C. C. REGENBOGEN & P. A. RITTER.

SAFETY DEVICE AGAINST EXPLOSIONS IN THE AIR PIPES OF INTERNAL COMBUSTION ENGINES.

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1,166,855. Patented Jan. 4, 1916.

Fig. 1.

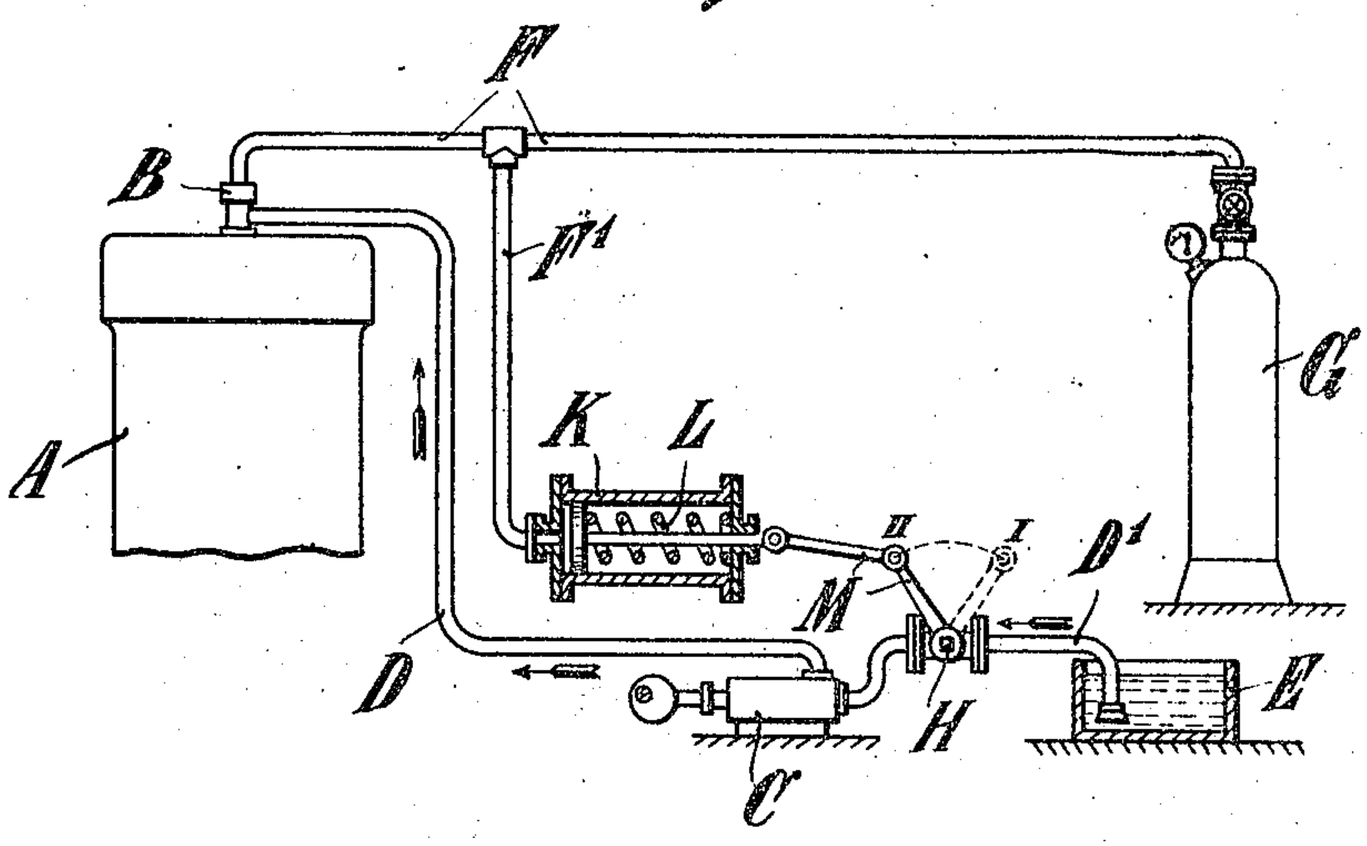
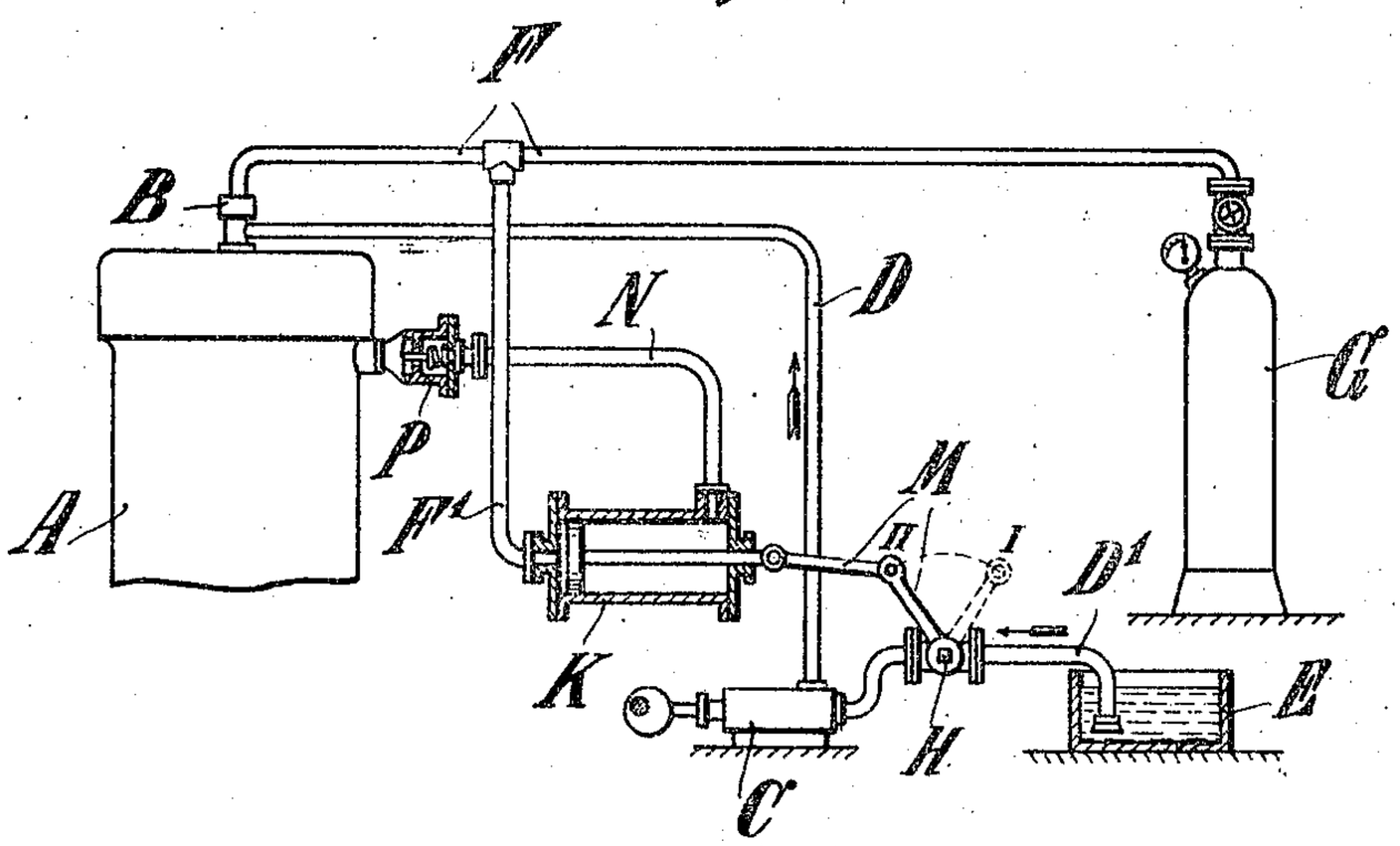


Fig. 2.



Witnesses
J. M. Reynboop
F. T. Stanley.

Inventors.
Conrad C. Regenbogen.
and Paul A. Ritter.
By Knight Bros
Attorneys.

UNITED STATES PATENT OFFICE.

CONRAD C. REGENBOGEN, OF KIEL-GAARDEN, AND PAUL A. RITTER, OF KIEL, GERMANY, ASSIGNORS TO FRIED. KRUPP AKTIENGESELLSCHAFT GERMANIAWERFT, OF KIEL-GAARDEN, GERMANY.

SAFETY DEVICE AGAINST EXPLOSIONS IN THE AIR-PIPES OF INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that we, CONRAD C. REGENBOGEN and PAUL A. RITTER, citizens of the German Empire, residing at Kiel-Gaarden, Germany, and Kiel, Germany, have invented certain new and useful Improvements in Safety Devices Against Explosions in the Air Pipes of Internal-Combustion Engines, of which the following is a specification.

Should the pressure of the injection air, for one reason or another, sink below the end pressure generated in the compression chamber of the cylinder during the operation of internal combustion engines, the fuel at the time contained in the nozzle will, on the opening of the fuel injection valve, be sprayed into the air conduit instead of in the cylinder. The combustible mixture generated thereby, might on accidental ignition give cause to an explosion extremely dangerous to the operators and the engine.

In order to prevent such explosion to be transmitted to the air supply tank, a non-return valve with brake disk is provided in the air duct, between the tank and the fuel injecting valve. It is, however, not possible in this manner to prevent that all the parts situated in front of the non-return valve in the direction of the cylinder, in particular the atomizer, the atomizer needle, etc., are destroyed by the explosion. The object of the present invention is now to provide a device, by means of which the consequences of the explosion are not lessened as formerly, but which prevents the forming of a combustible mixture altogether and thereby avoids effectively the occurrence of an explosion in the air duct.

Two embodiments of the present invention are diagrammatically illustrated in the accompanying drawings and; Figure 1 shows an elevation of the device partly in section and, Fig. 2, a view similar to Fig. 1 of a slightly modified arrangement.

In Fig. 1 A is the working cylinder of an injection internal combustion engine and B the fuel injecting valve. To the valve B are attached the fuel intake pipe D leading from the fuel pump C, and the air injecting pipe F, which is connected with a compressed air receptacle G. From the fuel pump C, its suction pipe D^1 leads to the fuel supply tank E.

In accordance with the present invention, a shutting off member H is inserted in this fuel suction pipe D^1, which member is opened and closed by a pressure regulator K in coöperation with a connecting rod M. The pressure regulator K is of the usual construction and consists of a piston running in a cylinder, and with a spring L acting on one side thereof, the other side standing under the influence of the pressure from the injection air, which has admittance to the cylinder of the pressure regulator by means of a branch pipe F^1 from the pipe F. The tension of the spring L being so selected, that it is able to expand when the pressure of the injection air has fallen below that required for injecting the fuel in the working cylinder.

The operation of the described device is as follows: During sufficiently high pressure of the injection air, the spring L will be compressed by the piston actuated by the pressure of the injection air, so that the shutting off member H is opened as shown by dotted lines, position I, in the drawing, and the fuel is permitted to pass through without hindrance. If now the pressure of the injection air sinks below the permissible amount, the spring L will expand and turn the piston of the pressure regulator to the left, so that the shutting-off member simultaneously is closed by means of the connecting rods M, see the full drawn position II. In order to sufficiently adjust the pressure limits through which the device is brought into action, provision might be made through which it would be possible to change the tension of the spring L.

As the packing of the piston in the pressure regulator is, on account of the high pressure of the injection air, connected with difficulties, a diaphragm may, for this purpose be utilized instead of this piston.

The embodiment illustrated in Fig. 2 differs from that in Fig. 1 only thereby that instead of the spring L, a gaseous pressure means is used. This is provided in a simple manner, by directly connecting the right hand cylinder-half of the pressure cylinder

through a pipe N with the compression chamber of the working cylinder A, so that the right end face of the pressure regulator piston is influenced by the compression pressure. This arrangement has the advantage, that the piston of the pressure regulator needs to be packed against a small portion of the pressure corresponding to the difference between the compression pressure and the injecting air pressure, that means that this arrangement is much easier to keep tight than the embodiment illustrated in Fig. 1. A non-return valve P inserted in the pipe N prevents the transmission of the occurring pressure fluctuations in the working cylinder into the pipe N and causing a vibration of the piston of the pressure regulator. The manner of operation of the arrangement according to Fig. 2 coincides with that shown in Fig. 1.

Instead of having the shutting-off member H of the pressure regulator K positively connected, it might be so arranged that means such as a spring or a weighted lever, is provided on the shutting-off member itself for closing it, the pressure regulator releasing only this closing device on the lowering of the pressure below a permissible amount in the air injection pipe.

We claim:

1. A safety device against explosions in the air pipes of internal combustion engines, comprising means for shutting off the fuel supply, directly the pressure in the air pipes sinks below a certain amount, said means having a cylinder of constant volume, a reciprocating member therein, a normally open valve in the fuel conduit of the engine, said cylinder and said valve forming separate units, connection between said member and said valve, one end of said cylinder having a pipe connection with said air pipes, and pressure means for holding said member against said end of the cylinder.

2. A safety device against explosions in the air pipes of internal combustion engines, comprising means for shutting off the fuel supply, directly the pressure in the air pipes sinks below a certain amount, said means having a cylinder of constant volume, a reciprocating member therein, a normally open valve in the fuel conduit of the engine, said cylinder and said valve forming separate units, connection between said member and said valve, one end of said cylinder having a pipe connection with said air pipes, and pressure means for holding said member against said end of the cylinder, said pressure means having a conduit connecting the compression chamber of the engine with the opposite end of said cylinder.

3. A safety device against explosions in the air pipes of internal combustion engines, comprising means for shutting off the fuel supply, directly the pressure in the air pipes sinks below a certain amount, said means having a cylinder of constant volume, a reciprocating member therein, a normally open valve in the fuel conduit of the engine, said cylinder and said valve forming separate units, connection between said member and said valve, one end of said cylinder having a pipe connection with said air pipes, and pressure means for holding said member against said end of the cylinder, said pressure means having a conduit connecting the compression chamber of the engine with the opposite end of said cylinder and a non-return valve in said conduit.

In testimony whereof the foregoing specification is signed in the presence of two witnesses.

CONRAD C. REGENBOGEN.
PAUL A. RITTER.

Witnesses:
JULIUS ROJSKE,
HUGO LIEBELT.