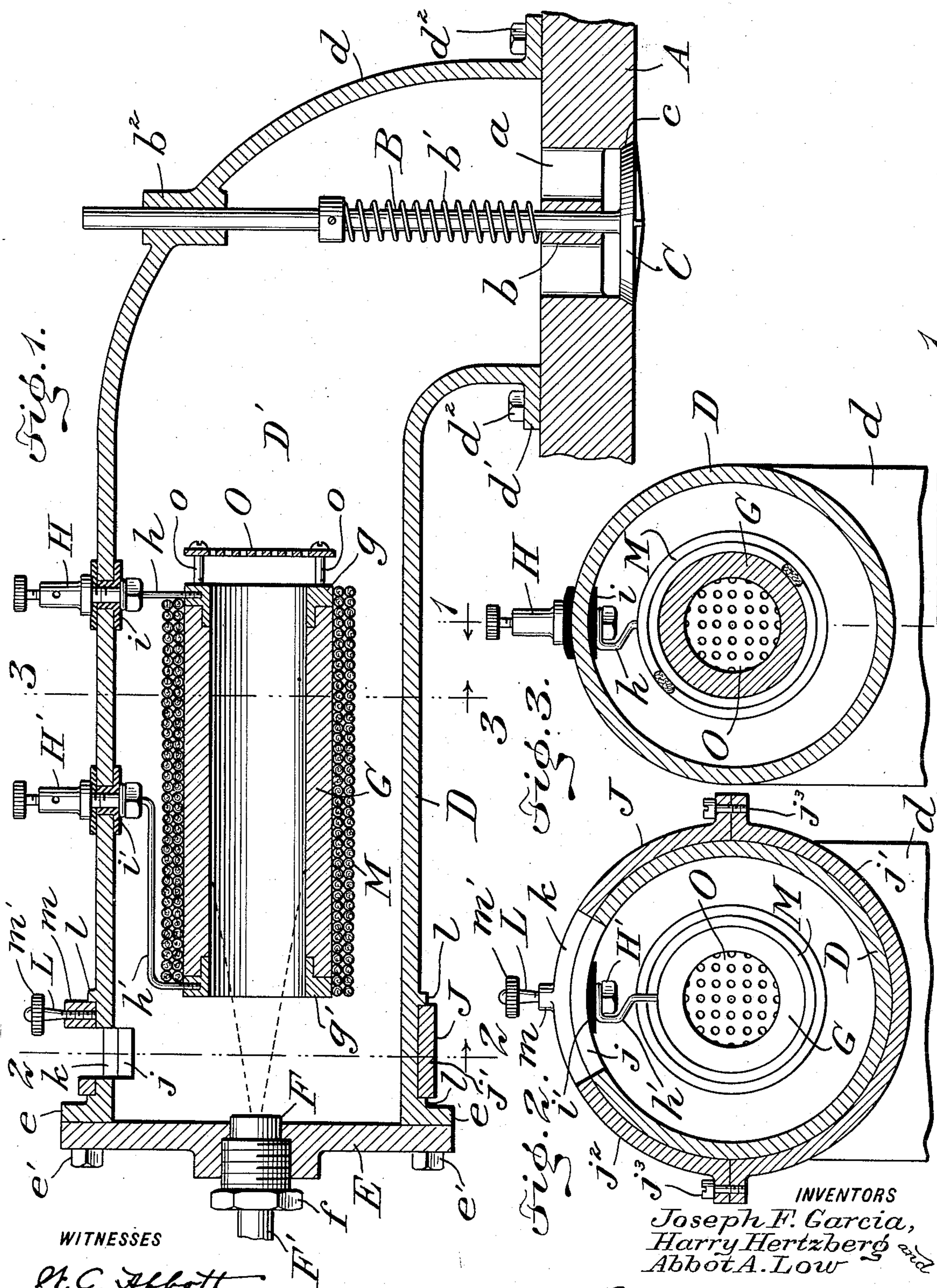


STARTING VAPORIZER FOR EXPLOSIVE ENGINES.

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WITNESSES

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STARTING-VAPORIZER FOR EXPLOSIVE-ENGINES.

990,249.

Specification of Letters Patent.

Patented Apr. 25, 1911.

Application filed October 7, 1907. Serial No. 396,158.

To all whom it may concern:

Be it known that we, JOSEPH F. GARCIA and HARRY HERTZBERG, of Brooklyn, county of Kings, and ABBOT A. Low, of Horseshoe, county of St. Lawrence, State of New York, all citizens of the United States, have invented a certain new and useful Starting-Vaporizer for Explosive-Engines, of which the following is a specification.

10 This invention is a vaporizer for internal combustion engines, particularly for engines adapted to utilize kerosene as the motive fluid, whereby the engine may be started by the admission of kerosene and kept in operation by a continued supply of kerosene thereto.

The object is to quickly heat a surface to such a temperature as will convert kerosene, brought into contact therewith, into a vapor, and to regulate the admixture of atmospheric air with such vapor, thereby producing a combustible mixture or charge suitable for ignition in the cylinder of the engine.

25 The leading feature of the invention is a hollow member, and means for electrically heating the same, whereby a liquid combustible may be brought into contact with said heated member for the purpose of converting the liquid into a vapor, more especially at the time the engine is started.

In a preferred embodiment of the invention, the hollow member is composed of an electrical resistance material, such as a cylinder of carbon, and this member is included in an electric circuit in such manner that a current is adapted to traverse the same, whereby the hollow member is quickly heated by the electric current before starting the engine, thus producing a heated vaporizing surface, against which the liquid combustible is sprayed. The hollow member is supported in a chamber, to which air is supplied through a suitable inlet port, the area of said port being regulatable by a valve which is shiftable relative to the port, whereby more or less air may be admitted to the mixing chamber. It is preferred, also, to incase the hollow resistance member with heat insulating material, such as asbestos, and, further, to employ a baffle adjacent to that end of the hollow member by which the vapor passes into the mixing chamber.

55 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 longitudinal section, on the line 1—1 of Fig. 3, showing a preferred embodiment of our invention. Figs. 2 and 3 are vertical cross sections on the lines 2—2 and 3—3, respectively, of Fig. 1 each looking in the direction of the arrow.

A designates a portion of a cylinder head forming a part of the cylinder of an internal combustion engine. Said cylinder head has an intake port, *a*, in which is provided a guide, *b*, for the stem, *B*, of an intake valve, *C*, the latter being normally held to its seat, *c*, in the cylinder head by a spring, *b'*. The valve stem passes through another guide, *b*², which is provided in an elbow shaped end, *d*, of a casing, *D*, whereby the end of the valve stem, *B*, extends through and beyond the casing, *D*. The valve, *C*, may be operated in one direction by the energy of the suction which takes place in the cylinder when the piston moves in one direction, said valve, *C*, being moved in the opposite direction by the spring, *b'*; but, if desired, the valve may be operated mechanically and positively by appropriate lever and rod connections with a moving part of the engine in a manner well understood by those skilled in the art.

The casing, *D*, is composed, preferably, of a single casting having the elbow shaped end, *d*, the latter being provided with a flange, *d'*, which rests upon or against the cylinder head, *A*, whereby the casing is adapted to be fastened securely to said cylinder head by bolts, *d*², adapted to pass through the flange, *d'*. The other end of the casing, *D*, is flanged at *e*, and said end is closed by a head, *E*, the latter being secured removably in place by suitable bolts, *e'*. The head, *E*, is provided with an inlet or spray nozzle, *F*, which is held in place by a nut, *f*, and to this nozzle is coupled a fuel supply pipe, *F'*. This pipe leads from the vaporizer of our invention to a suitable oil pump which is operated at intervals for the purpose of forcing or injecting a proper quantity of kerosene through the nozzle, *F*, at the time of opening the intake valve, *C*.

The important feature of the present in-

vention is a vaporizing element adapted to be heated electrically to a temperature sufficient to instantly convert into vapor the charges of kerosene which are injected by the nozzle, F. The vaporizing element consists, preferably, of a hollow member, G, and in the drawings, this member is represented as a cylinder open at its respective ends. The cylinder may be composed of any suitable material, such as metal or an alloy of metals, but it is preferred to make the cylinder of a refractory electrical resistance material, such as carbon. We have found that carbon is advantageous for many reasons, chiefly because of its durability and of its capability of being heated quickly to the required temperature by an electric current.

The hollow vaporizing member, G, is provided at its end portions with appropriate means for including it in or as a part of an electric circuit, and in one embodiment of the invention, said hollow member is equipped with metallic caps or rings, *g*, *g'*, the latter being fastened securely to the end portions of the carbon cylinder. The cap or ring, *g*, is connected electrically to a wire or conductor, *h*, which is attached to a binding post, H, whereas the other cap or ring, *g'*, is in electrical engagement with another wire, *h'*, fastened to another binding post, H'. The two binding posts, H, H', are mounted in bushings, *i*, *i'*, respectively, which are provided in the casing, D, whereby the binding posts are supported externally of said casing and are insulated electrically therefrom.

As shown in the drawings, the hollow vaporizing member, G, is supported in a mixing chamber, D', of the casing, D, by the conductors, *h*, *h'*, the latter serving to suspend said hollow member, G, within said mixing chamber. It is evident, however, that the hollow member, G, may be supported in any other way within said mixing chamber. As shown in Fig. 1, the inlet nozzle, F, is in alinement with the hollow member, G, whereby the liquid combustible admitted by the nozzle is adapted to be sprayed into contact with the inner surfaces of the hollow member, G.

Atmospheric air is admitted to the chamber, D', of the casing by a port, *j*, herein shown as a slot in the casing, D, see Figs. 1 and 2. This port is provided in the casing at a point near the open end of the hollow member, G, into which the liquid combustible is sprayed by the nozzle, F, whereby air admitted by the port, *j*, is adapted to be drawn into the hollow member, G, and, also, to circulate around said hollow member, G, and in the mixing chamber, D'. The area of the port, *j*, is regulated by a shiftable damper herein shown as a divided ring, J, the sections, *j'*, *j''*, of which are fastened to-

gether by screws, *j'''*, whereby the annular damper may be fitted to or removed readily from the casing, D. The shiftable annular damper is provided with a port, *k*, shown in Fig. 2 as a slot adapted to register with the port, *j*, of the casing, D, and this damper may be turned on the casing so as to move the port, *k*, of the damper out of register with the port, *j*, or more or less into register with said port, *j*, whereby the area of the air inlet is adapted to be varied as desired. The detailed construction of the damper may be varied or modified as desired, but as shown, the damper is held in place between flanges, *l*, of the casing, D, and furthermore, said damper is provided with a clamp, L, shown in Figs. 1 and 2 as a binding screw which is mounted in the lug, *m*, of the damper, said binding screw having a suitable hand-wheel, *m'*, for its convenient manipulation.

The hollow member, G, is provided with means for protecting it against the action of heat in the mixing chamber, D', thus preventing said hollow member from becoming too highly heated. Said heat insulating means is represented in Figs. 1 and 3 as a jacket, M, composed, preferably, of asbestos. The asbestos is in the form of a cord or strand wound externally on the hollow member so as to provide a plurality of superimposed layers of insulating material. It is evident, however, that sheet material or a solid jacket may be employed.

Adjacent to the end of the hollow member, G, from which the vapor is discharged into the mixing chamber, D', is a baffle, O. Said baffle is shown as being attached to the end portion of said hollow member by suitable screws or stems, *o*, fastened to the end plate or ring, *g*. The baffle is represented as a perforated plate which lies quite close to the delivery end of the hollow member, and the air and vapor are caused to circulate through and around this baffle as they pass into the mixing chamber, D', whereby the intimate admixture of atmospheric air with the vapor is secured.

The operation of the invention is as follows: The damper, J, is adjusted to the required position so as to produce an air inlet port of the proper area. Before starting the engine an electric current is supplied to the hollow vaporizing member, G, in a way to traverse said member, the current being admitted at one binding post and taken off at the other binding post. The current is supplied for a sufficient length of time to heat the hollow member, G, to a temperature sufficient to vaporize the kerosene. The oil pump is operated to inject a small quantity of kerosene by the nozzle, F, into the hollow member, G, said pump being operated at about the period of opening the intake valve, C. The suction from

the engine draws in a supply of air through the port, *j*, and the vapor due to the contact of the kerosene with the heated surface of the hollow member, *G*, such air and vapor being mixed by contact with the baffle, *O*, and the circulation within the chamber, *D'*. The mixture of air and vapor forms a combustible charge which, when admitted to the engine cylinder, is compressed by the action of the piston, and is thereafter ignited by a suitable ignition device in said cylinder, whereby the expansion of the gas due to ignition of the combustible charge drives the piston in one direction. The kerosene is sprayed by the nozzle, *F*, directly into the hollow member, *G*, for the purpose of instantly converting the kerosene into a combustible vapor. The vaporized fuel is mixed with atmospheric air as the fuel and air pass through the hollow member, the perforated plate and the mixing chamber. The electric current is admitted to the hollow member, *G*, for a comparatively short period only, say for the first few explosions; after which the current is cut off. By this time the engine and the casing, *D*, are heated sufficiently to vaporize the liquid combustible by contact with the walls of the chamber, *D*, and with the hollow member, *G*. The member, *G*, is kept from being too highly heated by the insulating jacket, *M*, and by the circulation of air around it, although the material of which the member, *G*, is composed will not deteriorate readily under the action of the heat.

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

1. In a starting vaporizer, a mixing cham-

ber, an air inlet thereto, a hollow vaporizing member composed of electrical resistance material, said member being open at its respective ends, means whereby an electric current is adapted to flow through said resistance material for directly heating said member, means for supplying a liquid combustible to one open end of said vaporizing member, and a baffle positioned externally to said vaporizing member and adjacent the other open end thereof.

2. In a starting vaporizer for internal combustion engines, a casing having a mixing chamber, means for admitting air to said chamber of the casing, a hollow vaporizing member positioned within said mixing chamber, said vaporizing member being composed of electrical resistance material, means for spraying a liquid combustible into direct contact with the interior surface of said vaporizing member, means operating to suspend the vaporizing member and to supply an electrical current thereto, whereby said current is adapted to flow through the electrical resistance material composing said vaporizing member and to directly heat the same, and means for controlling the outflow of a gaseous mixture from said mixing chamber.

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

JOSEPH F. GARCIA.
HARRY HERTZBERG.
ABBOT A. LOW.

Witnesses:

GEO. E. CONDIT,
GEO. WELLING GIDDINGS.