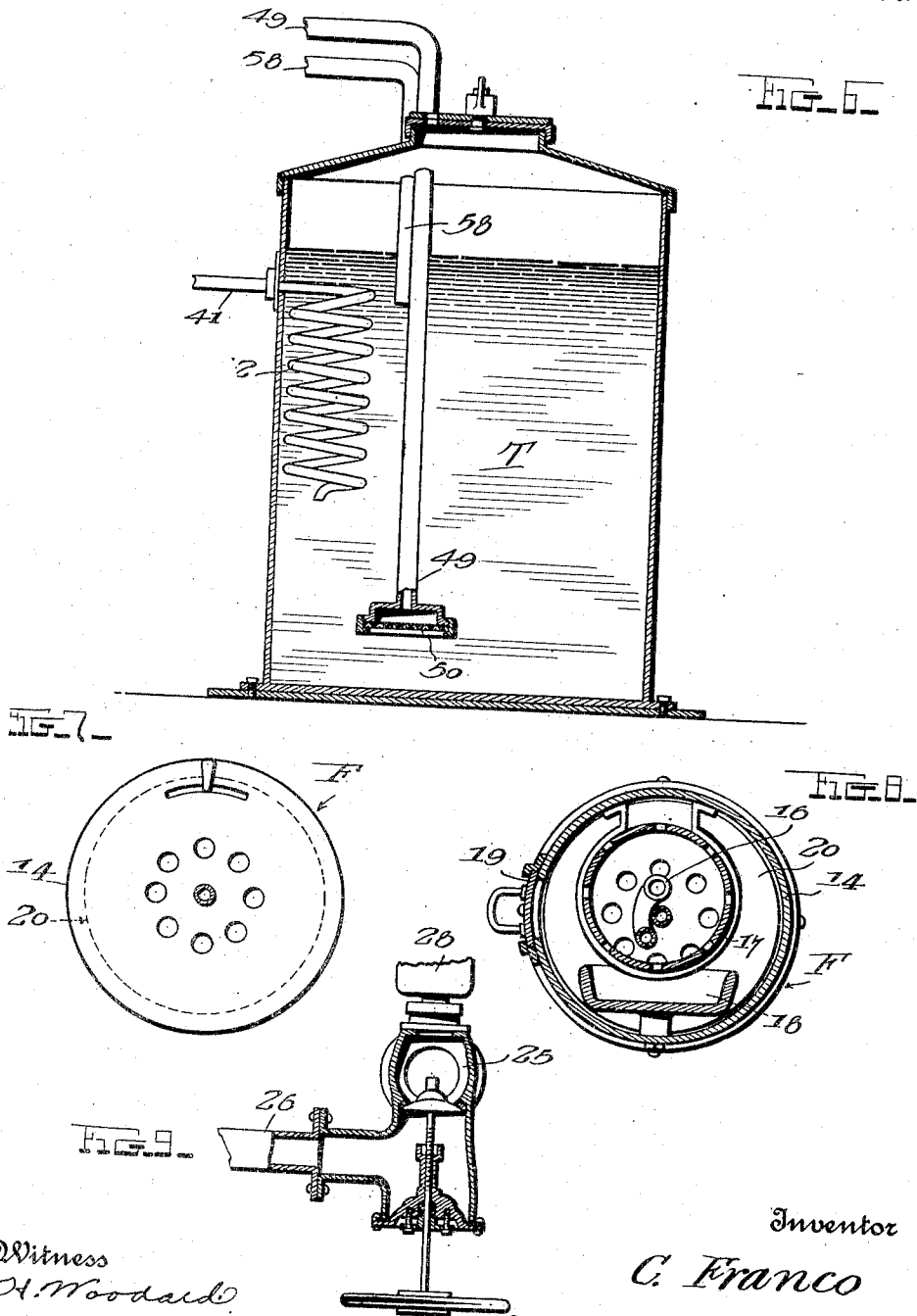
Inventor
C. Franco

By *A. B. Wilson & Co.*
Attorneys

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5 SHEETS—SHEET 5.



Witness
H. Woodard

Inventor
C. Franco

334 *H. Blaisson & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

CESARE FRANCO, OF NEW YORK, N. Y.

POWER-DEVELOPING MACHINE.

1,304,298.

Specification of Letters Patent.

Patented May 20, 1919.

Application filed June 1, 1918. Serial No. 237,765.

To all whom it may concern:

Be it known that I, CESARE FRANCO, a subject of the King of Italy, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Power-Developing Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide novel means for actuating a pressure operated engine and for utilizing the exhaust from this engine to generate the pressure by which to operate the same, this result being obtained in the present form of the invention, by heating a liquid fuel in a boiler to generate gas under pressure, conveying the generated gas to the engine to operate the latter, conducting part of the exhaust gas from the engine to a gaseous fuel burner which operates the boiler, and conducting the remaining exhaust gas to a condenser in the fuel container.

With the foregoing object in view, the invention resides in the novel features of construction and unique combinations of parts to be hereinafter fully described and claimed, the descriptive matter being supplemented by the accompanying drawings which form a part of this application and in which:

Figure 1 is a top plan view of the machine;

Fig. 2 is a side elevation thereof;

Fig. 3 is a vertical section with parts in elevation;

Figs. 4 and 5 are horizontal sections of the boiler taken on the planes indicated by the lines 4—4 and 5—5 respectively of Fig. 3;

Fig. 6 is a vertical section of the fuel supply tank on the plane indicated by the line 6—6 of Fig. 3;

Figs. 7 and 8 are detail vertical sections on the planes of the lines 7—7 and 8—8, showing more particularly the construction of the furnace; and

Fig. 9 is a detail vertical section on the plane indicated by the line 9—9 of Fig. 3, illustrating the construction of the valve which controls the passage of pressure to the injector of the boiler.

Briefly speaking, the machine consists of a boiler B adapted to contain a liquid fuel,

a furnace F to heat the boiler and generate gas under pressure from the fuel therein, an engine E, means for conveying the generated gas under pressure from the boiler B to the engine E, and means for conducting the exhaust gas from the engine to the furnace F to be consumed by the latter. In most cases, a supply tank T will be provided for the liquid fuel, an injector I will be used to supply the boiler B with fuel from said tank T, and means will be used for conducting part of the exhaust gas into the supply tank and condensing the same for further use.

Although the boiler B could be of any preferred construction, it preferably consists of an outer shell 1, an inner shell 2, a pressure dome or the like 3, a retort 4 heated by the furnace F, and a coil 5 rising from said retort in the shell 2 and discharging into the dome 3. The space 6 between the two shells 1 and 2 is adapted to contain the liquid fuel from which the gas is to be generated, and by reference to Fig. 3, it will be observed that the retort 4 communicates with this space, so that the liquid will be heated in the retort 4 and coil 5, being discharged from the latter into the bottom of the dome 3 from which it will circulate through nipples 7 and return to the space 6. In traveling in this manner, the liquid fuel is highly heated and caused to give off gas which collects under pressure in the dome 3. A dry gas chamber 8 is preferably located in the dome 3 and provided with a perforated top 9 through which the gas enters said chamber from said dome, and it is from the chamber in question that the outlet pipe 10 leads from the boiler, whereby to carry only extremely hot and dry gas to the engine. The products of combustion from the furnace F rise through the inner shell 2 around the coil 5 and the dome 3, and are discharged at 11 from the top of the boiler, the upper end of said boiler being by preference lined with asbestos or the like as seen at 12 to shield it against the excessive heat.

By means of a suitable passage 13, the lower end of the inner shell 2 communicates with the horizontal casing 14 of the furnace F, fire-proofed baffles 15 being by preference provided at the sides of the passage as seen in Figs. 3 and 4, said baffles serving to direct the flame from the furnace burner 16, against the retort 4. Burner 16 is pref-

erably in the form of an elongated coil located in a perforated sleeve 17 mounted in the casing 14 above a fuel pan 18 which is used when first starting the machine, as hereinafter set forth. To gain access to the interior of casing 14 to light the burner, a door 19 is provided, and to control the supply of air to the burner, the outer end of the casing 14 is provided with a suitable shutter or damper 20. For initially heating the burner 16 to generate sufficient gas in the boiler for the purpose of starting the engine E, a common form of blow torch or the like 21 has a valved connection with the fuel supply pipe 22 of the burner 16, and when the use of the blow torch is no longer needed, its valve 23 may be closed.

The pressure outlet pipe 10 above referred to extends laterally at 24 to a suitable valve 25 from which a pipe 26 leads to the control valve 27 of the engine E. The valve 25 is in constant communication with a blow off 28 as will be clear from Fig. 9, said blow off being also connected with a branch pipe line 29 leading from the pipe 10 to the injector I. In addition to the valve 30 of the injector, the pipe line 29 may be provided with a cut-off valve 31 if desired, and similarly, a valve 32 may be employed in addition to valve 25 for controlling the passage of pressure to the engine. From the valve 27 of the engine E, the gas under pressure is directed to the engine through the passage 33 (Fig. 3), such gas pressure serving to operate the rotor 34. This rotor actuates an eccentric 35 and connecting rod 36 to control the valve 27. This arrangement is preferable when a rotary engine is to be employed, but it will be understood that other suitable types of motors could well be utilized, and that the exact manner in which the gas pressure operates them is an unimportant detail. In all cases however the exhaust 37 from the engine will serve to carry all or a part of the exhaust gas to the burner 16.

In the present showing, the exhaust 37 leads to a T-coupling 38 (Fig. 1), and by means of a valve 39 and suitable pipe connections, part of the exhaust gas may be conducted to the supply pipe 22 of the burner. By the provision of another valve 40 and pipe 41, the remainder of the exhaust gas may be conveyed into a condensing coil 42 in the supply tank T, so that such gas is condensed to a liquid for further use. The injector I, used for feeding the liquid from the tank T to the boiler B, is preferably constructed as follows:

The injector casing 43 is provided with a nozzle 46 through which the pressure from the pipe 22 passes when the valve 30 is opened, said nozzle delivering into a Venturi tube 47 which may be raised and lowered by suitable means 48 such as a pinion

and rack. Adjacent the nozzle 46, a pipe 49 discharges into the injector casing 43, said pipe leading from the tank T and preferably having a suitable screen 50 on its lower end. The pressure in passing through the Venturi tube 47, creates suction through the pipe 49 to draw the liquid fuel from the tank T and discharge it from the injector through a pipe 51, the lower end of said pipe having branches 52 and a check valve 53 in advance thereof, said branches having check valves 54 which deliver into the space 6 through perforations 55 (Fig. 4). It will thus be seen that by directing pressure through the injector, the boiler may be filled with the liquid fuel whenever required, the level of the fuel in said boiler being indicated by the usual glass 56, which is commonly known as a water glass. Also, the pressure within the boiler may be ascertained by an appropriate pressure gage 57.

In case the liquid should back up in the pipe 51, the Venturi tube 47 may be raised, thus placing said pipe in communication with a return pipe 58 which leads from the injector casing 43 to the tank T.

Before the machine is in operation, in order to fill the boiler with the liquid fuel from the tank T, it is necessary to apply a suitable pump (not shown) to the connection 59 of the pipe 51, said connection having a valve 60 which is closed during the ordinary working of the machine. The boiler having been filled with the liquid fuel, the burner 16 is heated by igniting an appropriate fuel in the pan 18, and the blow torch 21 is then operated to discharge its mixture of fuel and air through said burner. When this mixture is ignited, the flame initially heats the retort 4 and coil 5, thus generating sufficient gas pressure from the liquid fuel in the boiler to initially start the engine E when the necessary valves are opened. After starting of the engine, the valve 23 of the blow torch 21 is cut off, since the exhaust gas from the engine now supplies the burner with gaseous fuel to operate the same and heat the boiler in the required manner. Although the exhaust gas is in excess of the amount needed for the burner 16, it need not be wasted, since opening the valve 40 will conduct such excess gas into the condensing coil 42 of the tank T, thus returning it to liquid for further use. By employing a cheap grade of liquid fuel, the engine may be run with extreme economy, particularly in view of the fact that a part of the exhaust gas is consumed in the burner for performing work, while the remainder thereof is returned to liquid in the tank T.

From the foregoing, taken in connection with the accompanying drawings, it will be obvious that although the machine is of comparatively simple and inexpensive nature, it will be highly efficient and durable

and in every way desirable. Since probably the best results are obtained from the details shown and described, they are by preference followed, but within the scope of the invention as claimed, considerable latitude is allowed for making such minor changes as occasion may dictate.

I claim:

1. A power developing machine comprising in combination, a boiler, a supply tank to contain liquid fuel, means for supplying said boiler with liquid fuel from said tank, a gaseous fuel burner for heating said boiler to generate gas under pressure from the liquid fuel therein, a pressure-operated engine, means for conveying the generated gas under pressure from said boiler to said engine to operate the latter, means for directing part of the exhaust gas from the engine to said burner to operate the same, and means for directing the remaining exhaust gas into said supply tank.

2. A power developing machine comprising in combination, a boiler, a supply tank to contain liquid fuel, a condensing coil in said tank, means for supplying said boiler with liquid fuel from said tank, a gaseous fuel burner for heating said boiler to generate gas under pressure from the fuel therein, a pressure-operated engine, means for conveying the generated gas under pressure to said engine to operate the latter, means for directing a part of the exhaust gas from said engine to said burner to operate the same, and means for directing the remaining exhaust gas into said condensing coil.

3. A power developing machine comprising

in combination, a boiler, a supply tank to contain liquid fuel, an injector and connections for feeding the liquid fuel from said tank into said boiler, a return connection from said injector to said boiler, means for adjusting said injector to return the liquid fuel therefrom to said tank through said return connection, a gaseous fuel burner for heating said boiler to generate gas under pressure from the liquid fuel therein, a pressure-operated engine, means for conveying the generated gas under pressure from said boiler to said engine to operate the latter, and means for directing the exhaust gas from said engine to said burner to operate the same.

4. A power developing machine comprising in combination, a boiler, a supply tank to contain liquid fuel, an injector and connections for feeding the liquid fuel from said tank into said boiler, a return connection from said injector to said boiler, means for adjusting said injector to return the liquid fuel therefrom to said tank through said return connection, a gaseous fuel burner for heating said boiler to generate gas under pressure from the liquid fuel therein, a pressure-operated engine, means for conveying the generated gas under pressure from said boiler to said engine to operate the latter, means for directing part of the exhaust gas from the engine to said burner to operate the same, and means for directing the remaining exhaust gas to said supply tank.

In testimony whereof I have hereunto set my hand.

CESARE FRANCO.