No. 685,510. Patented Oct. 29, 1901.

W. P. FLINT.

AIR AND GAS MIXING AND GOVERNING DEVICE FOR GAS ENGINES.

(Application filed Sept. 6, 1900.)

(No Model.)

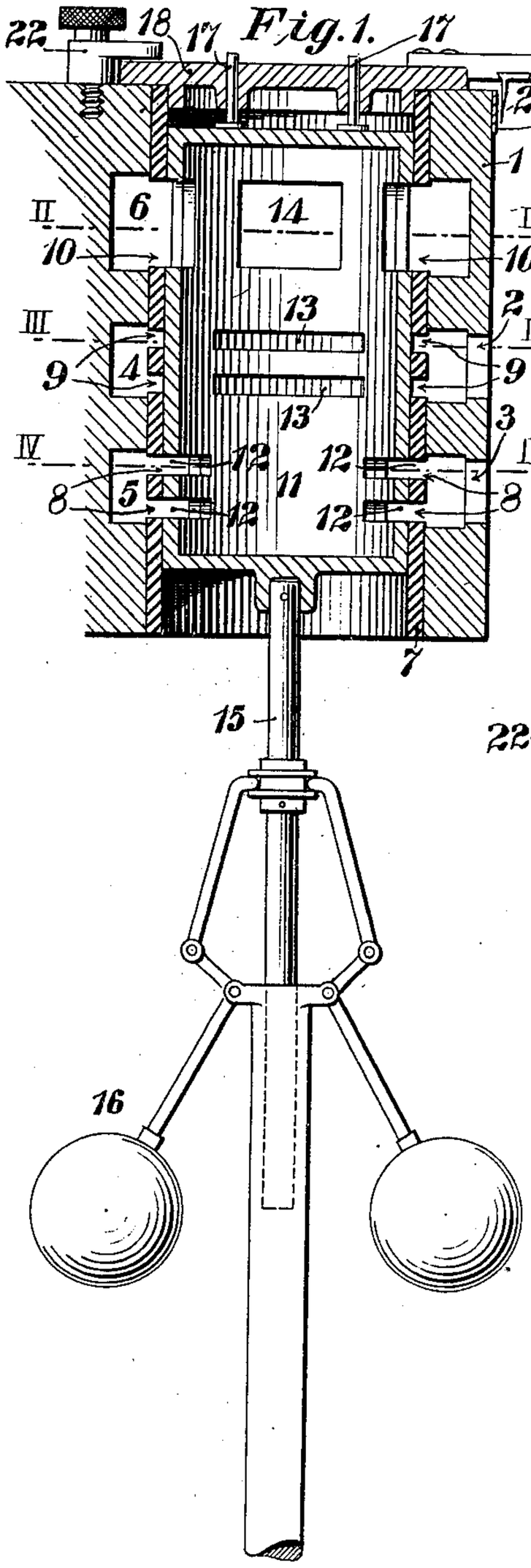


Fig. 1.

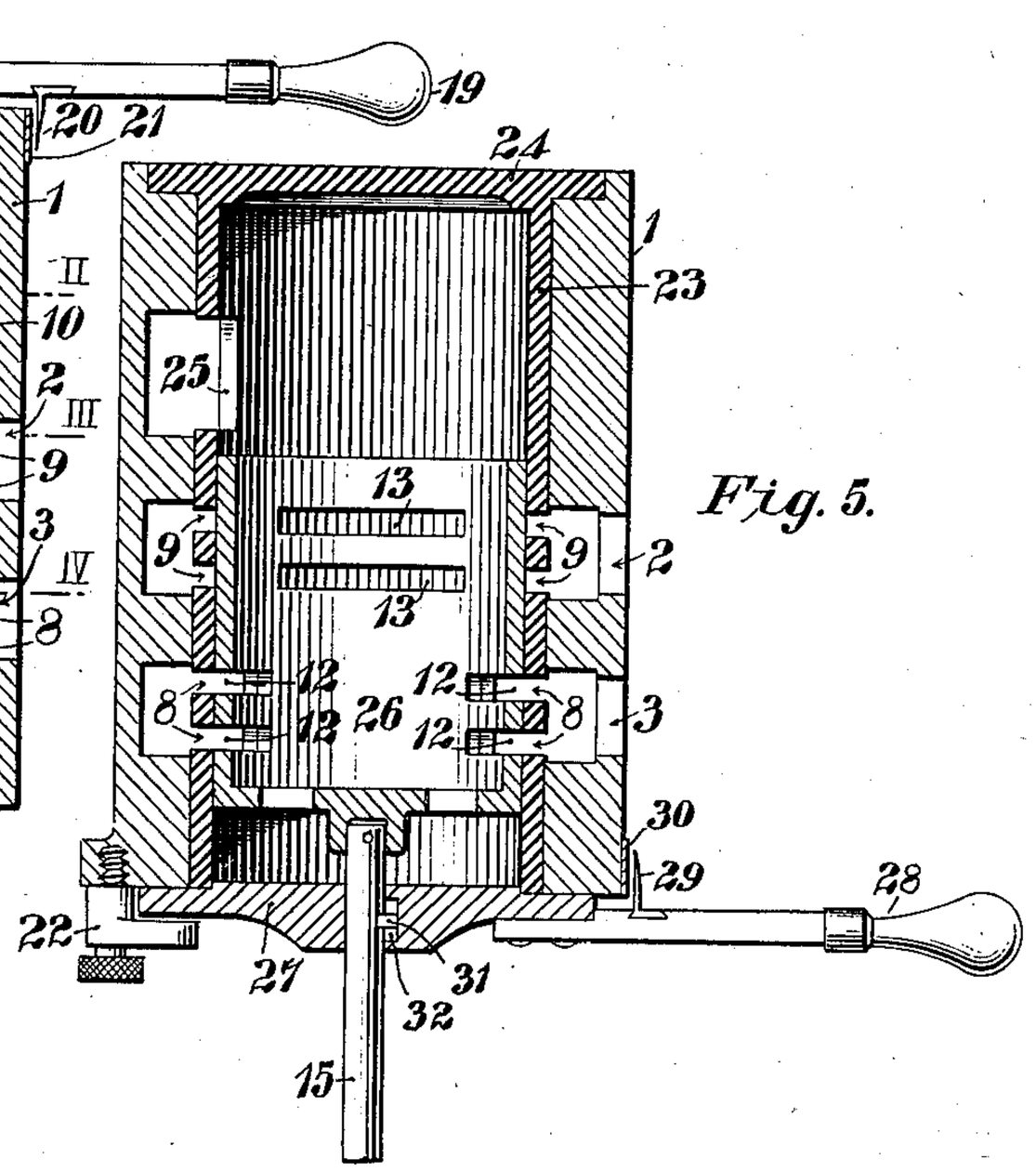


Fig. 5.

Fig. 2.

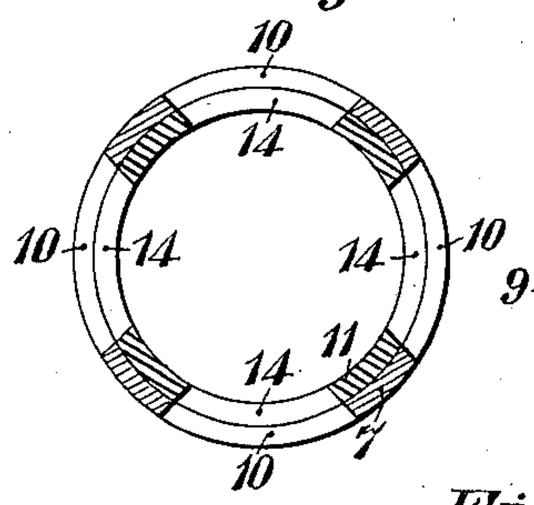


Fig. 3.

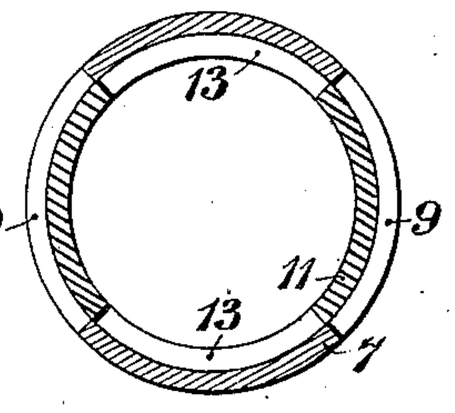
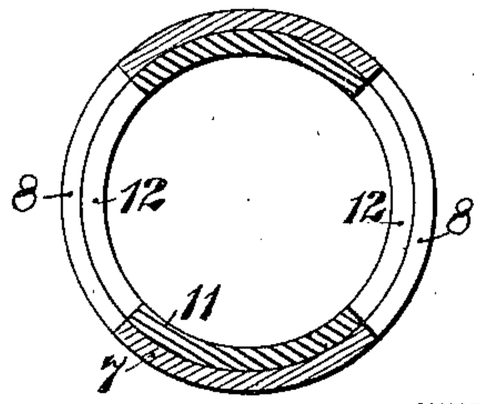


Fig. 4.



WITNESSES:

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AIR AND GAS MIXING AND GOVERNING DEVICE FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 685,510, dated October 29, 1901.

Application filed September 6, 1900. Serial No. 29,203. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. FLINT, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Air and Gas Mixing and Governing Devices for Gas-Engines, of which the following is a specification.

My invention relates to gas-engines, and particularly to devices employed for providing a mixture of air and gas of the proper proportions and supplying such mixture to the cylinders or igniting-chambers of gas-engines in proper quantities to insure a satisfactory operation of such engines.

The object of my invention is to provide a device which shall be more simple and inexpensive in construction and less liable to disarrangement in service than devices of the same general character heretofore employed.

The type of apparatus to which my invention pertains is disclosed in Patent No. 583,585, granted to Westinghouse and Ruud June 1, 1897, and reference may be had to that patent for any illustration or description of the details of coöperating parts not specifically shown and described herein. The apparatus of the patent above referred to embodies a stationary bushing provided with separate ports for the admission of air and gas and another set of ports for the outlet of the explosive mixture and a tubular valve located within the bushing and made in two parts, one of said parts having ports corresponding generally in number and position to the air-admission ports in the bushing and the other part having ports corresponding generally to the gas-admission ports and the ports for the outlet of the mixture in the bushing. In this construction the amount of explosive mixture furnished to the engine in connection with which the apparatus is used is varied in accordance with the variations in the speed of the engine by a longitudinal movement of the valve under the action of a pendulum or ball governor, and the relative amounts of air and gas which are combined to form the explosive mixture are regulated by independent rotative adjustment of the two parts of the valve.

While my present invention embodies several of the features of the construction set forth in the Westinghouse and Ruud patent, it simplifies and cheapens the construction of the valve. The partial vacuum which is formed inside the mixing-valve of the Westinghouse and Ruud patent tends to powerfully draw the two halves together, and if the joint between them is not absolutely square they will be forced to stand at an angle and bind in the bushing, thus disturbing the regulation of the engine. It is found in practice that this joint is a troublesome one to make with sufficient accuracy. Hence by making the valve of only one piece I cheapen the construction at the same time that I make it less liable to derangement. I also obviate the necessity of providing two sets of devices for effecting rotative adjustment of the valve and in general simplify and strengthen the construction.

In the accompanying drawings, Figure 1 is a view, partially in section and partially in side elevation, of a valve and its bushing and the governing mechanism constructed in accordance with my invention. Figs 2, 3, and 4 are transverse sectional views taken, respectively, on lines II II, III III, and IV IV of Fig. 1. Fig. 5 is a vertical section of a modified form of my invention.

Referring now to the details of construction illustrated in the drawings, the frame or casing 1 is provided with a gas-inlet port 2 and air-inlet port 3, corresponding annular chambers 4 and 5, and an annular chamber or passage 6 for receiving the explosive mixture and from which such mixture is conducted to the cylinder or cylinders of the gas-engine. (Not shown.) The frame or casing 1 is also provided with a bushing 7, which has a set of circumferentially-arranged ports 8 opening into the chamber 5, similar ports 9 opening into the chamber 4, and a set of larger ports 10 opening into the chamber 6. The number and size of the ports in each of these sets may obviously be varied from what is shown without in any way departing from my invention. The tubular valve 11 constitutes an integral structure and is provided with a set of ports 12, that are circumferen-

tially located in approximately the same plane or planes as the ports 8, and with ports 13, that are circumferentially arranged in approximately the same plane or planes as the ports 9, and with larger ports 14 in circumferential alinement with the ports 10 in the bushing. In order that the valve may be adjusted longitudinally so as to vary the amount of explosive mixture supplied to the engine, and therefore maintain the engine speed substantially constant, the valve 11 is supported upon the end of a shaft 15, that is adjusted longitudinally by a governor 16, operated from the main shaft of the engine (not shown) in the usual manner. For the purpose of regulating or adjusting the relative quantities of air and gas admitted to the interior of the mixing-valve 11 I locate the gas and air ports out of longitudinal alinement and preferably so much out of alinement that when the air-ports are wide open the gas-ports are closed, and vice versa. As shown in the drawings, the outlet-ports for the mixture are in longitudinal alinement with the gas-ports; but this is immaterial, since the ports are made large enough to at all times offer a sufficient opening for the passage of the mixture. In fact, they may be omitted entirely from the valve if the modified construction shown in Fig. 5 be used. It will be observed by reference to the drawings that the ports are shown in such position that the air-inlet ports are wide open when the gas-inlet ports are completely closed. If the valve 11 be adjusted rotatively in either direction, such adjustment will obviously inversely vary the sizes of the air and gas ports, the one increasing as the other decreases, thus making it possible to get any desired mixture of gas and air. If the load is light, the governor-balls will fly out and raise the mixing-valve till both gas and air ports are sufficiently reduced to admit only sufficient mixture to maintain the proper speed. Such adjustment will also decrease the size of the outlet-ports; but it is feasible to make such ports of sufficiently large size so that the variation produced by varying the size of the air and gas ports will not affect the operation of the engine.

As a means for rotatively adjusting the valve 11 I have shown pins 17 projecting upward from the valve-head, which may be grasped by any suitable fitting 18, provided with a handle 19 and pointer 20, the casing 1 being provided with a graduated scale 21 and a locking-clamp 22 in order to effect the adjustment. Any other suitable adjusting means may obviously be employed, if desired.

In Fig. 5 the bushing 23 is provided with a cap-plate 24 and with one or more outlet-ports 25. It has also the same air and gas ports 8 and 9 as in the preceding figures. The valve 26 also has the same air and gas ports 12 and 13 as in the preceding figures; but the outlet-port is the open upper end of the valve, which terminates just below the port or ports 25. In order to adjust the valve rotatively, I provide the bottom of the bushing 23 with a rotative plate 27, having a handle 28 and a pointer 29, the casing 1 having a scale 30, with which the pointer coöperates. Any suitable sliding but non-rotative connection, such as the pin 31 and groove 32, may be employed between the shaft 15 and the plate 27.

While I have found in practice that the construction and arrangement shown are admirably adapted for providing such adjustment as will insure the proper mixture of air and gas to secure the best results in the operation of engines, the construction and arrangement may be varied from what is shown as regards the number, shape, and size of ports, &c., if desired, without departing from the spirit and scope of my invention. It will be noted also that the amount of mixture is controlled by the longitudinal movement of the valve and the proportion by its angular or rotative movement. Obviously the governor could be made to rotate a suitably-arranged valve to control the amount of gas, while a longitudinal motion could be made to control the mixture by increasing the opening of one set of ports at the same time that it decreased the opening of the other set.

I claim as my invention—

1. A mixing and governing device for gas-engines comprising a cylindrical bushing having inlet-ports for air and for gas and outlet-ports for the mixture of air and gas, in combination with a cylindrical valve located in said bushing and having air and gas ports corresponding to those in the bushing but having such relative displacement that a movement of the valve in one direction will inversely vary the size of the air and gas ports, and a movement at right angles will directly vary the size of said ports, an automatic governor and connections between the same and the valve for making the last-named adjustment.

2. A mixing and governing device for gas-engines comprising a cylindrical bushing having inlet-ports for air and for gas and outlet-ports for the mixture of air and gas, in combination with a tubular valve movably located in said bushing and having air and gas ports corresponding to the air and gas ports in the bushing, the air-ports being displaced in one direction with reference to the gas-ports so that an adjustment of the valve in that direction effects an inverse variation in the air and gas port areas, an automatic governor and connections between the same and the valve for adjusting the latter so as to effect a simultaneous direct variation of the air and gas ports.

3. A mixing and governing device for gas-engines comprising a cylindrical bushing having air, gas and mixture ports, in combination with a single tubular valve adjustably mounted in said bushing and having air and gas ports corresponding to the air and gas ports in the bushing but so disposed that a

rotative adjustment of the valve will vary the inlet-port areas for air and gas inversely, an automatic governor and connections between the same and the valve for adjusting the latter longitudinally.

4. A mixing and governing device for gas-engines comprising a cylindrical bushing having circumferentially-disposed sets of air and gas ports in combination with a single tubular valve adjustably located in said bushing and having corresponding sets of air and gas ports, the air-ports being laterally displaced with reference to the gas-ports so that a rotative adjustment of the valve will vary the amounts of air and gas inversely, an automatic governor and connections between the same and the valve for adjusting the latter longitudinally.

5. A mixing and governing device for gas-engines comprising a cylindrical bushing and a tubular valve adjustably mounted therein each having circumferentially-disposed ports for air, gas and a mixture of air and gas, and the air-ports in one of said parts being laterally displaced with reference to its gas-ports, whereby a rotative adjustment of the valve will effect an inverse variation in the amounts of air and gas admitted, an automatic governor and means for connecting the same to the valve to adjust the latter longitudinally.

6. A mixing and governing device for gas-engines comprising a bushing and a tubular valve adjustably located therein, said bushing being provided with air and gas inlet ports and with mixture-outlet ports of greater width, all in longitudinal alinement and said valve having corresponding ports the dimensions of which are substantially the same as those of the ports in the bushing, the gas-ports being, however, out of longitudinal alinement with the air-ports, in combination with a governor and means for connecting the same to the valve to adjust the latter longitudinally in accordance with the engine speed.

7. A mixing and governing device for gas-engines comprising a cylindrical bushing having gas and air inlet ports, a tubular valve having corresponding gas and air ports so located that longitudinal motion of the valve controls the amount of the mixture by varying the air and gas ports together to the same or substantially the same amount, while the angular motion of the same controls the proportion of gas and air in the mixture by increasing the size of one set of ports at the same time that it decreases the size of the other set in conjunction with suitable means for allowing the mixture to leave the valve without hindrance at all adjustments.

In testimony whereof I have hereunto subscribed my name this 27th day of August, 1900.

WM. P. FLINT.

Witnesses:
EDWIN RUUD,
JAMES B. YOUNG.