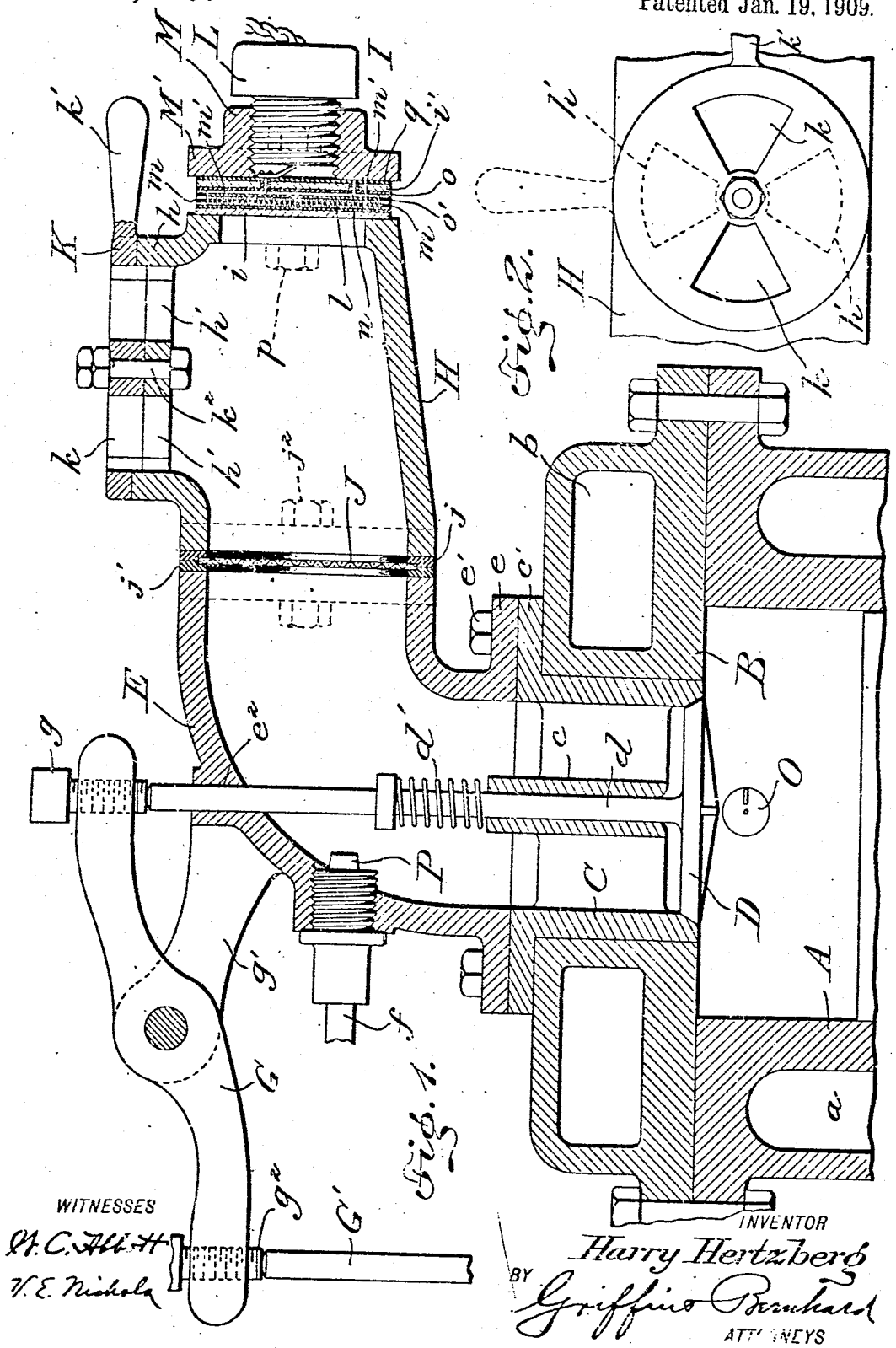
H. HERTZBERG.

EXTERNAL ELECTRICAL VAPORIZER FOR COMBUSTION ENGINES.

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WITNESSES

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EXTERNAL ELECTRICAL VAPORIZER FOR COMBUSTION-ENGINES.

No. 909,897. Specification of Letters Patent. Patented Jan. 19, 1909.

Application filed March 12, 1907. Serial No. 362,017.

To all whom it may concern:

Be it known that I, HARRY HERTZBERG, a citizen of the United States, residing at the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented a certain new and useful External Electrical Vaporizer for Combustion-Engines, of which the following is a specification.

This invention is a vaporizer for internal combustion engines, the latter being adapted for operation, more particularly, by the explosion of charges containing kerosene.

It is found that an engine can not be started quickly when a combustible mixture of air and kerosene is first supplied to the cylinder, owing to the fact that the kerosene has a tendency to condense by contact with the cold surfaces of the cylinder and its head. Ordinarily, the cylinder is heated by some external appliance or flame, but such operation consumes time and labor, besides wasting the fuel, or the engine may be started by using naphtha or gasolene, and thereafter run by the combustion of kerosene, but this requires two kinds of fuel to be supplied, and provision must be made for storing the extra starting fuel and for injecting the same into a mixing chamber to be commingled with air for producing the explosive mixture.

The object of this invention is to quickly vaporize a liquid combustible when starting and while operating an engine, thus requiring only one kind or grade of fuel to be used in the operation of the engine.

My vaporizer is intended for use on an engine externally to the cylinder thereof, and it contemplates the employment of means whereby a mass of metal may quickly be heated by an electric current to produce a hot vaporizing surface, against which a liquid combustible is adapted to strike for producing an explosive vapor which is to be drawn into an engine cylinder and ignited therein.

In the accompanying drawings, I 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 section, with certain parts in elevation, of an external vaporizer for combustion engines. Fig. 2 is a detail plan view of one means for regulating the admission of air to said vaporizer.

A portion of an ordinary engine cylinder is indicated at A, said cylinder having a water jacket, *a*, and a head, B, the latter being provided with a chamber, *b*, whereby water may circulate around the cylinder and through the head. The cylinder head is shown as having an opening in which is fitted a flanged sleeve, C, the inner end of which is provided with a seat for the intake valve, D, said valve having a stem, *d*, which passes through a guide tube, *c*, of the sleeve, C. The intake valve, D, is held normally on its seat by a spring, *d'*, and said valve is adapted to be actuated positively by suitable mechanical connections with a moving part of the engine, although it is evident that the valve, D, may be operated by suction, as is common in this class of engines.

E designates a casing arranged externally of the cylinder head and forming a guide for the stem of the intake valve, said casing also supporting the external vaporizer of this invention, as well as providing means for the connection of the fuel supply pipe, *f*. As shown, the casing, E, is substantially elbow-shaped, said casing having a flange, *e*, at its inner part, which flange rests on an external flange, *e'*, of the sleeve, C, whereby the casing and the sleeve are adapted to be secured to the cylinder head, B, by bolts, *e'*. The casing, E, is shown as having a guide, e^2, for the upper part of the valve stem, *d*, and on this valve stem operates an adjusting screw, *g*, of an operative lever, G, the latter being fulcrumed on a short arm, *g*, which is a part of the casing, E. At its other end the lever, G, has an adjusting screw, g^2, which is engaged by a rod, G', the latter being in turn operated by a movable part of the engine in a manner well known to those skilled in the art.

H designates a vaporizer, and I is an electrically operated heater therefor. The vaporizer consists of a hollow body, which is composed preferably of a metal of high heat conductivity, whereby the body of the vaporizer is adapted to be quickly heated by the electrically operated heater, I. The vaporizer H is attached to the casing, E, at its opposite end from the sleeve, C, and as shown, said vaporizer forms a continuation of the casing, E, to which it is rigidly attached. Said vaporizer is insulated electrically from the casing, E, and as shown, the vaporizer and the casing clamp between

themselves a diaphragm or partition, J, the latter being composed of metallic gauze. The gauze is placed between layers of insulating material, j, j', which are applied to the meeting ends of the casing and the vaporizer body, said casing and the body being flanged and secured together by bolts, j^2, as indicated by dotted lines in Fig. 1. The body of the vaporizer, H, is provided on its upper side with an annular flange, h, forming an air inlet, h', to the chamber of the vaporizer body. On this flange, h, rests an air valve, K, shown in detail in Fig. 2. Said valve is provided with openings, k, and a suitable handle, k', the valve being pivoted to the vaporizer body by bolts, k^2. It is evident that the valve may be adjusted to bring its openings, k, more or less into registration with the air inlet, h', of the vaporizer, and by adjusting the valve, K, the volume of air to be admitted to the vaporizer may be regulated as described.

Any suitable form of electrical heater may be employed in connection with the vaporizer, H. As shown, the heater, I, is composed of metallic plates, i, i', an electrical resistance, l, a core, m, on which the electrical resistance is wound or coiled, and layers of insulating material, n, o, thus producing a composite body which is of compact construction and is secured to an open portion of the vaporizer, H, by suitable bolts, p, one of which is indicated by dotted lines in Fig. 1. The core, m, is composed preferably of a layer of mica, and the electrical resistance, l, is a metallic wire or ribbon which is wound non-inductively on said core. Against one side of the electrical resistance is placed the layer, n, of insulating material, and the two end portions, m', of the resistance wire or ribbon are insulated from the coil by another layer of insulating material, o', after which the layer of insulating material, o, is placed against the end portions, m', of the resistance wire or ribbon.

The electric heater is confined between the metallic plates, i i', said plate, i, being in contact with the body of the vaporizer, H, or it may be in one piece therewith. It is preferred to make the body, H, and the plates, i, i', of copper in order that they may be heated quickly by the heat developed in the resistance, l, of the electrical heater, whereby the resistance is substantially in contact with the plates, i, i', and the body of the vaporizer, H. This construction is advantageous for the reason that the copper plates, i, and the body, H, constitute a mass of metal which will absorb the heat as rapidly as it is generated in the resistance of the electrical heater. The end portions, m, m', of the resistance terminate in circuit contacts or terminals which are adapted to be engaged by the terminals of a plug, L, the latter being similar to the plug employed in the sockets of incandescent lighting systems. Said plug is adapted to be screwed into the socket, M, which is provided with a face plate, M', the latter being insulated from the plate, i', by a layer of material, q. The face plate, M', of the socket, M, is adapted to be fastened by the bolts, p, to the casing of the vaporizer, H, and the parts composing the electrical heater, I, are thus clamped between the socket plate, M', and the vaporizer, H. As is usual in engines of this class, the charges of combustible vapor are adapted to be exploded in the engine cylinder by an igniter, O, of any suitable type.

The fuel supply pipe, f, is coupled to a jet nozzle, P, the latter being attached in a suitable way to the casing, E. The diaphragm, J, is between the jet nozzle P, and the vaporizer, and said nozzle is adapted to supply a jet or stream of combustible fluid, preferably kerosene, across the casing, E, and into the chamber of the vaporizer, H, whereby the stream of fluid is broken up by the diaphragm, J. It is preferred to so construct and arrange the parts that the jet nozzle, P, is opposite to or in line with the electrical heater, I, thus making provision for the jet of kerosene to strike against the hot surface presented by the electrical heater or by the walls of the vaporizer, H.

The operation is as follows: When the engine is started a current of electrical energy is supplied by the conductors of the plug, L, to the positive lead of the electrical resistance, l, the current traversing said resistance and being returned by the negative terminal to the proper conductor of said plug, L. The electrical resistance heats up very quickly, and the heat developed thereby is absorbed rapidly by the plates, i, i', and the body of the vaporizer, H, whereby the plate, i, and the body of the vaporizer are heated in a few minutes time to the temperature necessary to convert the combustible mixture of air and fuel into an explosive charge to be admited into the engine cylinder. The valve, K, having been adjusted and the engine started or "cranked" so as to operate the pump for supplying a jet of kerosene through the nozzle, P, the liquid is projected against the metallic gauze diaphragm, J, which breaks up the stream. The spray of liquid mixes with the air admitted to the chamber of the vaporizer, H, and the liquid is converted by contact with the plate, i, or the body of the vaporizer, H, into a vapor, which vapor is drawn through the diaphragm, J, and the casing, E, into the chamber of the cylinder, A, when the valve, D, is opened. The charge thus admitted is compressed in the piston chamber, and at the proper time the igniter, O, is operated to explode said charge, thereby driving the piston downwardly. The de-

scribed operations are repeated indefinitely so as to supply the vapor to the engine cylinder in a manner well known to those skilled in the art.

Having thus fully described the invention, what I claim as new, and desire to secured by Letters Patent is:—

1. In an engine of the class described, an external starting vaporizer composed of a chambered box or casing composed of a metallic mass of high heat conductivity, the inner surfaces of said box or casing forming a vaporizing surface, an electric heater positioned externally with respect to the chamber of said box or casing and engaging directly with the metallic mass composing the same, whereby the entire metallic mass may be brought quickly to a temperature suitable for vaporizing a liquid combustible, and means for spraying a liquid combustible across said box or casing and into contact with said electric heater.

2. In an engine of the class described, an external starting vaporizer comprising a box or casing composed of a hollow copper mass of high heat conductivity, the inner surface of said box or casing constituting a vaporizing surface, an electrically-operated heater positioned externally on said box or casing and engaging directly with the metallic mass thereof for rapidly heating the same, means for injecting a liquid combustible across the chamber of the box or casing and into contact with an element of the aforesaid heater, and means for admitting air to the interior of the copper mass.

3. In an engine of the class described, an external starting vaporizer comprising a box or casing composed of a chambered metallic mass presenting a relatively large area of vaporizing surface for contact with a combustible fluid, said box or casing having an opening at one end, an electrically operated heater positioned externally on said box or casing, at the open end thereof, and engaging directly with the hollow mass composing the same, for initially heating said metallic mass, means for spraying a liquid combustible in said box or casing, and means for admitting air to the chamber of said box or casing.

4. In an engine of the class described, the combination with a valve box, of a vaporizing box or casing open at one end and secured externally to said valve box, an external electrically-operated heater operating to close the open end of the box or casing and engaging directly therewith, and means for spraying a liquid combustible across the vaporizing box and into contact with an element of the aforesaid heater.

5. In an engine of the class described, an external starting vaporizer comprising a chambered box composed of a metallic mass of high heat conductivity, said box having an opening at one end, an air inlet to said chambered box, electrical means positioned externally on said open end of the box for directly heating the metallic mass thereof, said electrical heating means having an imperforate metal plate which is exposed through the opening in the box for contact with a liquid combustible, and means whereby a liquid combustible is brought into direct contact with the inner surfaces of said box and with the imperforate metal plate of the aforesaid electrical heating means.

6. In a starting vaporizer, a chambered box having an opening at one end and composed of a metallic mass of high heat conductivity, means for regulating the admission of air to the chamber of said box, an electrically operated heater positioned externally to the box, at the open end thereof, and provided with a metallic plate which engages directly with the metal composing the box for directly heating the metallic mass, and means for spraying a combustible liquid into the chamber and into contact with the metal plate of said heater.

7. In a starting vaporizer, the combination with a valve box, of a chambered vaporizing box composed of a metallic mass of high heat conductivity, an electrically operated heater positioned externally on, and in mechanical contact with, an end of said chambered box for directly heating the metallic mass thereof, an air inlet to said chambered box, and means for spraying a liquid combustible into said chamber of the vaporizing box.

8. In a starting vaporizer, an elbow shaped valve box, a chambered vaporizing box positioned externally on said valve box and forming a continuation thereof, said vaporizing box being composed of a different metal from that of the valve box, and an electrically-operated heater in engagement with the metal of the vaporizing box for quickly heating the latter, said heater having an exposed socket-connection.

9. In a starting vaporizer, a chambered metallic vaporizing box having an opening at one end, an electrical heater positioned externally on the box and closing the opening in the end thereof, said heater being provided with an insulated metallic member which is in direct contact with the metal composing said box, and means for injecting a combustible fluid into contact with the inner surfaces of said metallic box and with metallic member of the heater.

10. In a starting vaporizer, a chambered metallic vaporizing box having an opening at one end, means for regulating the admission of air to the chamber of said box, an electrically-operated heater positioned externally on the open end of said box, said heater being provided with an electrical resistance incased in a mass of heat-absorbing

metal, said metallic mass of the heater being in mechanical engagement with the metal composing the vaporizing box for directly heating the latter, and means for supplying a combustible liquid to said vaporizing box.

11. In a starting vaporizer, an elbow shaped valve box, a vaporizing box composed of a hollow metallic mass of high heat conductivity, said vaporizing box being positioned externally on said valve box and united at one end thereto, an air inlet to said vaporizer, an electrically-operated heater secured to the other end of the vaporizing box and positioned externally thereon, for heating the hollow mass composing said vaporizing box, and means for supplying a combustible liquid to said vaporizing box, whereby said liquid combustible is converted into a vapor by contact with the inner surfaces of the vaporizer.

12. In a starting vaporizer, the combination with a valve box, of a vaporizing box composed of a chambered metallic mass and secured externally to said valve box, an air inlet to said vaporizing box, an external electrical heater having an insulated metallic member in direct contact with the metallic mass composing said vaporizing box, and means for supplying a combustible liquid to the chamber of said vaporizer.

13. In a starting vaporizer, the combination with a valve box, of a vaporizing box in communication therewith, a foraminous partition between the valve box and the vaporizing box, an electrical heater on the vaporizing box, and means for supplying a combustible liquid through said foraminous partition and into a chamber of the vaporizing box.

14. In an external vaporizer, a chambered box having an air inlet and an opening at one end, and an electrically-operated heater composed of a mass of heat absorbing metal and an electrical resistance incased in said metallic mass, the metallic mass of said heater being in direct engagement with the chambered box and applied across the open end thereof for closing the same.

15. In a starting vaporizer, a vaporizing box having an air inlet, an electrically-operated heater positioned externally on said box, said heater having an imperforate vaporizing member and an electrical resistance insulated from said member, the said vaporizing member of the heater being in mechanical engagement with the body of the vaporizer and, also, presenting an imperforate vaporizing surface which is exposed in the chamber of said box for contact with a liquid combustible, and means for spraying a liquid combustible against said surface of the vaporizing member and, also, into contact with the walls of the vaporizing box.

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

HARRY HERTZBERG.

Witnesses:
GEO. WELLING GIDDINGS,
H. T. BERNHARD.