S. J. WEBB.

HOT AIR ENGINE.

APPLICATION FILED JAN. 8, 1902.

1,038,805. Patented Sept. 17, 1912.

2 SHEETS—SHEET 1.

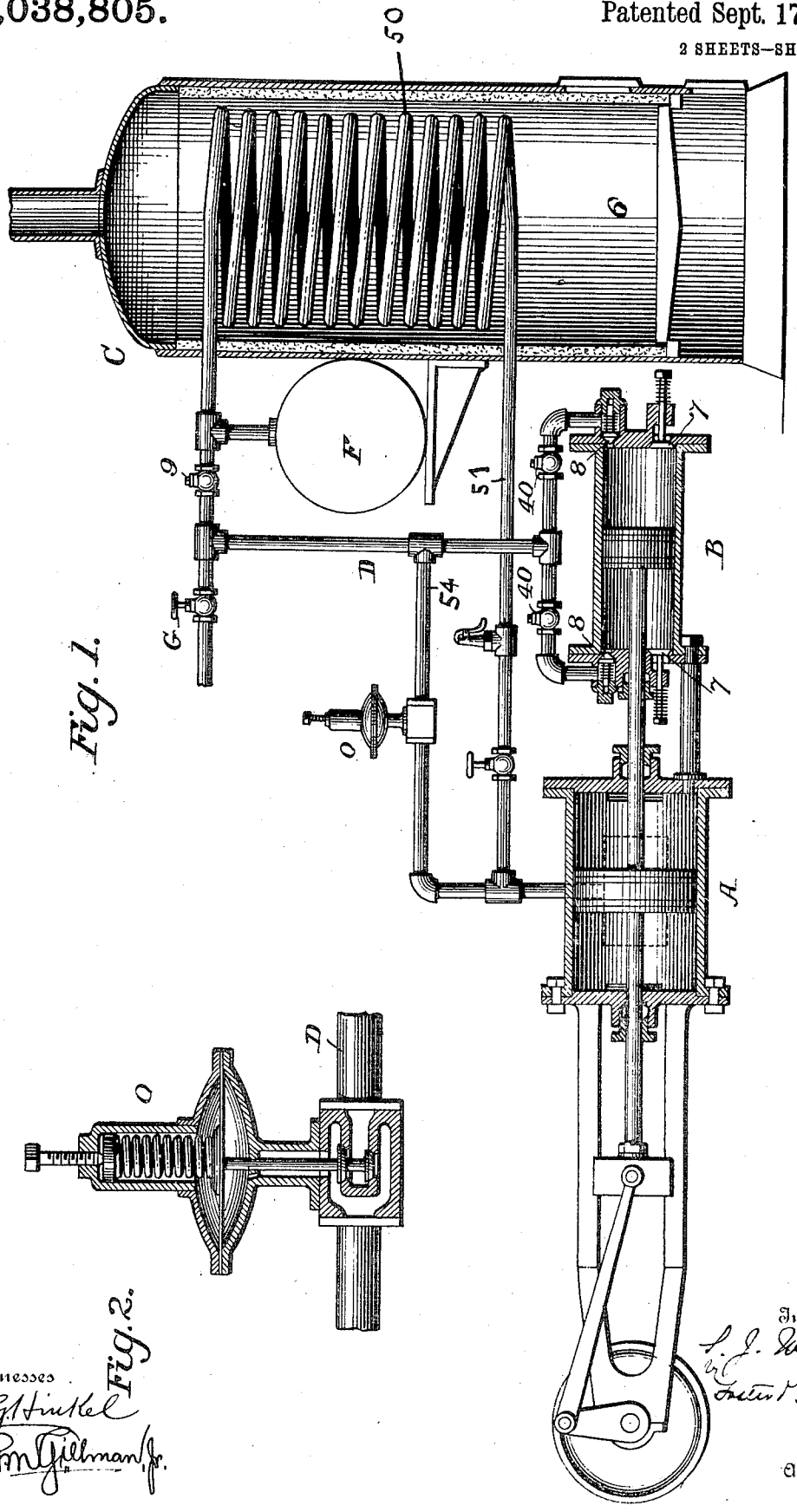

Fig. 1.

Fig. 2.

Witnesses

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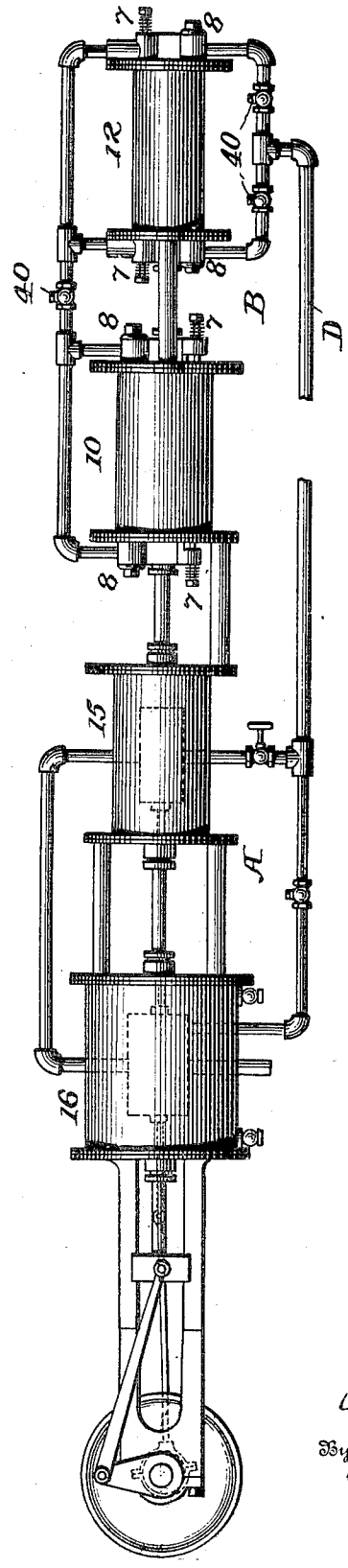

Fig. 3.

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UNITED STATES PATENT OFFICE.

SAMUEL J. WEBB, OF MINDEN, LOUISIANA; ROBERT D. WEBB, OF MINDEN, LOUISIANA, BY INHERITANCE AND BY MESNE ASSIGNMENTS OWNER OF ENTIRE TITLE.

HOT-AIR ENGINE.

1,038,805. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed January 8, 1902. Serial No. 88,917.

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 Hot-Air Engines, of which the following is a specification.

My invention relates to that class of motors in which movement is imparted to the operating parts of an engine by compressed air, and my invention consists in means whereby to secure the motor fluid in proper quantity and at desired pressure and for utilizing the same in driving the engine as fully set forth hereinafter and as illustrated in the accompanying drawing, in which—

Figure 1 is a longitudinal sectional elevation of an apparatus embodying my invention; Fig. 2 is a sectional view of the relief and regulating valve; Fig. 3 is a plan view showing a compound motor engine, which may be used in place of that shown in Fig. 1.

In the apparatus are the main parts, the motor A, the compressor B, the heater C and a conduit D including the heater between the outlet of the compressor and the inlet of the motor.

The motor as shown has a cylinder, piston and piston rod, but it may be of rotary or other form, as also may the compressor, and the heater is shown as a coil of the conduit D arranged in a furnace 6 suitably heated, but any other means of heating the air or other gas passing from the compressor may be employed. The motor has a slide or other valve, not shown, controlling admission and exhaust.

In the construction shown, the compressing cylinder has two air inlet ports with spring seated valves 7, 7, and two outlet ports also with spring closed valves 8, 8, the casings of which communicate with the conduit D. In said conduit are suitable control valves.

The reciprocation of the piston of the compressor draws air into the ends alternately of the cylinder and compresses the same, forcing it into the heater when it is heated in its compressed state and thence passes to the motor.

To provide for a reserve supply of compressed motor fluid I may make use of a reservoir or receptacle F communicating with the conduit D and I provide the latter with an exhaust port controlled by a hand valve G and insert a check valve 9 between the receptacle F and the valve G. On opening the valve G the check valve 9 at once closes and the engine is operated from the supply of fluid in the receptacle F passing through the coil 50 and branch 51, while the air from the compressor is ejected from the port controlled by the valve G and the resistance of the compressor is thus cut off so that for a short time the full pressure of the motor fluid is available.

The receptacle F is preferably so arranged as not to be heated and is thus stored with cold air, which when passed to the heater, then becomes expanded and increased in pressure. I thus store up a greater volume than would be practicable if the receptacle was heated.

It is desirable to prevent a pressure in the air receiving channels and receptacles above a predetermined amount and I therefore provide a by-pass and a regulating valve device O which on an undue increase of pressure permits the air to pass cold from the compressor to the motor instead of directing it to the heater whereby there is such a flow of part of the air through the pipes D, 54 and engine that the pressure is soon reduced when the operations become normal.

Inasmuch as the cylinder B is of much less diameter than the cylinder of the engine A, the air may be discharged from the compressor although the engine operates at a less pressure per square inch than that in the compressor.

While I have shown a single cylinder A in the motor and in the compressor, each may have a plurality of cylinders. I also propose to utilize the retained heat of the exhaust of the motor by using a compound motor. Thus in Fig. 3, the motor A has a high pressure cylinder 15 and low pressure cylinder 16 with connections and valves as in ordinary compound engines and the compressor has a low pressure cylinder 10 and high pressure cylinder 12, thereby securing the advantages of two successive compressions of the air and secures also a higher working pressure.

Check valves 40 are arranged at proper points.

It will be seen that with my construction and arrangement of parts atmospheric air is

compressed to a relatively high pressure and then expanded and increased in volume by heat in the heater and from the heater the expanded and increased volume of air passes to the motor.

For the purpose of starting a motor a reservoir F, is charged with air under pressure, which air may be delivered to the motor by a suitable valve and connections and may be passed through the heater and an exhaust pipe controlled by the valve G permits the air to be ejected from the compressor on starting the motor from the air reservoir, and the check valve 9, prevents the compressed air in the reservoir exhausting at this time. The by-pass with its automatic valve allows the cold air to pass directly from the compressor to the motor under excess of pressure in the compressor or the conduit connected therewith.

Without limiting myself to the precise construction and arrangement of parts shown, I claim:—

1. In a hot air engine, the combination of an air compressor, a motor adapted to be operated by air compressed by the compressor, the latter connected to be operated by the motor, a conduit between the outlet of the compressor and the inlet port of the motor, means for heating the air passing through said conduit, and a by-pass connection between the compressor and motor permitting the cold air when the pressure is excessive to pass between the compressor and motor without going through the heater, substantially as set forth.

2. In a hot air engine, the combination of a motor air-actuated engine, an air compressor connected to be operated by the motor, a conduit between the outlet of the compressor and the inlet port of the motor, means for heating the air passing through said conduit, and a by-pass and loaded valve for permitting air above determined pressure to pass to the motor without passing through the heater, substantially as set forth.

3. In a hot air engine, the combination of a motor engine having a cylinder and reciprocating piston, an air compressor connected to be operated by the motor but of smaller diameter, a conduit between the outlet of the compressor and the inlet port of the motor, means for heating the air passing through said conduit, and an air receptacle communicating with said conduit, substantially as set forth.

4. The combination with a compound motor engine having high and low pressure cylinders, of a compound air compressor having high and low pressure cylinders, the cylinders being arranged in line with a piston rod common to all the pistons, a conduit between the compound motor engine and its cylinder and the compound air compressor, and a connection with the compound air compressor adapted to deliver compressed air for the purpose of heating, 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.