

F. H. ARMSTRONG.
 STARTER FOR GAS ENGINES.
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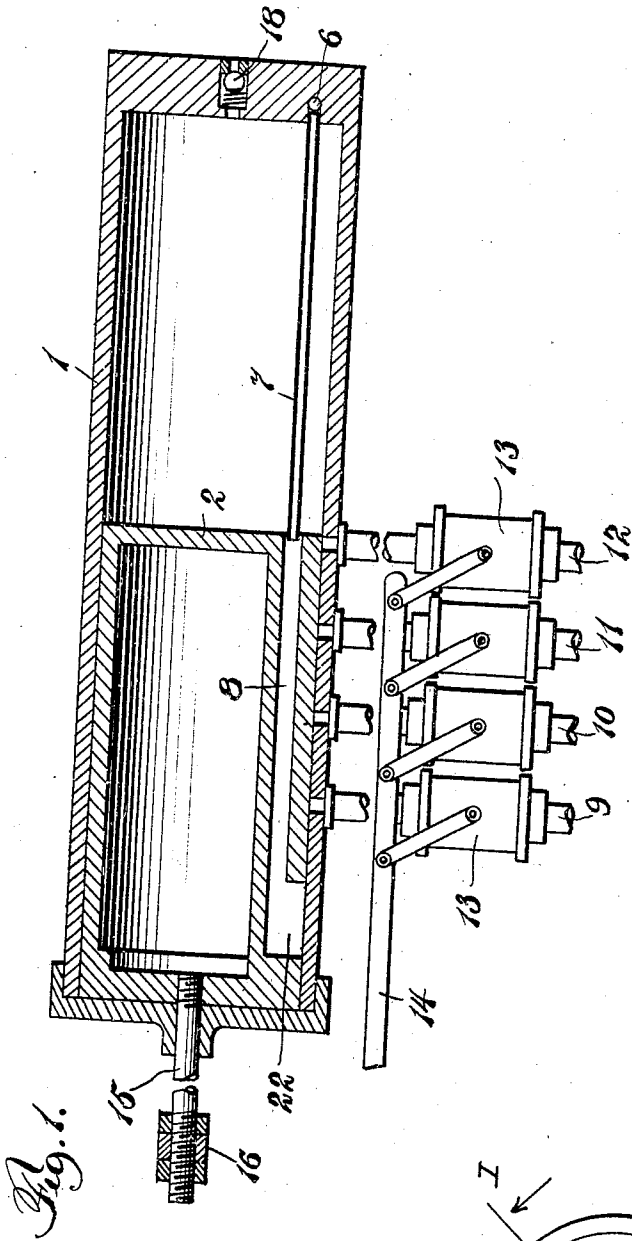
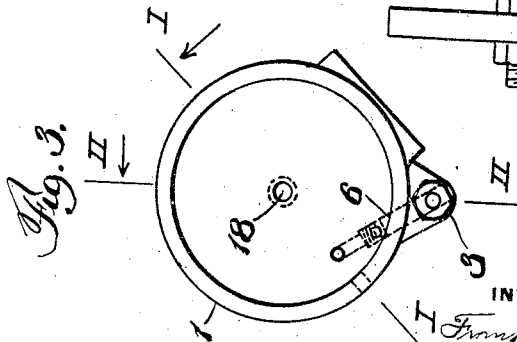
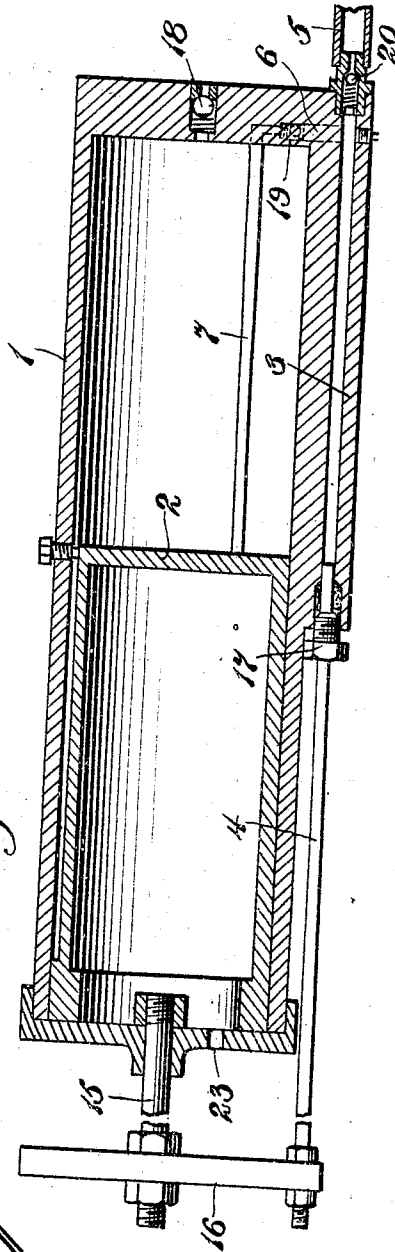


Fig. 2.



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STARTER FOR GAS-ENGINES.

945,738.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANK H. ARMSTRONG, a citizen of the United States, residing at Vulcan, in the county of Dickinson and State of Michigan, have invented certain new and useful Improvements in Starters for Gas-Engines, of which the following is a specification.

The invention relates to mechanism for supplying preliminary charges of fuel to the engine cylinders, and has for its objects; the general simplification and improvement of apparatus of this character; the provision of an apparatus adapted to supply a plurality of engine cylinders with uniform charges; the provision of an apparatus which may be cheaply applied to the ordinary gas engine; and the provision of an apparatus wherein a very effective atomization of the particles of liquid fuel is secured combined with a thorough and proportionately correct mixture of the fuel and air. One embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a longitudinal section through the device on the line I—I of Figure 3.

Figure 2 is a longitudinal section through the device on the line II—II of Figure 3, and

Figure 3 is an elevation of the right hand end of the cylinder of Figures 1 and 2.

Briefly stated the device comprises in the form illustrated, a cylinder, a delivery passage leading from the side of the cylinder to an engine cylinder which is to be charged, a manually operable piston in the cylinder provided with a longitudinally extending passage-way having a part thereof adapted during the stroke of the piston to register with the delivery passage, a fuel nozzle in alinement with the passage-way, and means for forcing a stream of fuel through the nozzle as the piston moves forward. In the present instance the last mentioned means is a separate piston and cylinder, but the invention comprehends other means as well. A check valve is provided in the front portion of the cylinder, so that on the forward movement of the piston the air compressed in front thereof is forced through the passage-way together with the stream of liquid fuel, thus securing the necessary explosive mixture.

Referring to the general arrangement of parts as shown in Figures 1 and 2, the principal parts may be enumerated as follows;

1 is the cylinder, which is conveniently located with respect to the engine cylinders (not shown); 2 is the piston for the cylinder, which is made substantially hollow in order to lighten the device; 3 is an auxiliary cylinder (Fig. 2), in the present instance integral with the cylinder 1; 4 is a piston for the cylinder 3; 5 is the fuel supply pipe by means of which fuel is conducted to the cylinder 3; 6 is a passage for conducting the fuel from the cylinder 3 to the passage 8 in the piston 2; 7 is the nozzle of the connection 6, by means of which a fine stream of fuel is injected into the passage-way 8 in the piston 2; 9, 10, 11 and 12 are delivery pipes leading from the cylinder 1 to the four engine cylinders, which delivery pipes are provided with the valves 13; and 14 is an operating rod connected to the handles of the valves as illustrated in Figure 1, whereby they may be simultaneously operated.

The piston 2 is provided at its rear end with a rod 15, and this rod is secured to the piston 4 by means of the connecting bar 16 in the manner shown, such bar 16 serving as a handle whereby the two pistons may be simultaneously operated in the same direction. The cylinder 3 is provided with a stuffing box 17 at its rear end, and an outlet 23 is provided at the rear end of the cylinder 1 (Figure 2) in order to permit the free escape of air from the cylinder as the piston 2 moves to the left. A ball spring held check-valve 18 is provided at the front end of the cylinder 1, whereby air enters freely upon the rearward movement of the piston 2, but is prevented from escaping on the forward movement thereof. A ball check-valve 19 is also provided in the passage 6, such valve being spring-held closed, and permitting a flow from the cylinder 3 to the nozzle 7, but preventing any reverse flow. The ball check-valve 20 prevents any back flow through the supply pipe 5. The diameter of the passage-way 8 (Figure 1) is slightly greater than that of the pipe 7, so that a flow of air may occur intermediate the periphery of the pipe 7 and the wall of the passage-way 8.

Assuming that the parts are in the position occupied in Figures 1 and 2, and that the cylinder 3 contains a charge of liquid fuel supplied from the pipe 5, the operation in introducing a charge of explosive through the pipes 9, 10, 11 and 12 to the engine cylinders is as follows. The handle 14 is

first operated to open all of the valves 13, and the handle 16, and the pistons 2 and 4 operated thereby are then thrust vigorously forward from the position indicated in Figure 2. The fluid in the cylinder 3 is forced through the passage 6 and the nozzle 7 into the passage-way 8, the fine stream striking the wall at the rear end of the passage-way and being atomized to a large extent. At the same time the air compressed upon the front side of the piston 2 is driven rearwardly through the passage-way 8 intermediate the walls thereof and the outer surface of the nozzle 7 at a high velocity, the force of this air assisting still further in vaporizing the liquid fuel from the nozzle 7, and a thorough mixture is secured in the rear end of the passage-way. A certain amount of compression is attained in cylinder 1 and passage-way 8 before the portion 22 of such passage-way comes opposite the end of the pipe 9, so that a supply of fuel in the part 22 is insured and a sharp and effective flow of the explosive mixture occurs when registry between the portion 22 and the end of the pipe 9 occurs. The pipes 10, 11 and 12 are similarly supplied, as the piston 2 moves to its extreme forward position, so that a proper amount of explosive mixture is furnished to each engine cylinder. Before ignition in the engine cylinders, the valves 13 are closed by means of the handle 14 in order to protect the cylinder 1 and its parts from the pressure induced by the explosions of the cylinders.

It will be seen from the foregoing that the apparatus is extremely simple, and may be constructed at a small cost, also that certainty of a good mixture is insured, and a vigorous flow of the explosive mixture through the delivery pipes is provided for, as the portion 22 of the passage-way 8 registers therewith. The apparatus is obviously capable of use in any desired position, and may be applied to engines having any number of cylinders. Various other advantages incident to the construction will be apparent to those skilled in the art.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is the following:—

1. In an engine starter, a cylinder, a delivery passage leading from the side of the cylinder, a piston in the cylinder provided with a passageway and adapted at one point in its stroke to register with the delivery passage, and means operated by the forward movement of the piston for forcing an explosive mixture through the passage-way and thence into the delivery passage.

2. In an engine starter, a cylinder, a plurality of delivery passages leading from the side of the cylinder, a piston in the cylinder provided with a passageway adapted dur-

ing the forward movement of the piston to register successively with the delivery passages, and means operated by the forward movement of the piston for forcing an explosive mixture through the passageway and thence into the delivery passages.

3. In an engine starter, a cylinder, a delivery passage leading from the side of the cylinder, a piston in the cylinder provided with a longitudinal passageway having a part adapted at one point of the stroke of the piston to register with the delivery passage, a nozzle in alinement with the passageway, means whereby air is admitted to the front end of the cylinder, and means for forcing a stream of fuel through the nozzle as the piston is moved forward.

4. In an engine starter, a cylinder, a delivery passage leading from the side of the cylinder, a piston in the cylinder provided with a longitudinal passageway having a part adapted at one point of the stroke of the piston to register with the delivery passage, a tube projecting into the passageway with a space intermediate the pipe and passageway for the passage of the air compressed in the front end of the cylinder, and means for forcing a stream of fuel through the tube as the piston is moved forward.

5. In an engine starter, a cylinder, a delivery passage leading from the side of the cylinder, a piston in the cylinder provided with a longitudinal passageway having a part adapted at one point of the stroke of the piston to register with the delivery passage, a tube projecting into the passageway with a space intermediate the pipe and passageway for the passage of the air compressed in the front end of the cylinder, and a pump for forcing a stream of fuel through the tube as the piston is moved forward, said pump being connected to operate in unison with the said piston.

6. In an engine starter, an air cylinder, a fuel cylinder, a pair of pistons for the cylinders, connected to move together, a delivery passage leading from the side of the air cylinder, an inlet check-valve for admitting air to the front end of the air cylinder, a longitudinal passageway leading from the front end of the air piston to the side thereof and adapted to register with the delivery passage, a tube projecting into the passageway with a space intermediate the pipe and the passageway for the passage of the air compressed in the front end of the cylinder, and a communication between the fuel cylinder and the tube.

In testimony whereof I have hereunto signed my name in the presence of the two subscribing witnesses.

F. H. ARMSTRONG.

Witnesses:

WM. STANAWAY,
WM. H. DANE.