J. A. & J. CHARTER.

CHARGE FORMING DEVICE FOR GAS ENGINES.

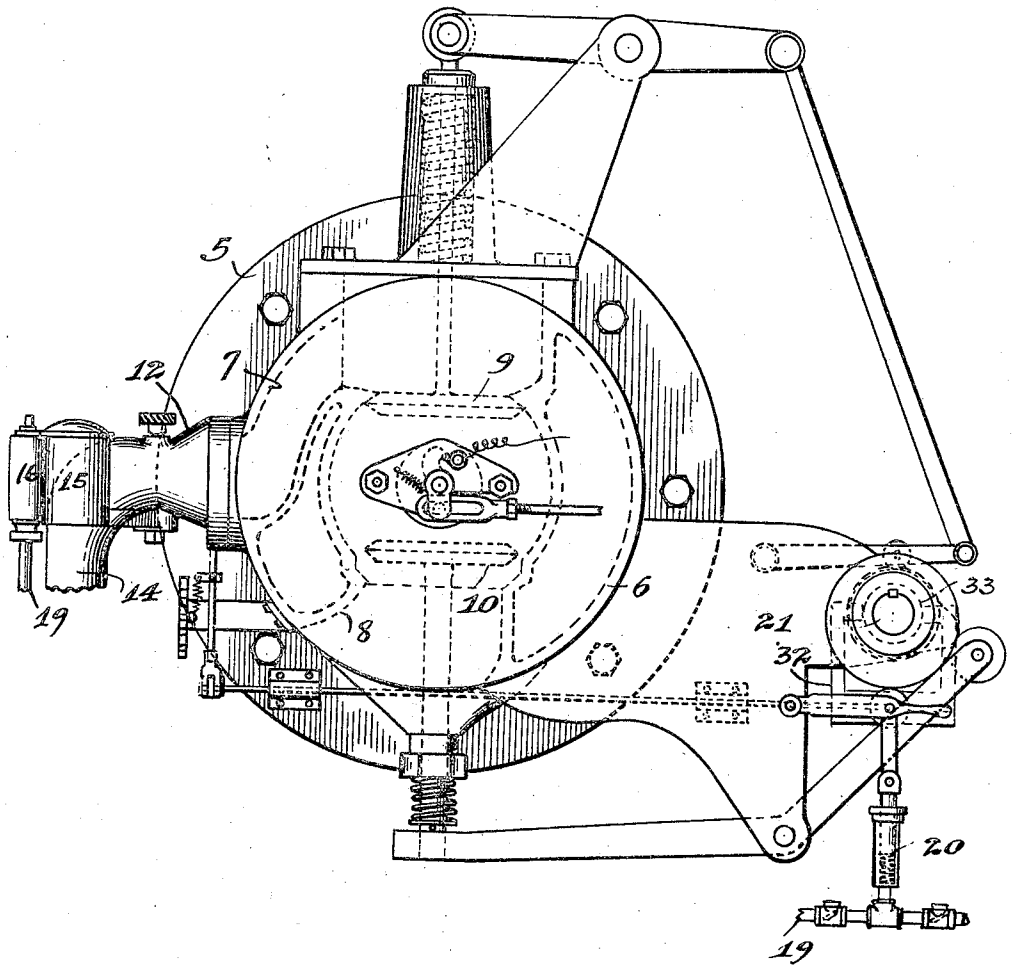
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2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

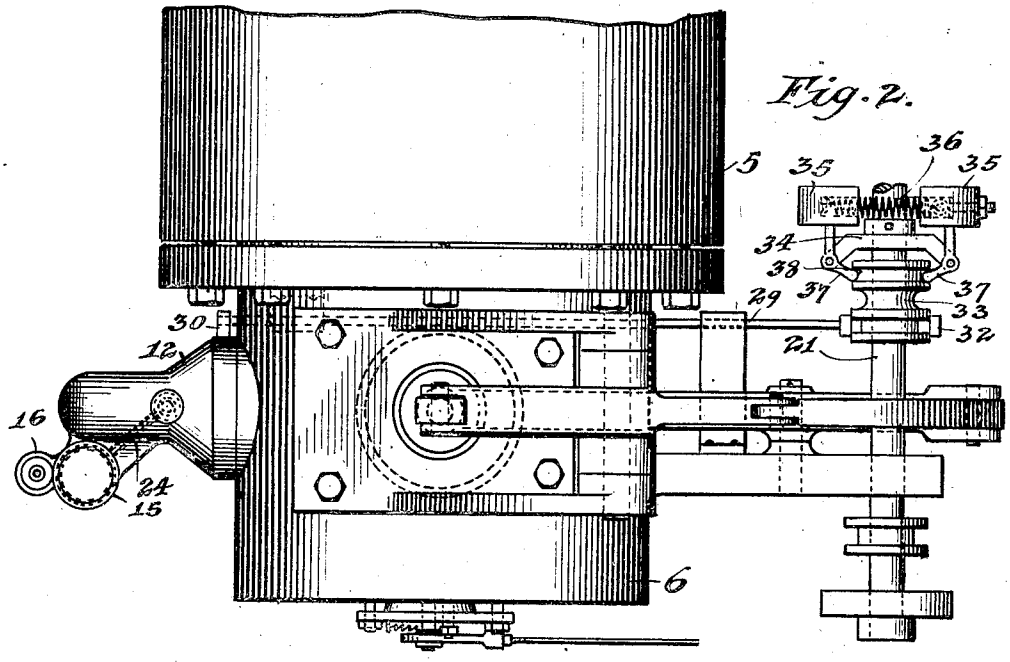


Fig. 3.

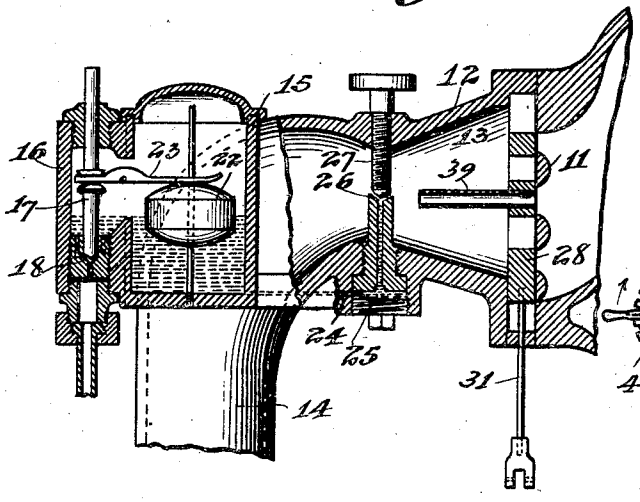
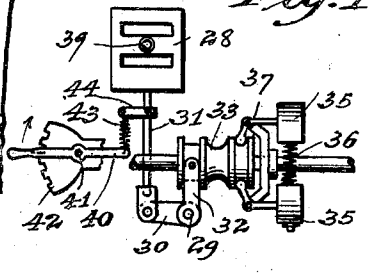


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CHARGE-FORMING DEVICE FOR GAS-ENGINES.

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Application filed July 28, 1908. Serial No. 445,779.

To all whom it may concern:

Be it known that we, JAMES A. CHARTER and JOHN CHARTER, both citizens of the United States, and residing, respectively, at Chicago, in the county of Cook and State of Illinois, and Xenia, in the county of Clay and State of Illinois, have invented certain new and useful Improvements in Charge-Forming Devices for Gas-Engines, of which the following is a specification.

This invention relates to the art of internal combustion engines, and pertains more especially to an improved mechanism for forming and governing the explosive charges admitted to the engine-cylinder.

One object of the invention is to provide an improved device of the character stated, which will facilitate the running of the engine alone or under light load with an economy of fuel, and prevent the stoppage of the engine through lack of sufficient fuel supply on occasions when the load is suddenly removed and the governing slide is practically closed to prevent the engine from racing.

Another object of the invention is to provide a means whereby the action of the centrifugal governor which controls the governing slide for the charge may be varied, so as to exert a greater or less closing action upon said slide under a given engine speed.

Other minor objects and advantages of the invention will be apparent from the following description.

Our invention, in one practical form in which the same may be embodied, is illustrated in the accompanying drawings, wherein,—

Figure 1 is an end elevation of the cylinder and side-shaft of a gas-engine, showing our improvements applied thereto. Fig. 2 is a top plan view of the parts shown in Fig. 1. Fig. 3 is a detail view, enlarged, in vertical section through the oil-supplying and charge-forming mechanism. Fig. 4 is a detail elevation more particularly illustrating the connection of the governor to the governing slide, and the governor-regulating device.

Referring to the drawings, 5 designates the engine-cylinder, and 6 the cylinder-head suitably secured thereto, which head is, as usual, hollow, and is ported to form the admission and exhaust passages 7 and 8, respectively, for the supply of the explosive charge and the discharge of the products of combustion. The usual cam-controlled supply and exhaust valves 9 and 10, respectively, are also indicated in Fig. 1.

Formed across the outer end of the supply-conduit 7 is a grid-shaped valve-seat 11, over which is secured a hollow casting 12 forming within itself a mixing-chamber 13, leading into which is the air-supply passage 14. Integral with or secured alongside of the casting 12 is a second casting comprising a vertical float-chamber 15 and a valve-chamber 16. In the latter is a pin-valve 17 controlling the supply of hydro-carbon fuel through a valve-seat 18, to which the fuel is supplied through a pipe 19 from a pump 20 (Fig. 1), preferably actuated from a cam on the side shaft 21 of the engine in a manner common and well understood. In the float-chamber 15 is a float 22, which, through a pivoted lever 23, automatically controls the fuel-intake 17, closing said valve when the body of fuel in the communicating valve and float chambers has reached a predetermined height, and automatically opening said valve when said fuel falls below a predetermined height.

The bottom of the float-chamber communicates through a duct or passage 24 with a small fuel-chamber 25 formed in the lower wall of the casting 12; and from said chamber 25 rises an axially-cored nozzle 26, said nozzle rising to a height slightly above the maximum level of the liquid fuel in the float-chamber, and preferably having its tip slightly hollowed or concaved, as shown. Directly above the nozzle 26 is a manually-operated valve 27, through which the size of the opening in the tip of the nozzle for the discharge of fuel may be regulated.

Slidably mounted on the grid-valve seat 11 is a grid-valve 28 constituting the governing slide for the explosive mixture on its way to the engine-cylinder. This slide is actuated to more or less open or close the passages between the grid-bars of the seat by a governor mechanism on the side shaft 21, as follows: 29 designates a rock-shaft suitably mounted in the engine-frame, said rock-shaft having fast on one end thereof a laterally-projecting arm 30 (Fig. 4), the outer end of which is pivotally connected to the lower end of the stem 31 of the slide 28. The other end of the rock-shaft 29 carries an upwardly-extending yoke 32, the arms of which em-

brace a circular groove formed in a collar 33 slidably mounted on the shaft 21. Fast on shaft 21 is a ring or collar 34, pivoted on which are a pair of centrifugal governor weights 35 that are connected together by a spring 36. The arms of the governor weights 35 have rigid therewith inwardly-projecting fingers 37 that engage an annular groove 38 in the sleeve 33. From this it will be seen that as the governor expands under the centrifugal action of the weights 35, the collar 33 will be moved longitudinally on the shaft 21, the shaft 29 will be rocked, and the slide 28 will be moved along the grid-seat 11 in a direction to contract the openings for the passage of the discharge; and, vice versa, as the speed decreases and the governor contracts, the shaft 29 will be rocked in the opposite direction, opening the passages through the grid 11.

We have found in practice that where the engine is drawing but lightly on the mixing mechanism, owing to running slowly, or owing to the practically complete closure of the supply-passage by the slide 28, as when the load is suddenly removed and the engine races, the suction effect is insufficient to draw the oil up through the tip of the nozzle 26 and properly vaporize and mix the same. To remedy this, we provide a tube 39, which is mounted at one end in and through the slide, and at its other end lies in the neighborhood of the upper end of the nozzle 26. This tube concentrates, as it were, the suction effect upon the air in the vicinity of the tip of the nozzle 26, thereby producing a sufficient vacuum effect to draw the fuel therefrom, where the same suction effect distributed throughout the entire cross-sectional area of the mixing-chamber would be insufficient; and hence this device affords a provision for continuously running the engine under light charges sufficient to keep the same in motion, and obviate the annoyance of re-starting whenever the engine has stopped through its failure to induce a sufficient charge to maintain its operation.

In Fig. 4 we have illustrated a simple device for graduating the throttling effect of the governor upon the slide 28; this device consisting of a lever 40 pivoted at 41 to a fixed quadrant rack 42, preferably located at a convenient point in front of the cylinder-head, one end of said lever 40 being connected through a spring 43 and clip 44 to the stem 31 of the slide 28, and the handle end of the lever 40 being provided with a suitable spring-pressed detent engaging the teeth of the quadrant rack. The spring 43 opposes more or less the centrifugal tendency of the governor weights, thus rendering the slide 38 more or less susceptible to the controlling effect of the governor weights, according to the tension under which the spring 43 is placed. For instance, when the engine is to be operated at an increased speed, the spring 43 will be placed under considerable tension, so that practically the full speed of the engine can be developed. On the other hand, when the speed is to be reduced, the spring 43 is adjusted to exert but little or no effect upon the slide, thus leaving the governor free to alone control the latter.

We claim:

1. In a charge-forming mechanism for engines, the combination with a mixing chamber having an air supply passage leading thereto and an oil supply nozzle projecting therein, of a valve controlling the communication of said mixing chamber with the induction passage of the engine, and a tube carried by said valve, said tube extending inwardly of the mixing chamber in a direction at right angles to said oil supply nozzle to a point adjacent to the delivery end of the latter and exerting a local suction thereon when the valve is closed, substantially as described.

2. In a charge-forming mechanism for engines, the combination with a mixing-chamber communicating on one side with the induction passage of the engine and on the other with the atmosphere, of an oil-supply nozzle projecting upwardly into said mixing chamber, means for maintaining a supply of oil in said nozzle at a height below the delivery end thereof, a governor-controlled slidable grid-valve between said mixing-chamber and induction passage, and a tube carried by said valve and extending inwardly of the mixing-chamber, said tube being so mounted in the valve that when the latter is closed its outer end communicates with the induction passage while its inner end lies adjacent to the delivery end of said nozzle, producing a local suction effect upon the oil in the latter, and when said valve is opened, said tube is without substantial effect upon said delivery nozzle, substantially as described.

3. In a charge-forming mechanism for engines, the combination with a mixing-chamber formed with an air-supply passage, and communicating with the induction passage of the engine, of an oil-supply nozzle projecting upwardly into said mixing chamber, means for maintaining a supply of oil in said nozzle at a height below the delivery end thereof, a valve between said mixing chamber and induction passage, a tube carried by said valve and extending inwardly of the mixing chamber whereby to produce a local suction effect upon the delivery end of said nozzle when said valve is closed, a governor mechanism connected to and operating said valve according to the speed of the engine, and means for opposing the closing movement of said valve, substantially as described.

4. In a charge-forming mechanism for engines, the combination with a mixing chamber formed with an air-supply passage, and communicating with the induction passage of the engine, of an oil-supply nozzle projecting upwardly into said mixing chamber, means for maintaining a supply of oil in said nozzle at a height below the delivery end thereof, a valve between said mixing chamber and induction passage, a tube carried by said valve and extending inwardly of the mixing chamber whereby to produce a local suction effect upon the delivery end of said nozzle when said valve is closed, a governor mechanism connecting to and operating said valve according to the speed of the engine, and adjustable elastic means for opposing the closing movement of said valve, substantially as described.

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