P. LANGER.

SPEED REGULATOR FOR EXPLOSIVE ENGINES.

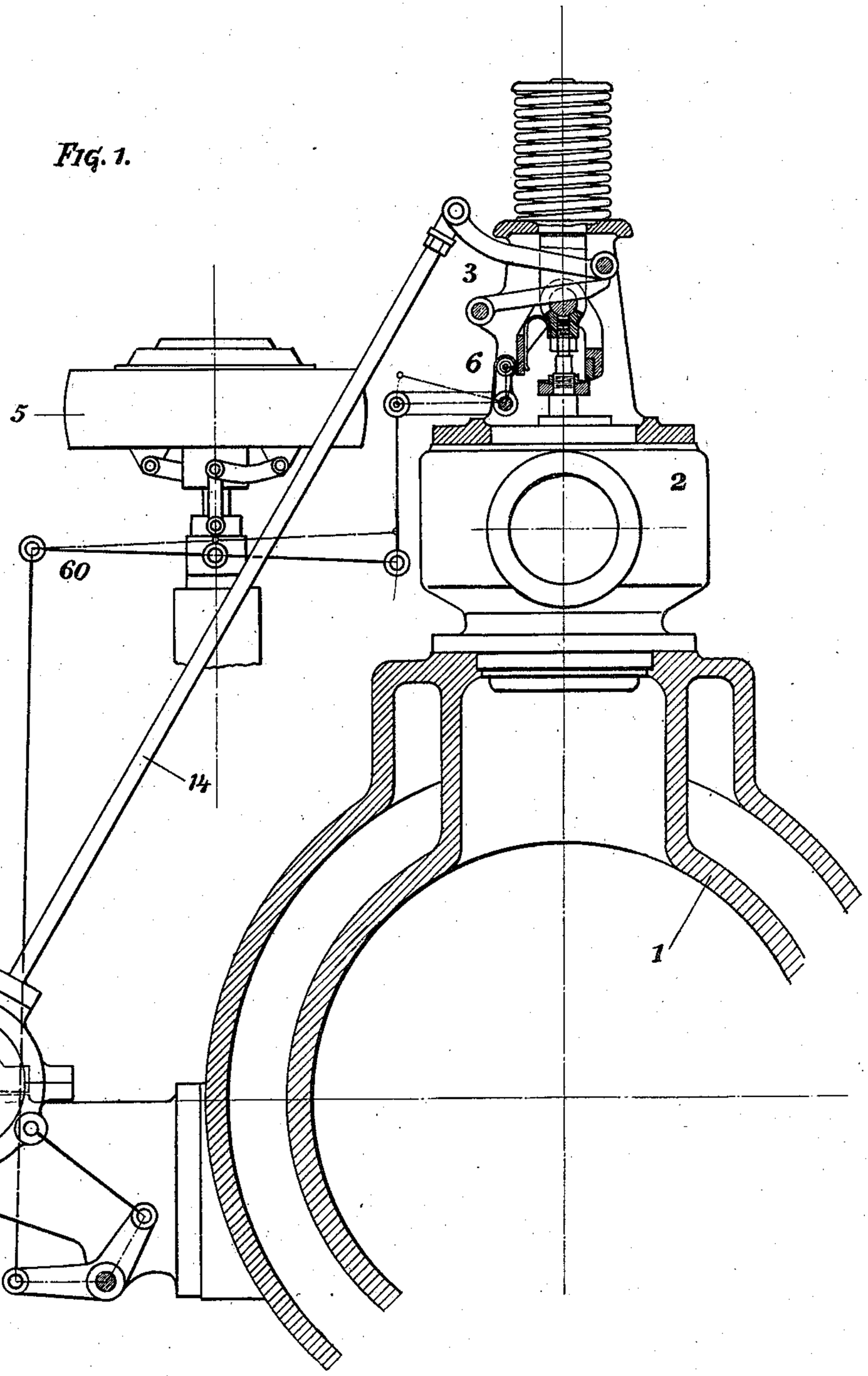
APPLICATION FILED MAR. 8, 1905.

966,567.

Patented Aug. 9, 1910.

2 SHEETS—SHEET 1.

FIG. 1.



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2 SHEETS—SHEET 2.

Fig. 4.

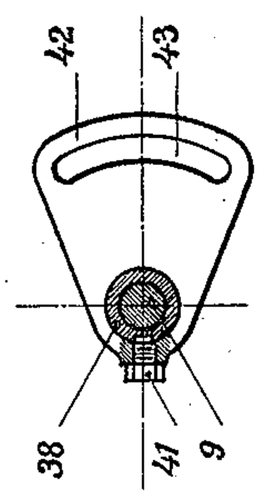


Fig. 3.

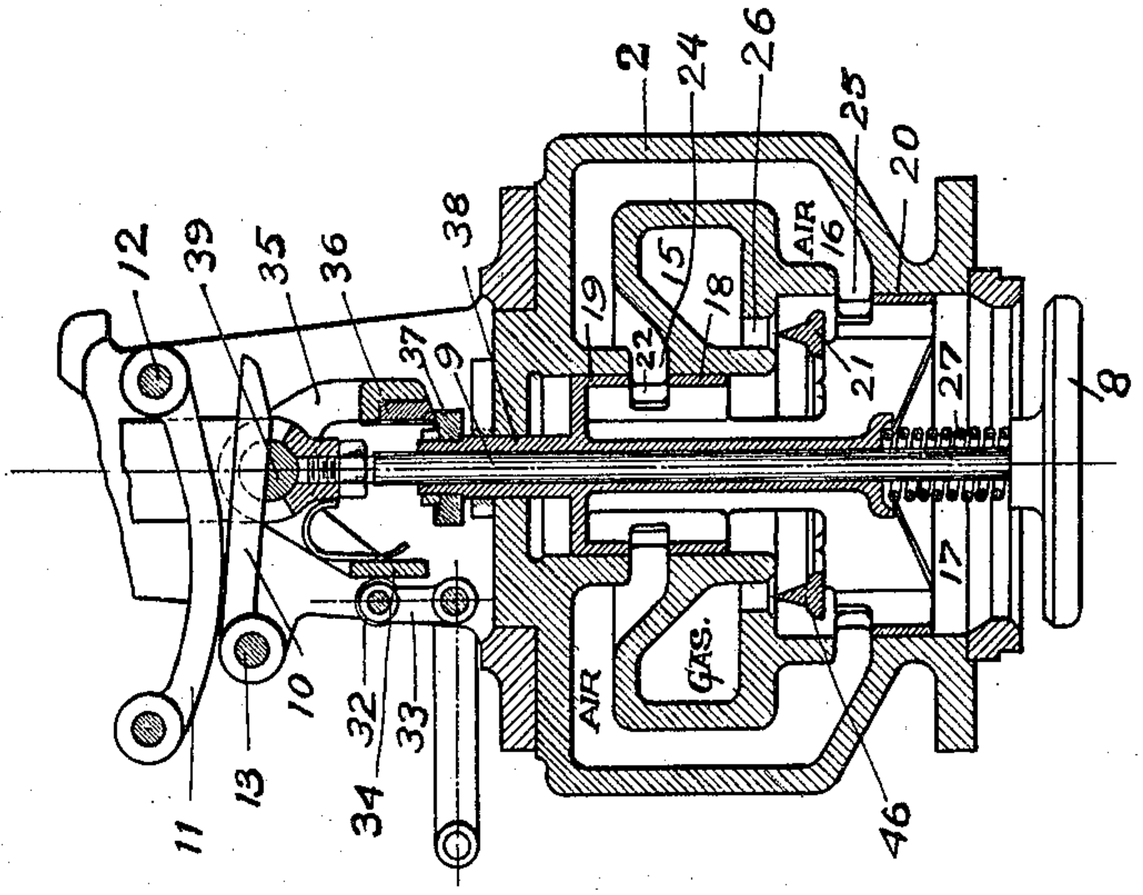
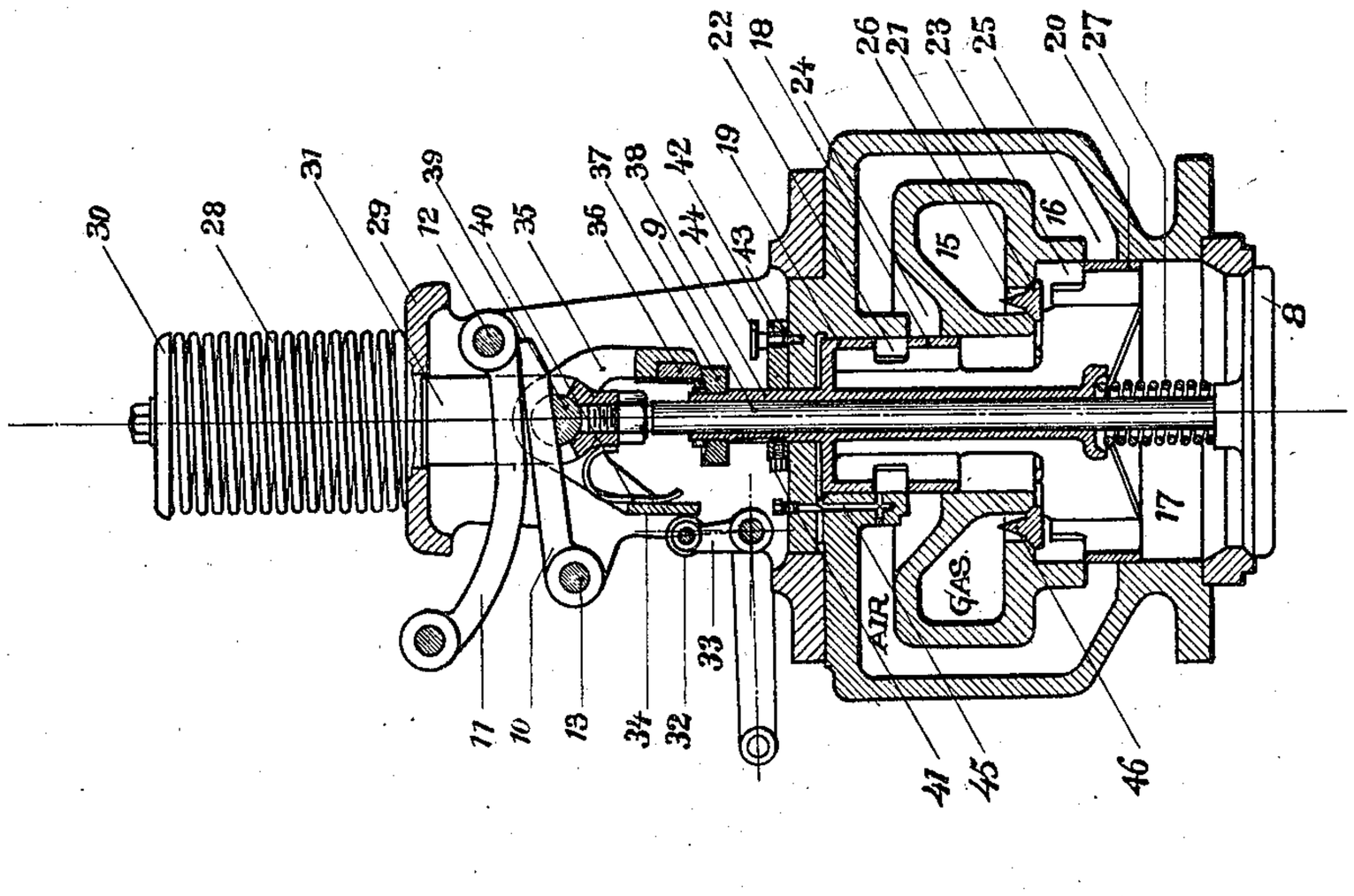


Fig. 2.



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SPEED-REGULATOR FOR EXPLOSIVE-ENGINES.

966,567. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed March 8, 1905. Serial No. 248,956.

To all whom it may concern:

Be it known that I, PAUL LANGER, a subject of the Emperor of Austria-Hungary, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Speed-Regulators for Explosive-Engines, of which the following is a specification.

The object of the invention is to provide a gas engine with improved gas mixing valve and valve gear. This object is attained by improving the regulating structure for a gas engine, as hereinafter described and as best shown in the accompanying drawing, in which,—

Figure 1 is a vertical section through the gas engine and valve gear, some of the parts being shown in elevation. Fig. 2 is a vertical section through the mixing valve at the fully closed position of both valves. Fig. 3 is a similar view at the fully opened position of the valves, Figs. 2 and 3 being both shown at full load. Fig. 4 is a plan view of the adjusting mechanism for the mixing valve.

Referring to the drawing, a gas engine 1 is shown with a valve body 2 mounted thereon, the valve gear 3 being operated by means of the eccentric 7, keyed to shaft 4 geared to the main shaft, not shown. The governor 5 operates upon the tripping cut-off mechanism 6 indirectly by co-acting with its connections 60, operated by the eccentric 7. The connections 60 for the tripping cut-off are shown in diagram in Fig. 1 and are vibrated by the eccentric 7, they being connected thereto as a series of connected linkage. The cut-off mechanism 6 is likewise vibrated because connected to this series of linkage. The governor 5 affects the vibration of the cut-off mechanism 6 by varying the location of the fulcrum point of the lever of the particular link of the series, to which it is connected.

Referring more particularly to Figs. 2 and 3, the main inlet valve 8 is operated through its valve stem 9, by the cam levers 10, 11. The lever 11 is pivotally mounted to the frame by pin 12, while the lever 10 is pivotally mounted on the frame by pin 13. The lever 10 is merely to avoid shock in starting or stopping the valve 8. The lever 11 is positively actuated by the eccentric rod 14, see Fig. 1, co-acting with the eccentric 7 in the usual manner. This operating mechanism is old and well known in puppet valve gearing and will need no further description. The valve 8 is kept in its closed position by means of the spring 28 acting between the frame 29 and a washer 30 mounted upon the end of a slide 31 attached to the upper end of the valve stem 9 and operating in the frame 29. Continuing the reference to Figs. 2 and 3, the valve body 2 is cored out to form two annular chambers 15 and 16. The chamber 15 is connected to a gas supply and is surrounded by the chamber 16 in communication with the atmosphere, these two annular chambers 15 and 16, communicating with the central mixing chamber 17 by ports 24, 25, 26. These ports are controlled by the mixing valve 18. The mixing valve 18 is loosely mounted upon the valve stem 9 of the main valve 8, while a spring 27, between the lower end of the valve 18 and the upper side of valve 8, tends to keep the valve 18 in its upper closed position. The mixing valve 18 consists of two cylindrical portions 19 and 20, separated by a puppet valve portion 21. For convenience, the upper cylindrical portion 19 is of smaller diameter than the lower cylindrical portion 20. The cylindrical portions of the mixing valve control the admission of air to the chamber 17, through the arcuate valve ports 22 and 23. These ports 22 and 23 are designed to co-act with arcuate air admission ports 24, 25, from the air chamber 16. The puppet valve portion 21 of the mixing valve 18, controls the admission of gas to the chamber 17 from the gas chamber 15 through an annular port 26.

The tripping cut-off mechanism 6 is positively operated by means of connections 60, see Fig. 1, to the strap of the eccentric 7. These connections 60 operate to oscillate a roller 32, see Fig. 2, upon the end of the lever 33. The roller 32 co-acts with the cam surface 34 upon the end of a U-shaped lever 35, at whose opposite end is the trip 36, acting upon the collar 37 mounted upon the

upper end of the hollow valve stem 38 of the mixing valve 18. The bent lever 35 is pivotally mounted near its middle portion upon a pin 39, mounted in the slide 31. A spring 40 serves to keep the bent lever 35 in contact with the actuating roller 32.

To adjust the mixing valve 18 circumferentially so as to regulate the effective circumferential length of air inlet, thus regulating the amount of air to gas, an arc-shaped piece 42, see Figs. 2 and 4, is splined by means of a screw 41, on the hollow valve stem 38 of the mixing valve 18. The arc-shaped piece 42 has therein an arcuate slot 43, through which it is secured to the valve casing 2 by a set screw 44.

The governor 5 operates in such a manner upon the connections 60, as to vary the limits of oscillating motion given to the roller by its actuating gear, thus changing the point at which the trip 36 releases the collar 37, so as to allow the spring 27 to close valve 18 to cut off both the gas and air inflow. Or the action may be such as to prevent cut-off, as shown in Fig. 3.

The operation of the device is as follows: The main valve 8 is positively, continuously and unalteringly operated by the valve gear 3. The mixing valve 18 is also opened by being moved downwardly through the trip 36 by the valve gear 3, and operates to cut off the fluid inflow to the chamber 17 by being moved upwardly by means of the spring 27 whenever the trip 36 releases the collar 37. The shock of the seating of valve 18 is prevented by an air cushion which forms above the valve between it and the casing constituting a dash pot. The air from the air cushion is slowly released by suitable ports 45, leading from the dash pot chamber. These ports 45 serve to connect the dash pot chamber with the space below the upper part of the mixing valve 18, which upper part constitutes the piston of the dash pot. In the operation of the dash pot, the air gradually escapes from above the upper piston portion of the mixing valve through the ports 45.

In order to adjust the mixing valve circumferentially to compensate for different kinds of gas, the set screw 44 is loosened and the arc-shaped piece 42 and valve 18 adjusted to the desired angular position. The set screw 44 is then tightened and this holds the arc-shaped piece 42 and valve 18 in the set angular position, but allows the valve 18 to slide vertically by the spline and screw connection at 41.

The air inlet ports 24, 25, being separated by the annular gas port 26, form a structure insuring thorough mixture of the air and gas in the chamber 17. An annular projection 46 of the puppet valve portion 21, secures the proportional openings of the annular gas port 26 as referred to the opening of air inlet ports 24, 25. It will be seen that a tight closing of the annular gas port 26 is attained by the use of the puppet valve portion 21 of the mixing valve 18, a balanced valve structure being inadmissible for use with blast furnace gas which may be used and which is relatively dirty as compared with air.

It is to be noted that the spring 27 which causes the mixing valve 18 to be cut off, need only be of sufficient strength to counterbalance the gas pressure upon the puppet valve 26. It is also to be noted that the cutting off is not accomplished by the main inlet valve 8, but only and entirely by means of the mixing valve 18. And this cutting off applies proportionally and simultaneously to the air and gas. It is also to be noted that the operating means for the cut-off trip is independent of the operating means for the main valve; that is, the operating means for the cut-off trip is separate from the operating means for the main valve, but both may be operated by the same eccentric 7.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire it to be understood that the apparatus shown is merely illustrative and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In an internal combustion engine, the combination of a ported valve casing, a main valve therein, a second valve therein, means associated and carried by said main valve for engaging other means associated with and carried by said second valve for opening said second valve, means on said casing for releasing said two means from engagement for permitting closing of said second valve, and means for imparting to said releasing means a regular periodic vibration.

2. The combination of a ported member and a reciprocatory member having two piston valve portions and an intermediate puppet valve portion.

3. The combination of a ported member and a reciprocatory member having two piston valve portions and an intermediate puppet valve portion, the ports in the first member having such relation to the second member that all the valves have simultaneous opening or closing motion.

4. A piston valve having a dash pot and a surrounding member having a dash pot relief port registering with a port of the piston valve.

5. In an explosive engine, the combina-

tion of a ported valve casing, a main valve therein, a second valve therein adjustable to vary the quality of explosive mixture, means for adjusting said valve from without the engine and while said valve is in place, and means for closing the adjustable valve independently of the main valve.

In testimony whereof I affix my signature in presence of two witnesses.

PAUL LANGER.

Witnesses:
JOHN DAY, Jr.,
H. C. CASE.