J. B. BROWN.

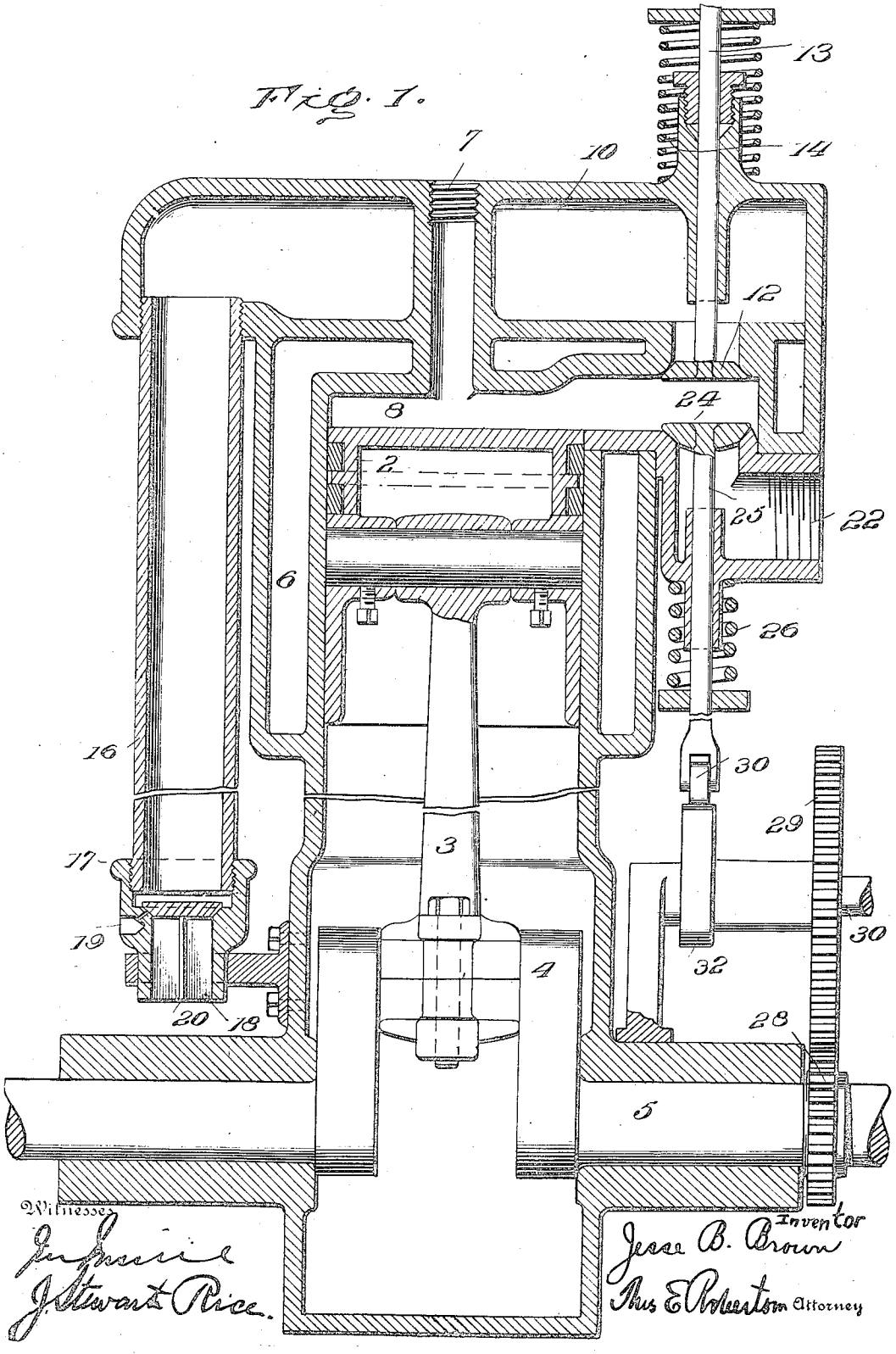
COMPRESSION REGULATOR.

APPLICATION FILED NOV. 14, 1903.

949,969. Patented Feb. 22, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



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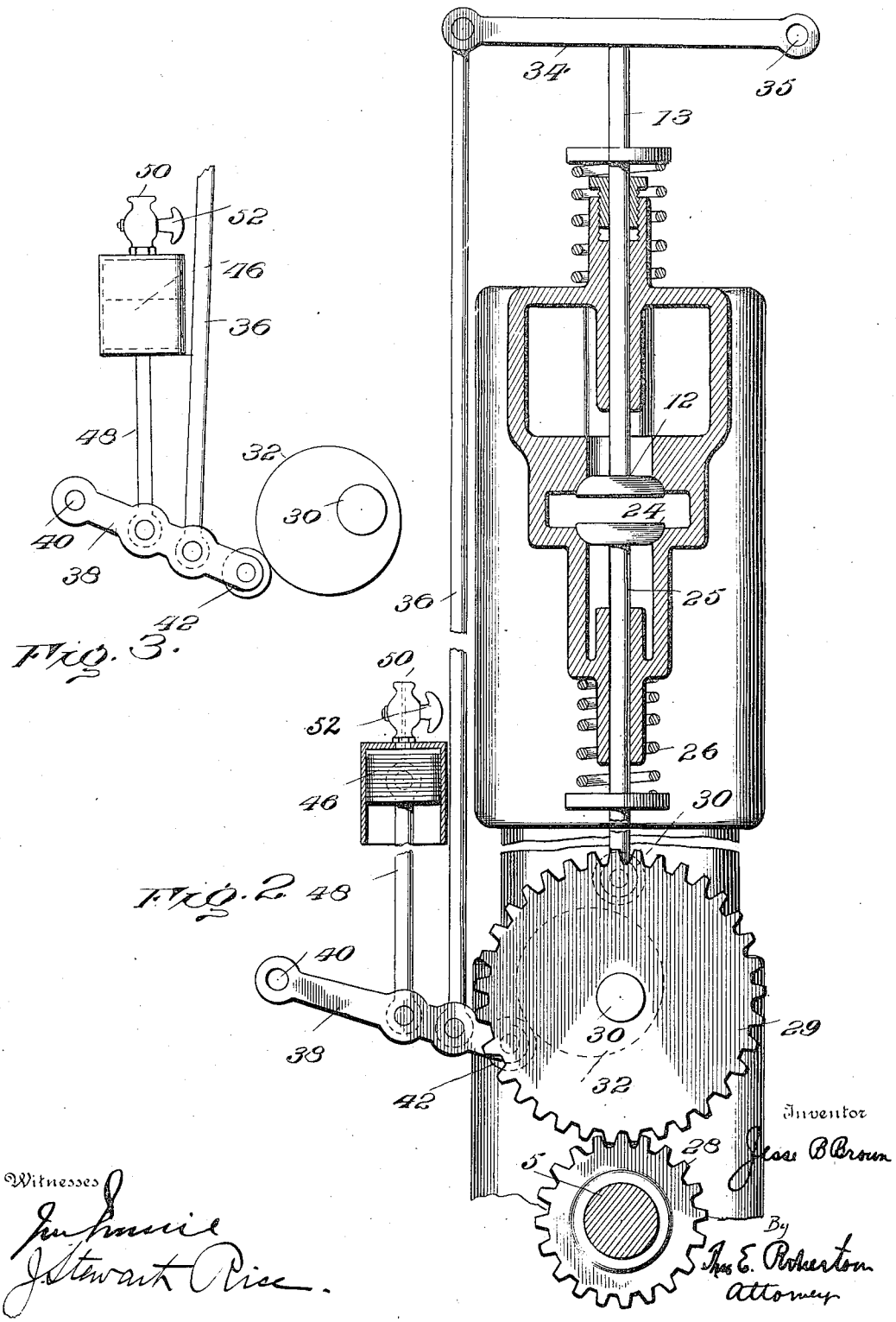

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COMPRESSION-REGULATOR.

949,969. Specification of Letters Patent. Patented Feb. 22, 1910.

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To all whom it may concern:

Be it known that I, JESSE B. BROWN, a citizen of the United States of America, and resident of Toledo, in the county of Lucas, in the State of Ohio, have invented certain new and useful Improvements in Compression-Regulators, of which the following is a specification.

This invention relates to certain new and useful improvements in compression regulators for explosive engines and the object of my invention is an engine wherein a storage chamber is employed into which all the charge, except that portion which is needed for the particular stroke, is forced, so that there may be no wasteful amount of gas consumed, and so that no energy is dissipated in compressing a larger charge than is necessary.

Another object of my invention is a governor which operates in connection with a valve so that the said valve is controlled by the governor in such a way that the valve does not close until all but the appropriate size of the charge has been expelled or forced from the compression chamber into a storage chamber if such be used.

With these and other objects in view my invention consists in the engine as illustrated, in its preferable embodiment, in the drawings accompanying this application, and as will now be hereinafter more particularly described and then definitely claimed at the end hereof.

In the said drawings: Figure 1 is a vertical central section of an engine constructed in accordance with my invention. Fig. 2 is a side elevation, partly in section, of the valve operating mechanism and the automatic governor for controlling one of the valves, and Fig. 3 is a detail view of the parts detached for the purpose of clearness.

Referring now to the aforesaid drawings by numerals: 1 designates the cylinder in which works a piston 2, preferably a trunk piston, though it may be of any desired construction, which is connected by the piston rod 3 to the crank 4, thus driving the crank shaft 5 in the usual way. The cylinder 1 is of course provided with a water jacket 6, and at the upper end, provision is made at 7 for an igniting plug (not shown). No further description of these parts is necessary as my invention does not reside therein, and said parts may be made of the form or construction which best suits the particular builder; it being understood that the parts as illustrated are merely the simplest embodiment selected by me when I built my first engine with my invention thereon.

The compression chamber 8 at the upper end of cylinder 1 is purposely of much smaller size than is usual, and instead of being connected directly with an inlet valve, I form, preferably above the upper end of the cylinder 1, what may be termed a storage chamber 10. A valve 12 normally held closed by a spring 14, is interposed between the compression chamber 8 and the storage chamber 10 as clearly seen in Fig. 1. At the opposite end of the storage chamber is connected a pipe 16 of rather large size, and at the lower end of this pipe is connected a coupling 17 in which is seated a gravity closing valve 18. The coupling 17 is provided with an opening 19 for the admission of gas and with an opening 20 for the admission of air. The compression chamber 8 is also provided with an exhaust 22 which is normally closed by the valve 24, a spring 26 being employed for the purpose of holding this valve closed except when it is opened positively by the mechanism to be described.

Connected to the crank shaft 5 is a small gear 28 which meshes with a gear 29 of twice its size which is fixed to and rotates with a supplemental shaft 30 on which shaft also rotates a cam 32. The spindle 25 of the exhaust valve 24 is formed with a roller 30 on its lower end with which co-acts the cam 32, so that at each revolution of the supplemental shaft 30, or at each two revolutions of the crank shaft 5, the cam raises the spindle 25 and thus opens the exhaust valve 24, in a manner which will be readily understood from an inspection of my drawings. The spindle 13 of the valve 12 has its upper end in contact with a lever 34 pivoted at 35 in any proper manner, and the other end of the lever 34 is pivotally connected by means of a connecting rod 36, with a second lever 38. This lever 38 is pivotally supported on a fixed pivot 40 at one end, and on its other end is journaled a roller 42 which co-acts with the cam 32. From an inspection of Fig. 2 it will be apparent that at each revolution of the cam 32, which it will be remembered rotates once to each two revolutions of the crank shaft 5, the said cam will co-act with the roller 42 and depress the same, thus lowering the free end of the lever 38 and through the con-

necting rod 36 and lever 34, depress the spindle 13 and its valve 12 in order to admit the charge to the compression chamber at the proper time. The cam is so proportioned with relation to the roller 42, that it opens the valve 12 at the beginning of every other down stroke of the piston 2 and holds said valve in its opened position until the piston makes one-third of its up stroke, when the cam permits the spring 14 to automatically close the valve 12 and during the remainder of the up stroke, the charge is compressed and fired in the usual manner.

In order to permit the closing of the valve 12 so as to make it possible to have this valve closed at an early period when running on a heavy load and at a later period when running on a light load, I employ a dash pot 44 whose piston 46 is pivotally connected with the lever 38 by means of the piston or connecting rod 48. At the closed end of the dash-pot I provide an air valve 50 which is controlled by the cock 52. This dash-pot I prefer to term a governor, and the operation of my engine, with the dash-pot or governor connected, is as follows: Assuming that the engine is running, and that the parts are in the positions shown in Fig. 1, the charge is fired in the compression chamber 8 by means of the usual firing plug inserted through the opening 7 but not shown, and the explosion of the gases drives the piston 2 downward. As said piston returns, the cam 32 is in the proper position to open the exhaust valve 24, when the burned charge is driven from the cylinder 1 in the usual manner. As the piston begins its downward stroke, the cam 32 is in the proper position to open, through its various connections 34, 36, 38 and 42, the valve 12, and as said piston descends to complete its stroke, a charge is drawn from the storage chamber through the open valve 12 and a fresh supply of gas and air is drawn through the valve 18, which of course is opened by suction in the usual manner, and on the return of the stroke of the piston 2, the valve 12 is closed and the gas compressed in the compression chamber 8. If the engine is running on a normal load, the cam 32 permits the valve 12 to close when the piston 2 has made about one-third of its up stroke and during this first portion of the stroke, the surplus portion of the charge in the compression chamber 8 is driven back into the storage chamber 10 until the valve 12 is closed. It will of course be understood that the cock 52 is adjusted so as to permit the air to escape from the dash-pot at the proper speed to permit the valve to be closed by its spring at the proper moment; and therefore as the valve cannot close until the air is expelled from the dash-pot it follows that the time required for the valve to close is dependent on how rapidly the air escapes from the dash-pot, and that the faster that the air escapes the quicker will the valve be closed. The result of this is that if the valve 12 closes early in the stroke, a much larger amount of the charge will be compressed than when said valve is closed later in the stroke which permits a portion of the charge to be driven back into the storage chamber. If the load on the engine is made suddenly lighter, the tendency is, of course, to run faster, but this controlled by the dash-pot, which allows valve 12 to be closed by its spring only at the regular speed, causes valve 12 to be closed later in the stroke and permits the piston 2 to force a larger portion of the charge into the storage chamber, and thus makes the explosion lighter.

From the foregoing and the accompanying drawings, it will be seen that I have invented a very simple form of engine which, owing to the fact that only so much of a charge is used as is actually needed, is exceedingly economical, and as the charge which is exploded is not always of a fixed amount, the noise of the exhaust is not so great, and this permits me to do away with a muffler.

It is of course manifest that changes may be made in the form and construction of my engine, and that while I have described it as being used with gas, it may be used as well with gasolene.

What I claim as new is:

1. In an engine, a cylinder having a compression chamber of relatively small size, a storage chamber located at the ignition end of said cylinder next to said compression chamber and relatively larger than the latter, a valve between said compression chamber and said storage chamber, means for actuating said valve, comprising a cam and connections operative from the main shaft, and a governor controlling the movement of the valve comprising a dash-pot having a piston therein operated by said cam, whereby, upon a light load, the governor closes the said valve nearer the end of the stroke than on a heavier load, permitting the excessive charge to pass directly into said storage chamber, substantially as described.

2. In an engine, the combination of the cylinder and piston therein, an auxiliary storage chamber located adjacent to, and communicating with said cylinder, a valve regulating the communication between said auxiliary chamber and the cylinder, and means for regulating the closing of said valve whereby a part of the charge introduced into the cylinder may pass back into said auxiliary chamber, the means for regulating the closing of the valve including a dash pot.

3. In an engine, the combination of the cylinder and a piston therein, a storage

chamber located adjacent to said cylinder, a valved connection between said storage chamber and said cylinder, and means whereby a part of the charge in the cylinder will pass through said connection into the storage chamber, said means being controlled and regulated by an air controlled governor.

4. In an engine, the combination of a cylinder, a piston thereon, a storage chamber located adjacent to said cylinder, and having valved connection only with said cylinder, means for operating said valve comprising an eccentric having connections with the piston rod, and a governor controlling the closing of said valved connection, the governor comprising a dash pot and means for regulating the vent thereof.

5. In an engine, the combination of the cylinder and piston therein, of an auxiliary compression chamber connected to the cylinder, an inlet valve establishing a communication between the auxiliary chamber and the cylinder, valve operating means, a dash pot connected to the valve operating means, and means arranged to vary through the dash pot, the closing of the inlet valve, whereby different amounts of the charge may go back into said auxiliary chamber.

6. In an engine, the combination of the cylinder and piston therein, of an auxiliary compression chamber connected to the cylinder, an inlet valve leading from the auxiliary chamber to the cylinder and establishing the only communication therebetween, means for operating the valve whereby a part of the charge may go back into said auxiliary chamber, a dash pot connected to the valve, and operating means for regulating the vent of the dash pot, whereby the closing of the inlet valve will be changeable.

7. In an engine, the combination of the cylinder and piston therein, an inlet valve and an outlet valve, and means for regulating the closing of the inlet valve and permitting a part of the charge in the cylinder to escape therethrough, the said means including a dash pot operatively associated with said valve.

8. In an engine, the combination of the cylinder and piston therein, a dash pot, an auxiliary storage chamber connected to the cylinder, an inlet valve leading from the auxiliary chamber to the cylinder, and means for connecting the dash pot to the inlet valve, the dash pot mechanism and the inlet valve being constructed and arranged to permit a portion of the charge in the cylinder to escape through the inlet valve by the retarding action of the dash pot.

9. In an engine, the combination of the cylinder and piston therein, an auxiliary storage chamber located adjacent to and communicating with said cylinder, a valve regulating the communication between said auxiliary chamber and the cylinder, means for regulating the closing thereof, whereby a part of the charge introduced into the cylinder may pass back into said auxiliary chamber, the means for regulating the closing of the valve including a dash pot, and means for regulating the vent thereof.

10. In an engine, a cylinder having a compression chamber, a storage chamber located at the ignition end of said cylinder next to said compression chamber, a valve between said compression chamber and said storage chamber, and means for actuating the valve whereby a portion of the charge in said compression chamber is admitted into the storage chamber, the said means being actuated by a cam operative from the main shaft and a dash pot operated by the cam, whereby upon a light load the dash pot prevents the valve from closing until nearer the end of the compression stroke than on a heavier load.

11. In an engine, the combination of the cylinder and piston therein, of an inlet valve, and a dash pot controlling the closing of the inlet valve and means for varying the action of the dash pot, in combination with an auxiliary compression chamber communicating with said inlet valve and into which a portion of the charge is permitted to escape by the retarding action of the dash pot.

12. In an explosive engine, the combination with the cylinder and piston therein, of an auxiliary compression chamber opening into said cylinder, an inlet valve located in the opening between said auxiliary compression chamber and said cylinder, a dash pot, the piston of which is operatively connected with said inlet valve so as to retard its closing, and which is provided with a vent and means for regulating the size of said vent.

13. In an engine, the combination of the cylinder and piston therein, an auxiliary storage chamber communicating with the cylinder through an opening, means for permitting a portion of the charge in the cylinder to pass to the storage chamber, and means for varying the amount of discharge from the compression to the storage chamber including an air controlled device.

14. In an engine, the combination of the cylinder and a piston therein, a storage chamber located adjacent to said cylinder and having communication therewith, means whereby a portion of the charge in the cylinder is allowed to escape into the storage chamber including a governor controlling the passage of the charge from said cylinder into said storage chamber, comprising an air controlled device.

15. In an engine, the combination of a cylinder and piston therein, of an auxiliary chamber located adjacent to said cylinder, a valved connection between the chamber and cylinder, means whereby a charge may pass

through the said connection to the cylinder from said chamber, means for gradually closing the valved connection whereby a part of the charge in the cylinder may return to the chamber, and means for varying the retarding closing action of said valve.

16. In an engine, the combination of a cylinder and the piston, of an inlet valve and dash pot associated with the inlet valve, the dash pot and valve being constructed and arranged whereby the closing of the valve is retarded, and an auxiliary compression chamber into which a portion of the charge is permitted to escape by the retarding action.

Signed by me at Toledo Ohio this 6th day of November 1903.

JESSE B. BROWN.

Witnesses:
GEO. W. HOUSDORFER,
G. W. GRAHAM.