S. J. WEBB.

GAS ENGINE.

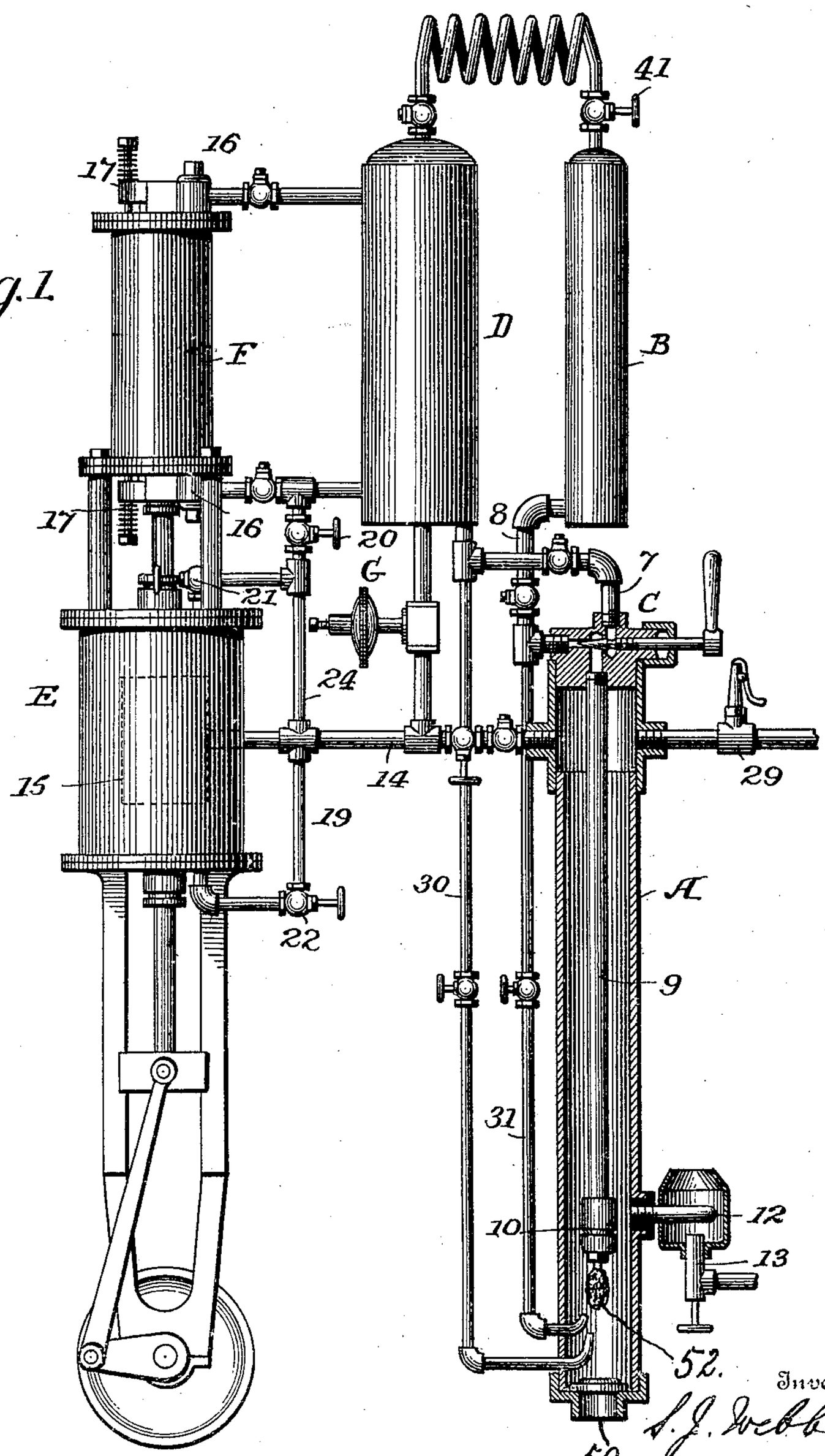
APPLICATION FILED JAN. 8, 1902. RENEWED AUG. 2, 1907.

962,995.

Patented June 28, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2

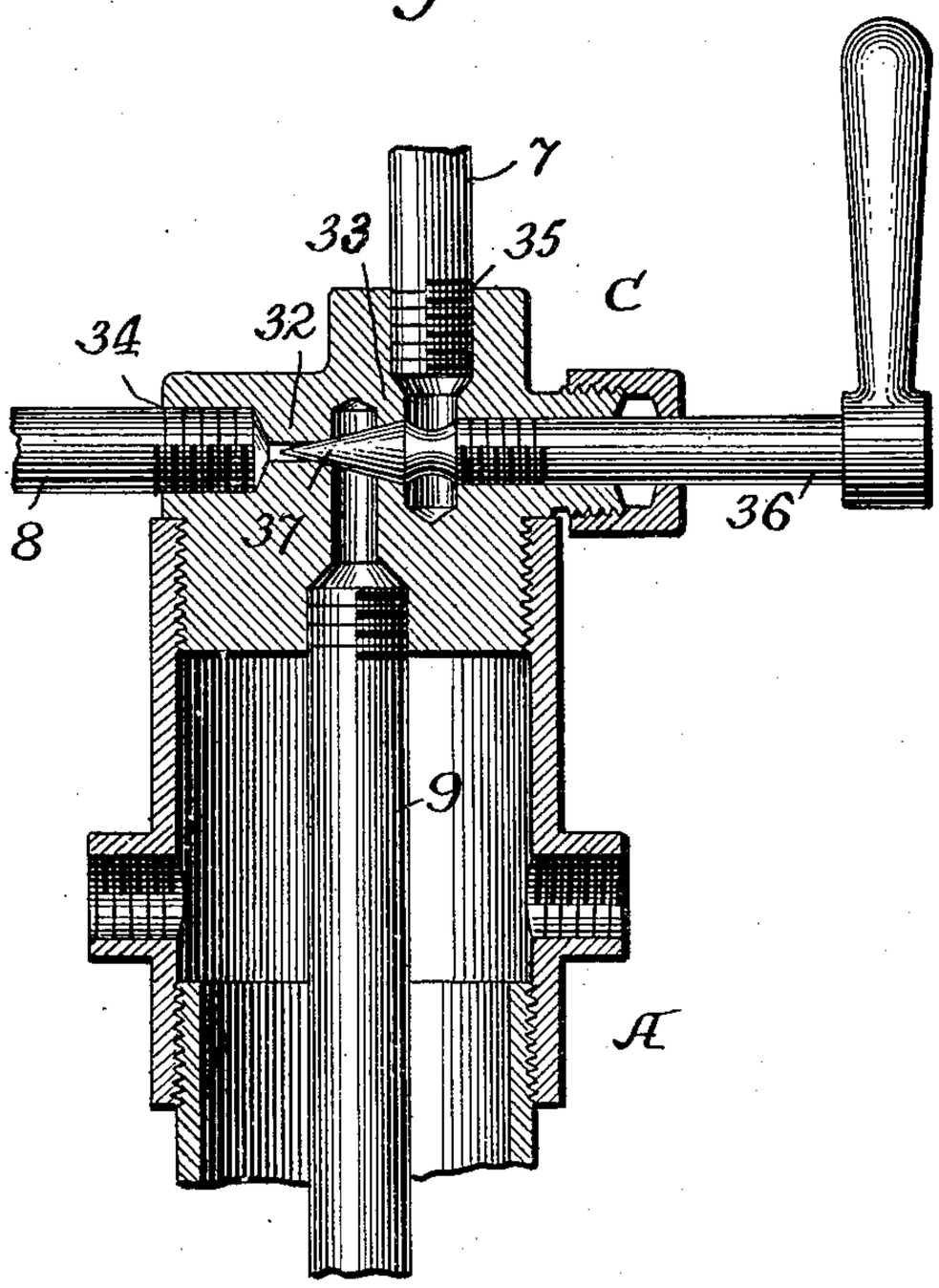
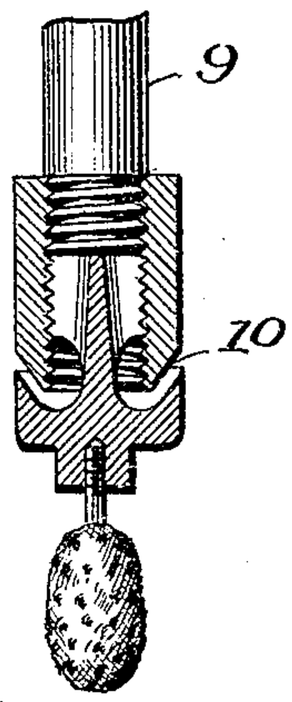


Fig. 3.



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UNITED STATES PATENT OFFICE.

SAMUEL J. WEBB, OF MINDEN, LOUISIANA.

GAS-ENGINE.

962,995. Specification of Letters Patent. **Patented June 28, 1910.**

Application filed January 8, 1902, Serial No. 88,916. Renewed August 2, 1907. Serial No. 386,817.

To all whom it may concern:

Be it known that I, SAMUEL J. WEBB, a citizen of the United States, residing at Minden, in the parish of Webster and State of Louisiana, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

My invention relates to gas engines and specially to that class known as internal combustion engines, and my invention consists of means for securing the requisite supply of motor fluid, at the required pressure, by the comparatively slow combustion of gases as fully set forth hereinafter and as illustrated in the accompanying drawing, in which—

Figure 1 is an elevation in part section of an apparatus embodying my invention; Fig. 2, an enlarged sectional view of the controlling valve and adjacent parts; Fig. 3, an enlarged sectional view of the nozzle, showing also the starting heater.

The engine is provided with a suitable cylinder A containing a combustion chamber in which a mixture of gas and air is burned to thereby expand the gases and secure a volume of motor gas at a desired high pressure. The gas may be introduced as such into the cylinder A, or, as shown, liquid fuel as for instance kerosene may be conducted from a reservoir B into the cylinder A and there vaporized and burned after admixture with the air or other gas. As shown, there is a valve casing C with which communicate the reservoir B and an air reservoir D through suitable pipes 7, 8, and the valve or valves of said casing are of such construction as to regulate the passage of oil and air to a mixing and vaporizing conduit pipe 9 leading from the valve casing to the interior of the combustion chamber.

The pipe 9 is provided at the bottom with openings or nozzles 10 through which flows the combustible mixture, the latter being ignited in any suitable manner, as for instance, by an ignition tube 12, heated by a Bunsen burner 13, the expanded gases resulting from this ignition securing a desired high pressure motor gas, which flows from the combustion cylinder A through a pipe 14 to the valve chest 15 of any suitable motor engine E, that shown having a cylinder and piston like an ordinary steam engine, and this motor engine operates an air compressor F, which may be of any suitable character. As shown, the air compressor F has a cylinder and piston, discharge ports and spring seated valves 16 and inlet ports that are closed by spring seated valves 17, and the air drawn into the compressor by one movement of the piston is compressed by the reverse movement at each end of the cylinder and is forced into the air reservoir D.

A relief valve G controls the communication between the reservoir D and the pipe 14 so that if there is any excess of pressure in the reservoir, the air will pass back into the motor E without being heated or expanded.

A pipe 19 affords communication between the air reservoir D and both ends of the motor cylinder E and is provided with cocks 20 21 and 22, by means of which the compressed air may be carried to either end of the motor cylinder to start the engine in case the valve in the valve chest 15 should be closed. If said valve is not closed, the engine may be started by opening the valve 20, when the compressed air will pass to the steam chest through a branch 24. The cylinder A is provided with a suitable safety valve 29 and from the cylinder D extends a pipe 30 provided with a suitable valve the said pipe terminating within the combustion chamber adjacent to the point where the gaseous mixture is consumed and serving to supply the latter with an increasing quantity of air which in some instances may be desirable, and a pipe 31 extends from the oil chamber to the combustion tank to afford an additional supply of oil or its equivalent when necessary. These additional supply pipes for oil and air may be necessary where different grades of oil are used at different times or under different conditions.

While the valve device C may be of any suitable character I have shown in Fig. 2 a preferred construction where there are two partitions 32, 33, the former between the oil port 34 and the interior of the pipe 9 and the latter between the air port 35 and the interior of the pipe 9, and a valve stem 36 is provided with a tapering end 37 which closes the port in the partition 33 as well as that in the partition 32. The relative sizes of the two ports are such as to determine the relative flows of the two different fluids and preserve their proper relations whatever may be the degree to which the valve is opened. It will be seen that the motor cylinder is of much larger diameter than the compression

cylinder. In order to insure the flow of oil, I prefer to store the same in the reservoir B under pressure and one means of so doing is to connect the reservoirs D and B by a small pipe 40 provided with a cock 41.

In the operation of the engine, the regulated supply of air and oil through the tube 9 results in heating both, in vaporizing the oil and mixing the vapor with the air, and in the comparatively slow burning of the mixture in the combustion cylinder A. The volume of compressed gas thus obtained passes through the motor which operates the compressor and stores in the reservoir D the desired volume of air at the determined pressure regulated by the valve G. The valve device C in which both the oil and air valves are operated simultaneously, serves to secure the desired control of the engine. Whatever may be the adjustment of the control device G the air will pass from the reservoir D directly to the motor whenever the predetermined pressure is obtained and in such case, if the pressure in the combustion chamber A should equal or exceed that in the reservoir D, there of course can be no further feeding of air from the reservoir D or oil from the reservoir B and the combustion of gases will cease until the pressure is lowered when it will automatically recommence.

I have described my improved apparatus in connection with a motor having a single cylinder, but it will be evident that there may be a plurality of engines in case a cylinder engine is employed, and when the compressor is of the character shown, there may be a plurality of cylinders. In order to facilitate the lighting of the mixture in the first instance I provide a port and clap valve 50 at the bottom of the combustion chamber A, which valve may be opened for the purpose of thrusting in a taper or light of any kind while simultaneously lifting the safety valve, thereby creating an upward current which secures the desired ignition, this current being facilitated by the upwardly projecting nozzle 10 which causes the mixture to flow upward.

While I have referred to the part containing the combustion chamber as the cylinder, I do not thereby restrict the same to any special shape.

In order to facilitate the starting of the apparatus, a bundle of fibrous non-combustible material 52, as asbestos, may be arranged below the tube 9 in such position that the oil can be injected onto it from the oil pipe 31, and the ignition of the oil on this material serves to heat up and volatilize the contents of the pipe 9 before starting.

I do not here claim the valve device C, the same being the subject of a separate application, Serial No. 129,429.

Without limiting myself to the precise construction and arrangement of parts shown, or to a motor or compressor of any special character,

I claim as my invention:

1. The combination with a motor and a compressor operated therefrom, of a combustion chamber communicating with the motor, a compressed air reservoir connected to the compressor, a liquid fuel reservoir, pipe connections between said reservoirs, pipes for conveying compressed air and liquid fuel from the reservoirs to the said chamber, the supply of air and fuel being controlled by a single valve, and means for igniting the mixture of air and fuel within said combustion chamber, substantially as set forth.

2. The combination with a motor and a combustion chamber communicating therewith, of a compressed air reservoir, a liquid fuel reservoir, a single inlet valve chamber, pipe connections between said valve chamber and the respective reservoirs, and a single pipe connecting the said valve chamber with the interior of the said combustion chamber for conveying a mixture of air and liquid fuel thereto, substantially as set forth.

3. The combination with a motor and a combustion chamber communicating therewith, of a compressed air reservoir, a liquid fuel reservoir, a valve chamber, pipe connections between the chamber and the respective reservoirs, a single valve for controlling the flow through said pipe connections to the valve chamber, and a single pipe connecting the valve chamber with the interior of the said combustion chamber for conveying a mixture of air and liquid fuel thereto, substantially as set forth.

4. The combination with the combustion chamber and a motor, of a compressed air reservoir, and valved connections respectively between the air reservoir and the chamber, between the chamber and the motor, and between the air reservoir and the motor, substantially as set forth.

5. The combination with a motor and a combustion chamber communicating therewith, of a compressed air reservoir, a liquid fuel reservoir, a valve chamber, pipe connections between the valve chamber and the respective reservoirs, a single pipe connecting the valve chamber with the interior of the combustion chamber, independent pipes leading respectively from the air and liquid fuel reservoirs to the interior of the combustion chamber, and a valve in each of the last named pipes, substantially as set forth.

6. The combination with the combustion chamber provided with an igniting port in its lower end, of a pipe for delivering a combustible mixture to said chamber adjacent its lower end, a fibrous holder supported by the lower end of the pipe adjacent to the ignition port, means for injecting

liquid fuel onto said holder, and an inwardly opening valve for closing the igniting port, substantially as set forth.

7. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, and means for continuously igniting the mixture in said chamber.

8. In an apparatus of the class described, the combination with a combustion chamber, of a mixing and vaporizing conduit extending into and along said chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, and means for continuously igniting the mixture in said chamber.

9. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending from one end to the other end of said chamber and having a discharge at its end, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, and a discharge for said chamber at the end where the mixture conduit enters.

10. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending from one end to the other end of said chamber and having a discharge at its end, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting said mixture in said chamber at the end where the mixture conduit discharges, and a discharge for said chamber at the end where the conduit enters.

11. In an apparatus of the class described, the combination with a combustion chamber, of a vaporizing and mixing conduit extending from one end to the other end of said chamber and having a discharge at its end, an igniter located in the path of the gases as they are discharged from said conduit, and a discharge for said combination chamber at the end where the mixture conduit enters.

12. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, and means for supplying additional air directly to said combustion chamber.

13. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, and means for supplying additional fuel directly to said combustion chamber.

14. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending from one end to the other end of and in said chamber and having a discharge at its end, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, a discharge for said chamber, and means for supplying additional air to the combustion chamber at the point where said conduit discharges.

15. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending from one end to the other end of and in said chamber and having a discharge at its end, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, a discharge for said chamber, and means for supplying additional fuel to the combustion chamber at the point where said conduit discharges.

16. In an apparatus of the class described, the combination with a combustion chamber, of a vaporizing and mixing conduit extending from one end to the other end of and in said chamber and having a discharge at its end, an igniter located in the path of the gases as they are discharged from said conduit, a discharge for said combustion chamber at the end where the mixture conduit enters, and means for supplying additional air and fuel to said combustion chamber at the point where the mixture is discharged and ignited.

17. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, a discharge and a valve at the end of the combustion chamber where the mixture conduit enters, and a valve at the end of the combustion chamber where the mixture conduit discharges.

18. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, a discharge and a valve at the end of the combustion chamber where the mixture conduit enters, and a valve and a fuel holder at the end of the combustion chamber where the mixture conduit discharges.

19. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and

along said chamber, a discharge for said chamber, said conduit being provided with discharge openings directed toward the discharge end of said combustion chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, and means for continuously igniting the mixture in said chamber.

20. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, a discharge for said chamber at the end where said conduit enters, said conduit being provided with discharge openings directed toward the discharge end of said combustion chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, and means for continuously igniting the mixture in said chamber.

21. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, a discharge for said chamber at the end where said conduit enters, said conduit being provided with discharge openings directed toward the discharge end of said combustion chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, and an igniter located in the path of the mixture as it is discharged from said conduit.

22. In an apparatus of the class described, the combination with a combustion chamber, of a mixture conduit extending into and along said chamber, a discharge for said chamber, said conduit being provided with discharge openings directed toward the discharge end of said combustion chamber, means for supplying air and hydrocarbon fuel under pressure to said conduit, means for continuously igniting the mixture in said chamber, a valve at the discharge end of said combustion chamber, and a valve at the end of the combustion chamber where the conduit discharges.

23. In an apparatus of the class described, the combination with a motor and a combustion chamber, of a compressed air supply, a fuel supply, means connecting said supplies to said chamber, a conduit between said chamber and motor, means for continually igniting the mixture of air and fuel in said chamber, and an automatic regulating valve between said compressed air supply and conduit.

24. In an apparatus of the class described, the combination with a motor and a combustion chamber, of a compressed air supply, a fuel supply, means connecting said supplies to said chamber, a pipe connecting said supplies, a conduit between said chamber and motor, means for continually igniting the mixture of air and fuel in said chamber, and an automatic regulating valve between said compressed air supply and conduit.

25. In an apparatus of the class described, the combination with a motor and a combustion chamber, of a compressed air supply, a fuel supply, a mixing chamber connected to said combustion chamber, means connecting said supplies to said mixing chamber, means for heating said mixing chamber, a conduit between said combustion chamber and motor, means for continually igniting the mixture of air and fuel in said chamber, and an automatic regulating valve between said compressed air supply and conduit.

26. In an apparatus of the class described, the combination with a motor and a combustion chamber, of a compressed air supply, a fuel supply, a mixing chamber connected to said combustion chamber, means connecting said supplies to said mixing chamber, means for heating said mixing chamber, a pipe connecting said supplies, a conduit between said combustion chamber and motor, means for continually igniting the mixture of air and fuel in said chamber, and an automatic regulating valve between said compressed air supply and conduit.

27. A combustion chamber with means for admitting a combustible mixture thereto and with means maintained in continuous condition for heating the mixture, substantially as described.

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

SAMUEL J. WEBB.

Witnesses:
H. M. GILLMAN, JR.,
W. CLARENCE DUVALL.