C. PASEL.

FUEL INJECTING DEVICE.

APPLICATION FILED OCT. 24, 1912.

1,155,266.

Patented Sept. 28, 1915.

Fig. 1.

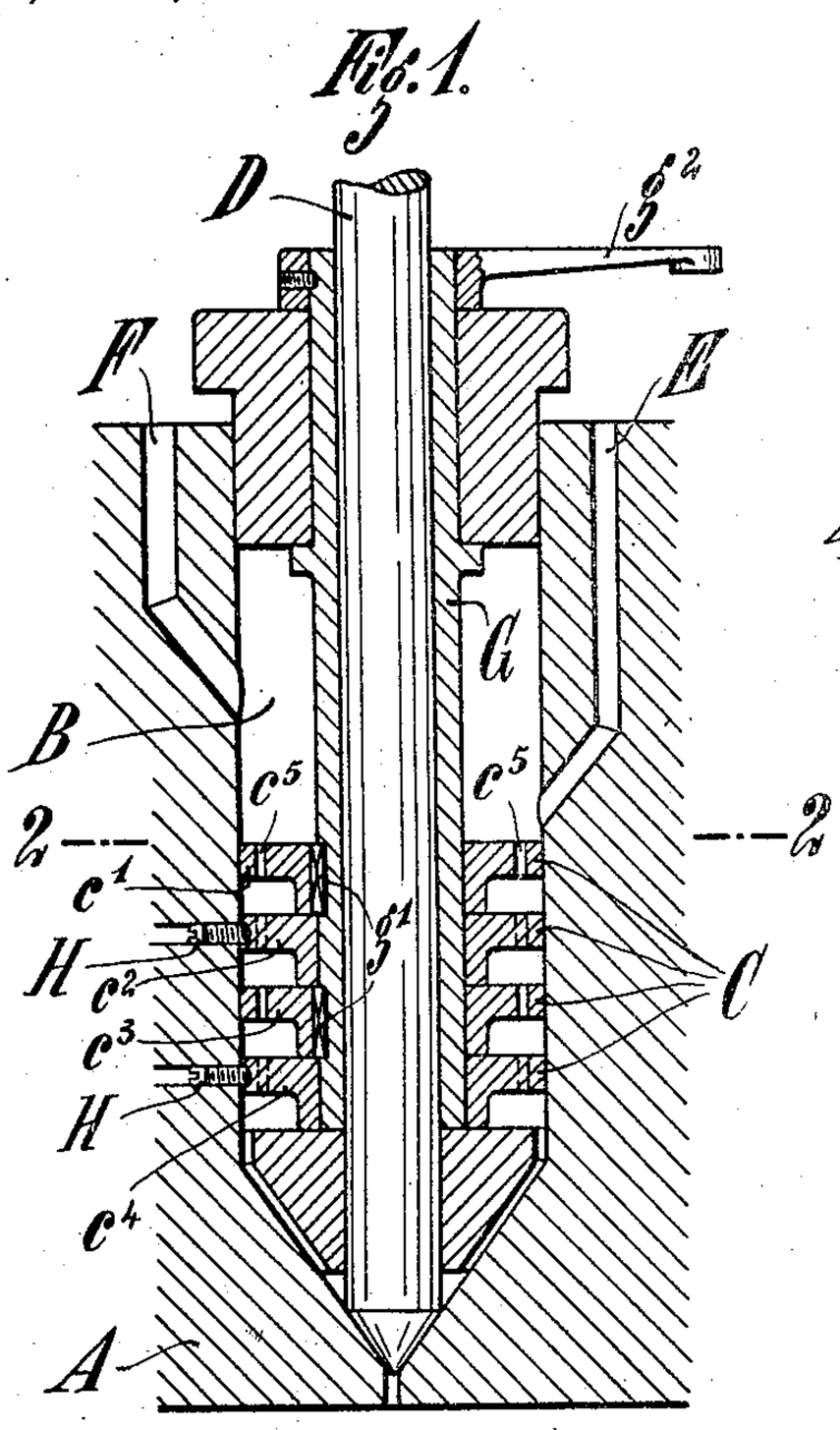


Fig. 3.

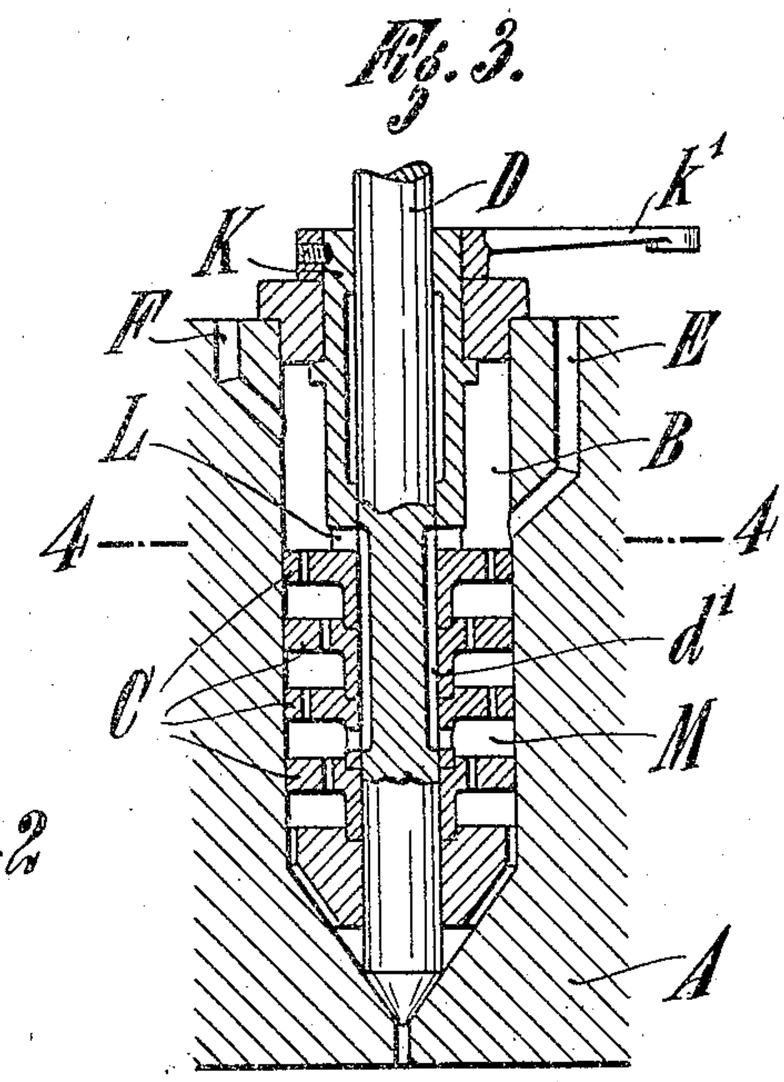


Fig. 4.

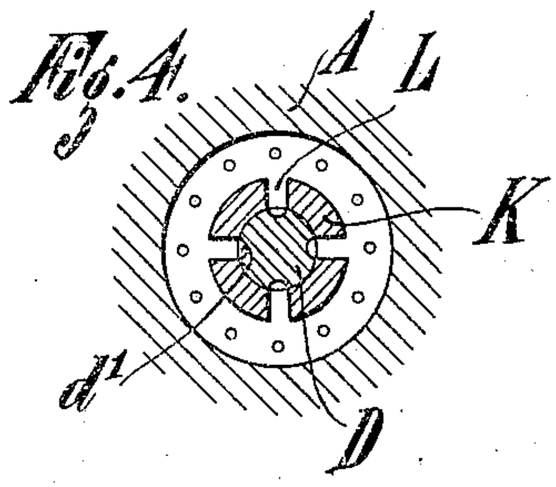


Fig. 2.

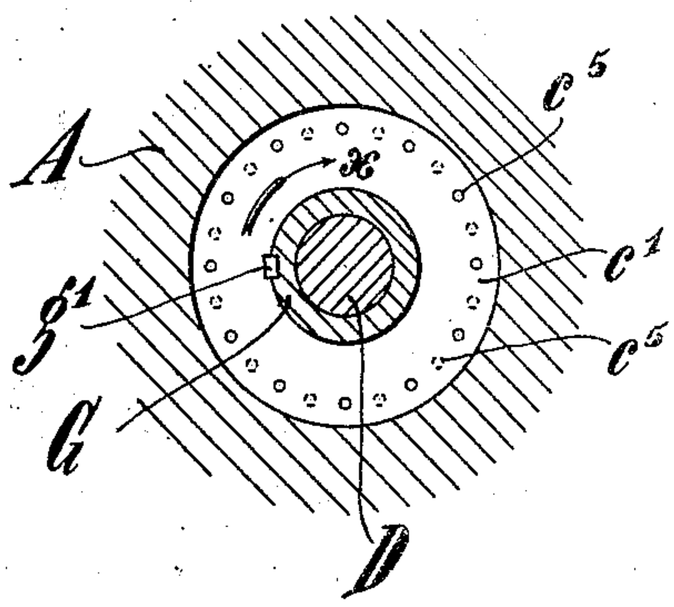
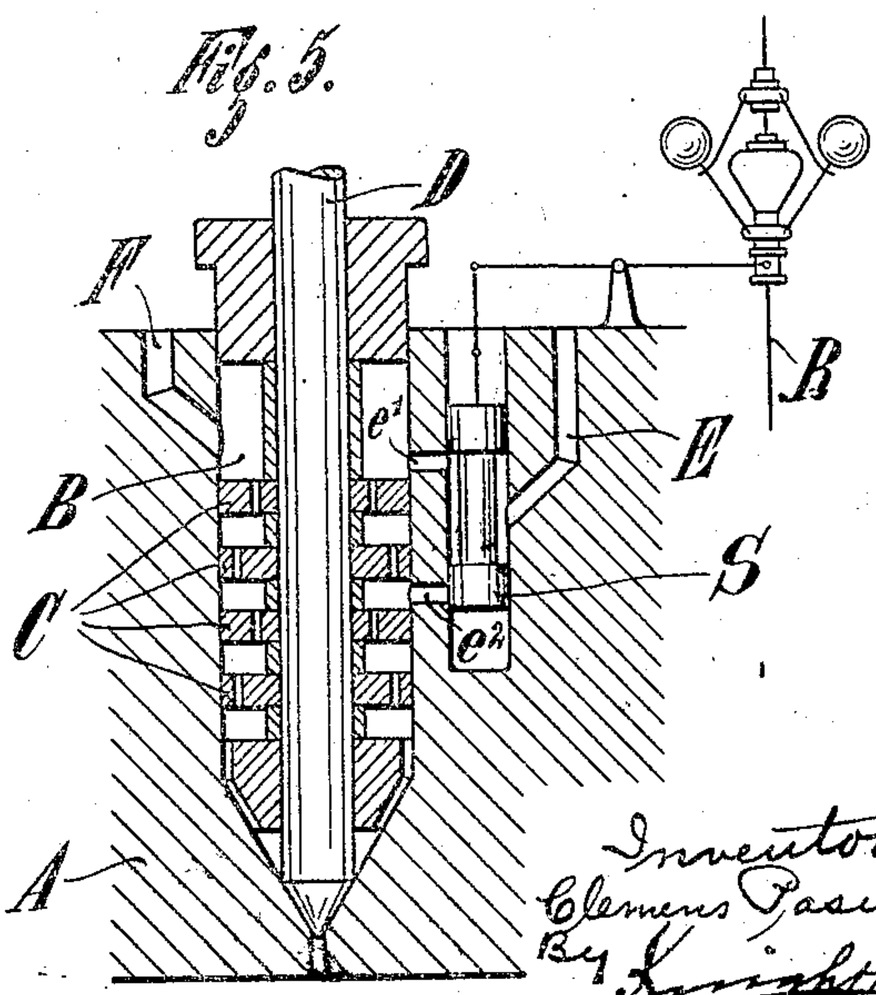


Fig. 5.



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CLEMENS PASEL, OF HEIDHAUSEN, NEAR WERDEN, GERMANY.

FUEL-INJECTING DEVICE.

1,155,266. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed October 24, 1912. Serial No. 727,610.

To all whom it may concern:

Be it known that I, CLEMENS PASEL, a citizen of the German Empire, residing at Heidhausen, near Werden, Ruhr, Germany, have invented certain new and useful Improvements in Fuel-Injecting Devices, of which the following is a specification.

The atomizers generally used in fuel valves for internal combustion engines give, as a rule, a very high resistance for the passing of the fuel which is necessary to produce a good atomizing of the admitted quantity of fuel during greater load on the engine. With diminishing load and the consequent smaller fuel consumption, this fuel passage resistance of the atomizer makes, however, a considerable disturbance because the fuel chamber will be completely emptied of fuel; and the freshly supplied, small quantity of fuel, will not be able to penetrate to the seat of the fuel needle and to displace the compressed injection air collected there, during the short available time. The consequence of this will be that the cold pressure air situated above the valve seat first enters the cylinder when the injection valve is opened, and will give occasion to mis-fire.

The object of the invention is to provide an atomizing device which is suitable for all loads of the engine. This object is attained by providing a means through which the resistance which the atomizer offers to the working fuel to be introduced can be altered in accordance with the load on the engine.

Three embodiments of the invention have been shown in the drawing wherein:

Figure 1 represents the parts of the fuel injecting device necessary to illustrate the invention with a plate-atomizer in longitudinal section; Fig. 2 a cross section on line 2—2 of Fig. 1. Fig. 3 a second embodiment of the injecting device in a similar view to Fig. 1. Fig. 4 a cross section on line 4—4 of Fig. 3 and Fig. 5 a third embodiment of the injecting device also in longitudinal section.

Regarding first Figs. 1 and 2 and the embodiments represented therein A designates a valve cage, wherein the atomizer C inclosing the fuel needle D is seated in the nozzle chamber B. The passages E and F serve to admit the fuel and the pressure air. The atomizer C consists of several atomizing plates c^1, c^2, c^3 and c^4 arranged one above another with a space between. These plates are provided with holes c^5 through which the fuel is driven on its way to the working cylinder. In distinction from other arrangements in known plate-atomizers wherein the holes of two adjacent plates are situated at different distances from the valve axis, all of the holes c^5 of the several plates in this case are arranged at the same distance from the valve axis. The atomizing plates c^1 and c^3 are non-revolubly connected with the sleeve G surrounding the fuel needle D by means of keys g^1, which sleeve can be turned by hand by means of a lever g^2 or else by means of the governor of the engine (not shown). The intermediate plates c^2, c^4 are on the other hand non-revolubly connected with the valve cage A by means of set screws H. As a consequence of this arrangement the plates may be adjusted in such relative position by turning the sleeve G, that the holes of two adjacent plates may be displaced to greater or smaller degree relative to each other or be completely alined.

The operation of the described device is as follows: With a great load of the engine, the atomizing plates will be brought into the position illustrated in Figs. 1 and 2, wherein the holes c^5 of adjacent plates are displaced relative to each other as far as possible and the fuel consequently receives the greatest resistance in passing the atomizer. Should the load of the engine now fall and the fuel transmission with it, the resistance will be diminished in a simple manner by turning the sleeve G, for instance in the direction of the arrow x, Fig. 2. The plates c^1, c^3 will be turned with the sleeve G to which they are non-revolubly connected, while the plates c^2, c^4 will retain their position in the nozzle chamber; by this means the angle through which the holes c^5 of two adjacent plates are displaced is gradually diminished, and these holes will finally come into alinement. The total resistance of the atomizer is thereby diminished so that even with a small load of the engine and with small quantity of fuel, the fuel can still reach the valve seat.

In the intermediate positions of the atomizing plates the passage resistance of the at-

omizer is naturally relatively greater. The amount of necessary diminishing of the resistance would depend on the greater or smaller explosiveness of the fuel utilized. For instance with a fuel not too difficult to ignite it might be sufficient to arrange only the upper atomizing plates revolubly, whereby the construction of the nozzle chamber will be considerably simplified.

In the two embodiments represented in Figs. 3, 4 and 5 the passage resistance in the atomizer may be varied in such a manner, that a part of the atomizer is entirely put out of action for the passing of the fuel, and the device is in both cases so arranged that the fuel may enter in the atomizer at different places located at different distances from the valve seat; corresponding to the different loads of the engine, so that the fuel is given a shorter way in the atomizer with a small load than with a full load.

In the embodiment of the fuel device shown in Figs. 3 and 4, wherein a normal plate-atomizer has been used, the fuel needle D is provided with several grooves d^1 by means of which the nozzle chamber B situated above the top atomizing plate may be connected or disconnected with the annular chamber M situated below the third atomizing plate. The needle D is for this purpose surrounded by a sleeve K above the atomizer which sleeve is seated on the top atomizing plate and is provided at its lower end with grooves L. By turning the sleeve K the ends of the grooves d^1 reaching out over the top atomizing plate may be connected or disconnected with the grooves L, while the lower ends of the grooves d^1 will remain in connection with the annular chamber M. The turning of the sleeve K can be accomplished either by hand or by the governor by means of the arm k^1. With great load of the engine, the sleeve K is adjusted relative to the fuel needle in such a manner that the upper ends of the grooves d^1 will be closed. The fuel is then compelled to take its way through all of the atomizing plates. On the other hand, should the load be diminished below a certain amount the sleeve K will be turned so far that grooves L and d^1 will be connected. The fuel admitted to the top atomizing plate will then take its way through the groove d^1 of the needle and will enter directly into the intermediate chambers M of the atomizer. In this manner, the passage resistance which the atomizer has set up against the fuel, can be considerably diminished, and it can therefore be made possible to admit the fuel to the valve seat even by a lower load of engine.

In the embodiment represented in Fig. 5, the fuel passage E is divided into two sets of passages e^1 and e^2, of which the passage e^1 opens into the nozzle chamber B, and the passage e^2 opens beneath the second atomizing plate in the atomizer C. A plunger S is seated in the connecting recess of the passages e^1 or e^2 by means of which each of the passages e^1 and e^2, in accordance with the load of the machine, may be brought in connection with the main passage E for the fuel. The plunger S can again be adjusted by the governor R of the engine. The operation of this device is evident from the figure and needs no further explanation.

I claim:

1. In a fuel injecting device for internal combustion engines having an atomizer, means for adjusting the resistance of the fuel passing through the atomizer in accordance with different loads of the engine.

2. In a fuel injecting device for internal combustion engines having a valve cage with a nozzle chamber, a valve spindle seated therein, and air and fuel passages opening into said nozzle chamber, an atomizer forward of said passage openings, means for adjusting the resistance of the fuel passing through the atomizer in accordance with different loads of the engine, said means consisting of two or more branch fuel passages, opening into the nozzle chamber one above the other at different distances from the seat of the needle valve, a device allowing the fuel to enter into the nozzle chamber through one or the other of these branch fuel-passages, thereby lengthening or shortening the way of the fuel through the atomizer.

3. In a fuel injecting device for internal combustion engines having a valve cage with a nozzle chamber, a valve spindle seated therein, and air and fuel passages opening into said nozzle chamber, an atomizer forward of said passage openings comprising a plurality of plates arranged around said spindle and spaces between said plates, a plurality of holes in said plates at different radial distances from the axis of the atomizer, a main fuel passage, a branch fuel passage opening into said chamber and a second branch fuel passage opening into one of said spaces between the plates, a recess connecting said main and said branch fuel passages and a plunger in said recess adapted to open one or the other of said branch fuel passages.

4. In a fuel injecting device for internal combustion engines having a valve cage with a nozzle chamber, a valve spindle seated therein and air and fuel passages opening into said nozzle chamber, an atomizer forward of said passage openings comprising a plurality of plates arranged around said spindle and spaces between said plates, a plurality of holes in said plates at different radial distances from the axis of the atomizer, a main fuel passage a branch fuel

passage opening into said chamber and a second branch fuel passage opening into one of said spaces between the plates, a recess connecting said main and said branch fuel passages and a plunger in said recess adapted to open one or the other of said branch passages; whereby the fuel will be given a long way with a great load of the engine and a short way with a small load of the engine.

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

CLEMENS PASEL [L.S.]

Witnesses:

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ALBERT NUFER.