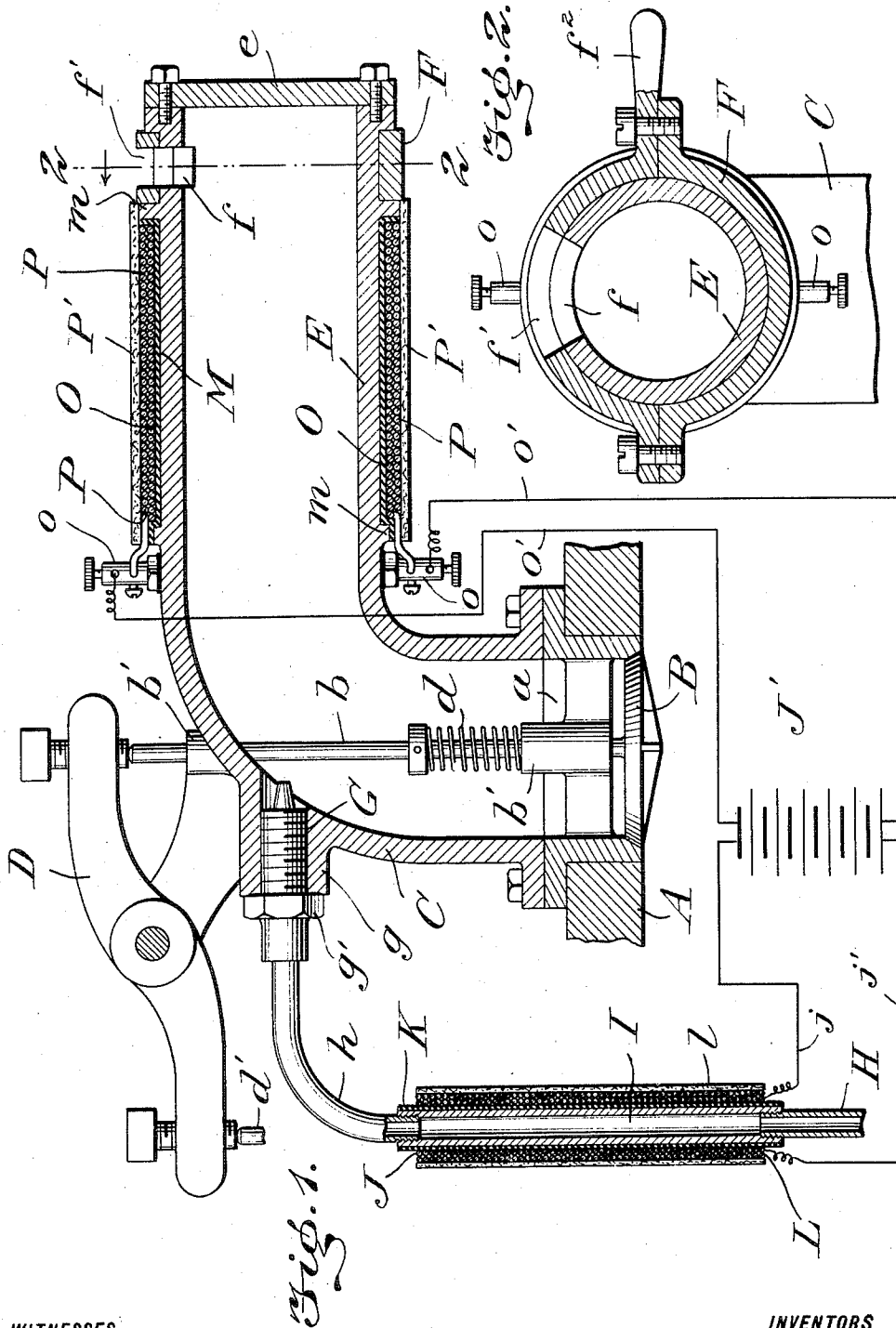


A. A. LOW & H. HERTZBERG.
EXPLOSIVE ENGINE.
APPLICATION FILED OCT. 12. 1907.

1,006,244.

Patented Oct. 17, 1911.

2 SHEETS—SHEET 1.



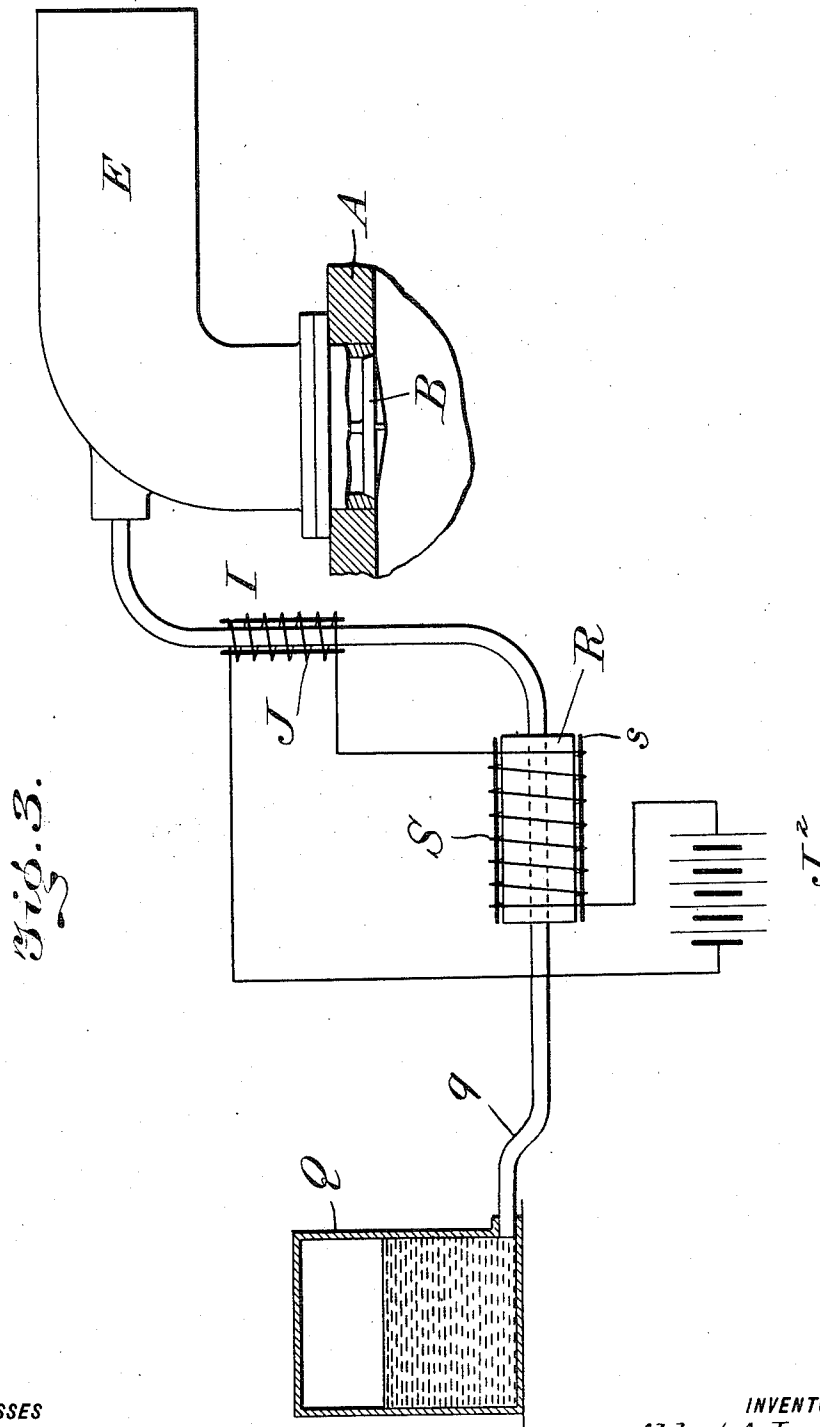
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WITNESSES

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UNITED STATES PATENT OFFICE.

ABBOT A. LOW, OF HORSESHOE, AND HARRY HERTZBERG, OF NEW YORK, N. Y.; SAID
HERTZBERG ASSIGNOR TO SAID LOW.

EXPLOSIVE-ENGINE.

1,006,244.

Specification of Letters Patent.

Patented Oct. 17, 1911.

Application filed October 12, 1907. Serial No. 397,193.

To all whom it may concern:

Be it known that we, ABBOT A. Low and HARRY HERTZBERG, citizens of the United States, residing at Horseshoe, St. Lawrence county, and State of New York, and the city of New York, borough of Brooklyn, county of Kings, and State of New York, respectively, have invented a certain new and useful Explosive-Engine, of which the following is a specification.

This invention is a means for preliminarily heating a liquid combustible or fuel prior to vaporizing the same and mixing the resulting vapor with air for the production of a combustible charge adapted to be supplied to an internal combustion engine.

The novel heating device is intended for use in connection with engines of that class which employ a low temperature liquid combustible, such as kerosene.

The object in view is to heat a low temperature liquid fuel as it passes to a vaporizer or carbureter, thus placing it in a condition to be vaporized rapidly when it enters said carbureter, whereby the fuel in its liquid and vaporous condition is raised in temperature, first, by heating it as it flows to the vaporizer, second, in the vaporizer itself, and third during compression in the engine cylinder. These operations result in such an increase in temperature of the fuel that when the explosion takes place in the cylinder the resulting gas acts with a high degree of pressure, thereby increasing the efficiency of the engine.

The invention is embodied in a vaporizer or carbureter comprising a metallic box or casing, and electrically-operated means for heating the same, said means being located, preferably, externally of said box or casing. Said heating means comprises a resistance coil wound externally on the box or casing, an electrical insulation between the coil and the box or casing, and suitable connections whereby the coil may be included in an electric circuit. The carbureter or vaporizer has an air port, the area of which is regulated by an adjustable damper.

In the accompanying drawings, we have illustrated one practical embodiment of the invention, but the construction shown therein is to be understood as illustrative only, and not as defining the limits of the invention.

Figure 1 is a vertical sectional elevation

through a vaporizer and a pre-fuel heater embodying the invention. Fig. 2 is a cross section on the line 2—2 of Fig. 1 illustrating one form of damper for the vaporizer. Fig. 3 is a diagrammatic view illustrating the invention in connection with a fuel reservoir heater.

A designates a part of a cylinder head to an internal combustion engine. In said head there is provided an intake port, *a*, which is closed normally by an intake valve, B, the stem, *b*, of which is guided in appropriate guides, *b'*, of an elbow, C, the latter being fixed to the head, A. A spring, *d*, holds the valve, B, to its seat, and said valve is adapted to be operated by the engine, such as the lever, D, and a rod, *d'*. The elbow, C, is extended to form the box or casing, E, of a vaporizer or carbureter, and, if desired, said box or casing may be made separate from the elbow, and of a different material from said elbow, in which case such box or casing, E, is united rigidly in any approved way to the elbow. The elbow itself may be of cast iron while the box or casing may be composed of copper. The box or casing, E, is closed at one end by a suitable head, *e*, and in said box or casing is provided an air inlet port, *f*, the latter being closed more or less by the adjustment of the damper, F. Said damper is represented as a ring having a slot, *f'*, and an operating handle *f''*. The damper is movable in a circular path around the box or casing for the purpose of bringing the port, *f'*, of the damper more or less into registration with the air port, *f*, of the box or casing, E. The elbow, C, is provided with a nipple, *g*, and in this nipple is fitted a spray nozzle, G, the latter being held in place by a set nut *g'*. Said spray nozzle is adapted to direct a jet or stream of liquid fuel into the vaporizer, E, and to said nozzle, G, there is secured a length, *h*, of a liquid fuel supply pipe, H, the latter leading from a suitable oil lamp (not shown).

The preliminary heater for the liquid fuel is shown as consisting of metallic member, I, the same being composed of a tube, the respective ends of which are united to the fuel pipe, H, and the branch, *h*, thereof. Said tubular member, I, is in alinement with the fuel pipe so as to form a part thereof or continuation thereof, the fuel being adapted to pass through said tubular mem-

ber, I, as it flows to the jet nozzle, G. For the purpose of quickly heating the hollow metallic member, I, there is provided a resistance coil, J, the latter being wound externally on said metallic member, I. The resistance coil is insulated from the metallic tube by an interposed layer, K, of electrical insulating material, preferably mica, the latter being wound directly on the metallic tube, I, and the resistance coil, J, then wound upon the mica layer, K. The ends of the resistance coil are joined to conductors, *j, j'*, leading to a battery, J', or other source of electric energy, whereby the resistance coil is heated for the purpose of heating the metallic tube, I, the mica layer, K, affording practically no resistance to the transmission of heat from the coil, J, to the metallic member, I.

It is preferred to inclose the heating coil, J, within a jacket of non-conducting material, and as shown, this jacket is composed of asbestos in the form of a strand or cord, L, which is wound on the resistance coil, J, and furthermore, the asbestos winding is then inclosed by a layer *l*, of sheet asbestos, although other heat insulating materials may be employed for enveloping the resistance winding. It is preferred, also, to provide means for electrically heating the box or casing, E, of the vaporizer. To this end said box or casing is shown as having suitable flanges, *m*, and on said box or casing there is placed a layer, M, of insulating material, such as mica. A resistance coil, O, is wound directly on this mica layer, said layer, M, and the resistance winding extending between the flanges, *m*, of the box or casing. The respective end portions of the resistance coil, O, are connected to the binding posts, *o*, herein shown as being mounted on the box or casing, E, said binding posts being insulated electrically from metallic contact with said box, E. The binding posts are supplied with a current of electric energy from the battery, J', or other source of electric energy, by conductors, *o'*.

It is preferred to incase the winding of the resistance coil, O, within a jacket which is a non-conductor of heat, and this jacket is shown in Fig. 1 as consisting of layers, P, P', of asbestos or other heat insulating material. The layer, P, is composed of an asbestos cord or strand which is wound directly on the metallic wire or ribbon composing the resistance coil, O, whereas the layer, P', is composed of sheet asbestos, whereby the resistance coil is incased and the heat developed thereby is precluded from radiating into the external atmosphere.

In Fig. 1 the preliminary fuel heater is shown as occupying a vertical position, but the particular arrangement is not important. It is evident that the heating coil, J, for the preliminary fuel heater and the coil,

O, for the vaporizer may be supplied from independent sources of electrical energy.

The operation will be readily understood from the foregoing description taken in connection with the drawings. The oil is forced by a pump through the pipe, H, the hollow member, I, the branch, *h*, and the nozzle, G, the latter spraying the fuel into the vaporizer, E. As the oil flows through the hollow tube, I, it is heated by said tube, the latter being heated by the resistance coil, J. When the engine is started, an electric current is supplied to the coil, O, for the purpose of heating the box or casing, E, of the vaporizer. After the engine has been in operation for a short time, the box or casing, E, becomes heated by the transmission of heat from the cylinder and other parts of the engine, and thereupon the current is switched off from the resistance coil, O.

In addition to the employment of the electrically-heated member, I, in the pipe for supplying fuel to the vaporizer or carbureter, E, we may employ the system shown in Fig. 3 for preliminarily heating the fuel. The kerosene, or other liquid combustible, is adapted to be contained in a tank, Q, from which leads a pipe, *q*, that extends to a reservoir heater, R. Said heater is composed of metal, and around it is wound an external resistance coil, S, the latter being insulated at *s*, from direct metallic contact with the heater, R. The pipe, H, leads from the reservoir heater, R, to the pipe heater, I, and the coils, J, S, of the heaters, I, R, may be included in series with a battery, J'.

It is to be understood that the fuel flows by gravity from the tank, Q, into the reservoir heater, R, the latter being electrically heated and normally filled with fuel so as to keep it in a warm condition. The fuel thence passes through the pipe, H, and the heating member, I, in which the fuel is further heated. Of course, the oil pump may be used at any point to force the fuel at intervals through the nozzle, G, into the vaporizer or carbureter, E.

Having thus fully described the invention, what we claim as new, and desire to secure by Letters Patent is:

1. In a vaporizer for internal combustion engines, a piston cylinder, a metallic elbow-shaped box or casing closed at one end and attached at its elbow end to the cylinder, means positioned at the elbow end for spraying a liquid fuel into contact with the walls and the closed end of said box or casing, and a heating coil wound externally upon the box or casing, and in mechanical contact therewith, for heating the metal comprising said box or casing.

2. In a vaporizer for internal combustion engines, a cylinder, a metallic elbow-shaped box or casing provided at one end with an

air inlet, an annular valve for regulating the
area of said air inlet, means for spraying
a liquid fuel into contact with the walls
of said box or casing, an electrically operat-
5 ed heating coil wound directly upon the box
or casing for heating the metal composing
the same, and means for electrically insu-
lating said coil from metallic contact with
the box or casing, said heating coil and insu-
10 lating means enveloping the box or casing

while leaving the air inlet and the valve
therefor free and unobstructed.

In testimony whereof we have signed our
names to this specification in the presence of
two subscribing witnesses.

ABBOT A. LOW.

HARRY HERTZBERG.

Witnesses:

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