

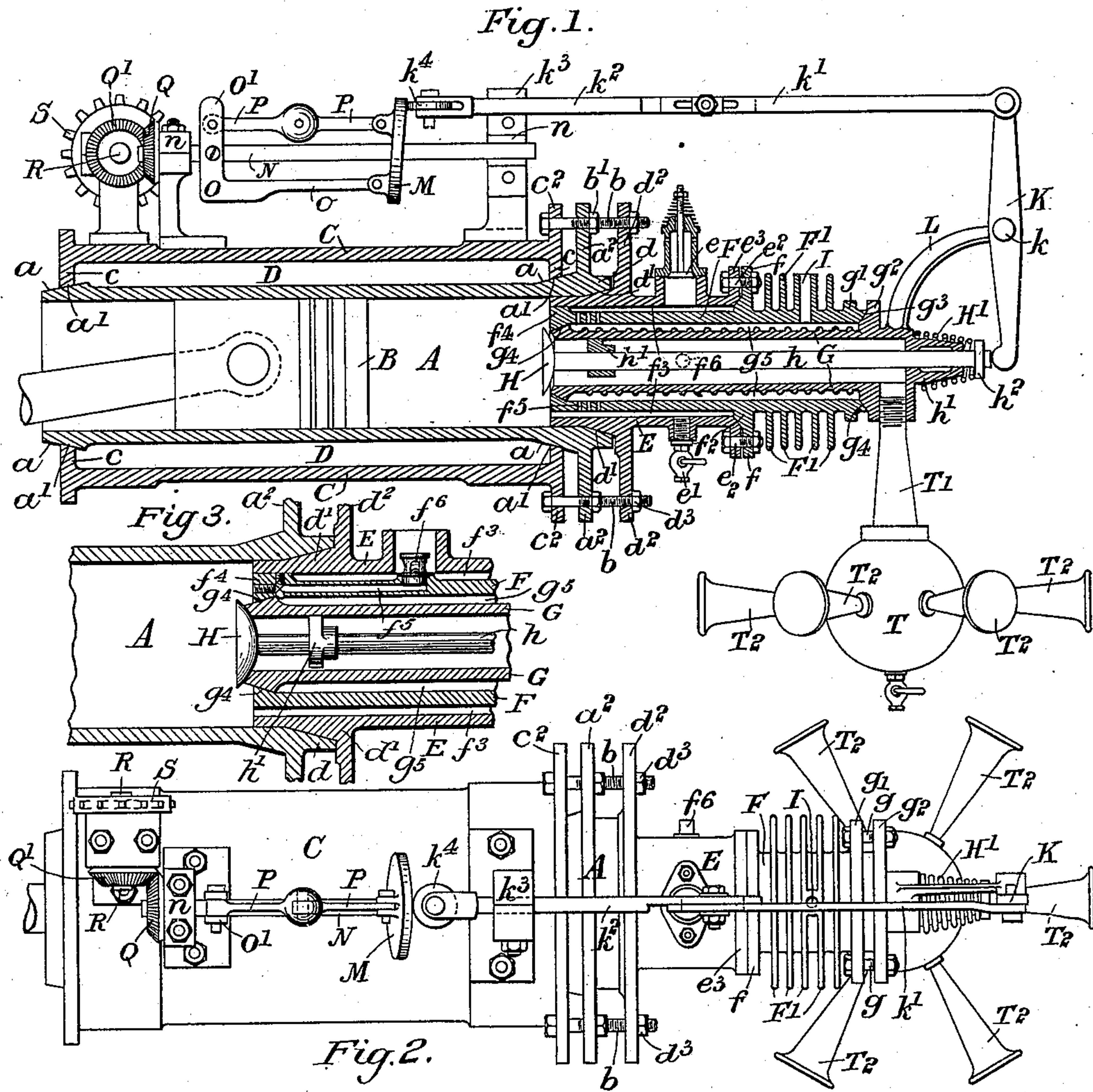
No. 646,282.

Patented Mar. 27, 1900.

**E. T. HEADECH.
HYDROCARBON MOTOR.**

(Application filed May 22, 1899.)

(No Model.)



WITNESSES

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UNITED STATES PATENT OFFICE.

ERNEST T. HEADECH, OF ASHFORD, COUNTY OF KENT, ENGLAND.

HYDROCARBON-MOTOR.

SPECIFICATION forming part of Letters Patent No. 646,282, dated March 27, 1900.

Application filed May 22, 1899. Serial No. 717,819. (No model.)

To all whom it may concern:

Be it known that I, ERNEST THOMAS HEAD-
ECH, electrical engineer, a subject of the
Queen of Great Britain and Ireland, and a
resident of Eastwell Park, Ashford, in the
county of Kent, England, have invented cer-
tain new and useful Improvements in Hydro-
carbon-Motors, (for which I have applied for
patents in Great Britain, No. 22,718, dated
October 28, 1898, and in Germany, dated
March 6, 1899,) which invention is fully set
forth in the following specification.

My invention relates to improvements in
hydrocarbon-motors, and more particularly
in connection with the oil-vaporizing appa-
ratus.

The oil-vaporizing apparatus according to
this invention projects into the compression-
space of the cylinder, and it consists of the
following parts: A tube, which I will call the
"outer" tube, made of a good heat-conduct-
ing metal—such as copper or gun-metal, for
instance—and of smaller diameter than the
bore of the engine-cylinder, is provided at its
inner end with three or more lugs or projec-
tions which fit the bore of the cylinder, en-
abling it to be held firmly in position. A por-
tion of the said tube projects beyond the end
of the cylinder and is provided at its outer end
with a series of radiating rings or gills to fa-
cilitate the heating of the tube externally
when starting the engine by means of a blow-
lamp or other heating device. At a point,
say, about a third from the outer end of the
said tube an external flange admits of the
tube being bolted to a valve-box formed in
one with the cylinder-cover and fitting with
a coned and ground-in joint. The cylinder-
cover, with the valve-box, is bolted to the cyl-
inder end, fitting with a coned or plain joint.
The valve-box carries an air-valve on a de-
tachable fitting or case for admission of the
air to an annular space formed between the
outer tube and the cylinder-walls, also a re-
lief-valve for lowering compression suddenly,
if required, and an ignition-plug. The igni-
tion may be effected by an electric current or
by other means common among internal-com-
bustion motors.

Oil is conducted into an annular space be-
tween the outer tube and an inner tube con-

stituting the exhaust-passage at or about the
center of the radiating part already described.
To the outer end of the inner tube is connect-
ed, by a flange and conical joint, the exhaust
outlet pipe or passage. The inner tube is fit-
ted in the same way as the cylinder and jacket,
the ends of the inner tube being ground into
the ends of the outer tube, and its inner end
is provided with a seating for the exhaust-
valve, which may be either a ball or semicir-
cular-faced. The external surface of the in-
ner tube may be screw-threaded or provided
with grooves through its entire length within
the outer tube, so as to provide a greater heat-
ing-surface on which to spray the oil, the in-
ner tube projecting beyond the end of the
outer tube at its outer end to allow of a con-
nection with the exhaust-pipe, as aforesaid,
and carries a cone to hold a tension-spring for
keeping the valve normally closed and to act
as a guide to the valve-spindle which passes
through it, the spring pressing against a col-
lar or washer on the end of the said spindle.

The exhaust gases or products of combus-
tion are led from the inner tube by way of the
connection before mentioned along a tapered
exhaust-pipe, the orifice at each end being
proportionate in area to the area of the cyl-
inder and to the amount of compression used.
The smaller end of the taper pipe is fitted
to the inner tube connection, and the larger
end is provided with a hollow receptacle,
preferably of a spherical form, provided with
nozzles of a conical form, with their small ends
screwed or otherwise fitted to the said recep-
tacle and their large ends or mouths open to
the atmosphere for allowing the exhaust-gases
gradually and quietly to expand.

Into the annular space between the two
tubes constituting the exhaust and vaporizer
oil is sprayed in a fine jet either by a pump
direct or by the suction of the piston or by
any other means necessary to give a thin jet,
which oil may be mixed with a little air or
not, as desired. Connection between the an-
nular oil-space and the cylinder may be made
by means of a tube connecting it with the
space under the air-valve, in which case the
said tube would be provided with a non-re-
turn valve to prevent pressure being set up
in the vaporizing-space or by perforations or

orifices made near the inner end of the outer tube, in this case a non-return valve being provided in the oil pipe or inlet.

I will further describe my invention with reference to the accompanying drawings, premising I do not restrict myself to the precise details of construction described and illustrated.

Figure 1 of the drawings represents in longitudinal vertical section, and Fig. 2 in plan, a hydrocarbon-motor constructed according to my invention. Fig. 3 is a longitudinal section of a portion of the motor, showing a slight modification in the communicating passage between the vaporizer and the cylinder.

The inner cylinder A, in which the piston B slides, is surrounded by an outer cylinder C, with a space D between to contain water, constituting a water-jacket, which water may be caused to flow through the said space to keep the cylinder A cool. The outer cylinder or jacket C is made separate from the cylinder A and connected thereto, so as to be readily separated when required without disturbing the other parts of the motor. The cylinder A has formed on the outer circumference at or near the ends inclined surfaces a , and the outer cylinder or jacket C has internal flanges c , having corresponding inclined surfaces a' , into which the inclined surfaces a on the cylinder A are ground, so as to form between the surfaces a and a' fluid-tight joints.

On the inner end of the cylinder A is provided an external flange a^2 , corresponding to a flange c^2 , formed on the cylinder C, the said flanges being connected together by bolts b and nuts b' , by which the surfaces a and a' are drawn into intimate contact. The admission end of the cylinder A is tapered internally at d , into which tapered or conical end d is ground, so as to form a fluid-tight joint, an external tapered or conical surface d' , formed on the oil-vaporizing apparatus, which constitutes the cylinder-cover and valve-box, carrying the air-admission valve, the oil-inlet, and the exhaust-valve. This vaporizer is provided with an external flange d^2 , having therein holes through which pass the bolts b , the said vaporizer being securely connected to the cylinder by nuts d^3 , screwed onto the said bolts. The vaporizer extends into the cylinder A and is made to fit fluid-tightly the bore of the said cylinder. The distance to which the vaporizer enters the said cylinder may be adjusted as required by interposing between the flange d^2 and the end of the cylinder A a washer or washers, and so vary as required the capacity of the compression-space in the cylinder. The vaporizer comprises three concentric tubes or cylinders E, F, and G, the outer cylinder E containing an air-admission valve e and relief valve or cock e' . The cylinder F is connected to the cylinder E by bolts e^2 , passing through flanges e^3 and f , formed, respectively, on the cylin-

ders E and F, the said flanges being provided with conical contact-surfaces at f^2 to form a fluid-tight joint. The cylinder F is of less diameter than the interior diameter of the cylinder E, so as to provide an annular space f^3 between them, and on its end adjacent to the interior of the cylinder A are three or more projections f^4 , which bear against the interior of the cylinder E to maintain its concentricity.

The inner tube or cylinder G constitutes the exhaust-passage and is connected to the cylinder F by bolts g , passing through flanges g' and g^2 , formed, respectively, on the cylinders F and G, fluid-tight joints being made between the said cylinders by inclined contact-surfaces g^3 and g^4 , similar to the joints between the cylinders A and C, hereinbefore described, the cylinder G being of less diameter than the interior of the cylinder F, so as to provide an annular space g^5 between them, as shown.

The inner end of the tube or cylinder G constitutes or is provided with a seat for the exhaust-valve H, which is preferably of spherical shape. The rod h of this valve extends through the tube or cylinder G and is supported in bearings h' . On the outer end of the valve-rod is a shoulder or collar h^2 , between which collar and the outer end of the tube or cylinder G is a spring H', which normally maintains the valve H on its seat.

The cylinder F is provided on its exterior, at the part which projects beyond the cylinder E, with heating gills or flanges F' , which may be heated by a lamp or other external heating means when starting the motor. An inlet I for oil is also provided at this part of the cylinder F for admitting oil to the space g^5 , wherein the oil is vaporized. Near the inner end of the cylinder F are perforations f^5 , through which the oil-vapor passes from the space g^5 into the space f^3 and mixes with air admitted to the said space f^3 by the air-valve e . From the space f^3 the mixture of air and vapor passes into the compression-space of cylinder A and may, if desired, be ignited by any suitable igniting device at f^6 , either by electricity or otherwise, to cause the explosion of the mixture, or the mixture may be fired by simple compression. The external surface of the cylinder F is screw-threaded or provided with helical or with annular ribs or projections, as shown in Fig. 1, to increase the heating-surface and facilitate the vaporization of the oil.

In place of making the part E detached and bolting it up to the cylinder A, as shown in the drawings, I may cast the said part E in one with the said cylinder A, so as to form an extension thereof. This extension would be fitted with the air and release valves in the same manner as the detached part is fitted, as shown in the drawings.

The exhaust-valve H is opened to permit of the exhaust products of combustion passing

from the cylinder A by a lever K, centered at k to a bracket L, projecting from the exhaust tube or cylinder G. One end of the lever K bears on the outer end of the valve-rod h , while the opposite end is connected by a rod k' to a bar k^2 , fitted to slide longitudinally in a bearing k^3 on the outer cylinder or jacket B of the motor. The bar k^2 carries at its free end a roller or antifriction-wheel k^4 in contact with a disk M, which receives rotary motion from the crank-shaft (not shown in the drawings) operated by the motor. The disk M is mounted loosely on a shaft N, carried in bearings n on the jacket C, on which shaft is fixed a two-armed bracket or lever O, one arm o of which bracket or lever is arranged parallel to the said shaft N and is hinged to the disk M near its periphery, while the other arm o' is at right angles to the shaft and is connected by hinged or toggle levers P to the diametrically-opposite side of the disk M and near its periphery. The length of the toggle-levers P is such that when in their normal position (shown in Fig. 1) their combined length is longer than the arm o of the bracket O, and will consequently cause the disk M to assume an inclined position on the shaft N, as shown, so that when the shaft N is rotated the disk M, acting on the wheel or roller k^4 , will impart to the bar k^2 a longitudinal movement in the bearing k^3 and, through the connecting-rod k' and the lever K', open the exhaust-valve H against the counteracting pressure of the spring H'. It will be understood that the said valve will be opened to a greater or less extent, according to the degree of inclination of the disk M. The shaft N carries a bevel-wheel Q in gear with a corresponding wheel Q', fast on a shaft or spindle R, carrying a pitch or chain wheel S, around which passes a chain from a chain-wheel on the crank-shaft of the motor, which latter chain-wheel is one-half the diameter of the wheel S, so that the shaft or spindle R, and consequently the disk M, will make one complete rotation to each two rotations of the crank-shaft, whereby the exhaust-valve H will be opened only at each alternate rotation of the said crank-shaft.

Connected to the exhaust tube or cylinder G is a silencing device for preventing or subduing noise, the said device consisting of a spherical expansion-chamber T, connected to the exhaust passage or tube G by a tapered or conical tube T', the larger end of the said conical tube being connected to the spherical chamber T. Radiating from the spherical chamber T are trumpet-shaped nozzles T², through which the exhaust products of combustion escape from the interior of the spherical chamber with but little, if any, noise.

The operation of the motor is as follows: To start the motor, the cylinder F is heated externally by a lamp or other heating device placed in close proximity to the gills or heating-flanges F' until sufficient heat is imparted to the said cylinder to vaporize a supply of

oil admitted to the space g^5 , which oil may be forced into the said space by a pump or be drawn in by suction by causing the piston B to make its outward stroke. The oil-vapor passes from the space g^5 through the perforations f^5 into the annular space f^3 , into which space a supply of air is admitted by the valve e , which air mixes with the oil-vapor, the said mixture when the piston makes its outward stroke being drawn into the cylinder, and on the return stroke of the piston the said mixture is compressed in the compression-space of the cylinder and in the annular space f^3 . While under compression the mixture may be ignited at the point f^0 , causing the said mixture to explode and force the piston outward and rotate the crank-shaft with such impetus that it will effect the return or inward stroke of the piston and force the products of combustion from the cylinder through the exhaust pipe or passage G, the exhaust-valve having been opened by the disk M. The piston then moves outward again, so as to draw another charge of mixed air and vapor into the cylinder, and then makes another inward stroke to compress the fresh charge, which upon being exploded imparts renewed impetus to the crank-shaft, and the cycle of operations hereinbefore described is repeated. The heat generated after the first explosion, in combination with the effects of compression, is usually sufficient to vaporize the oil and explode the mixture without the assistance of externally-applied heat, and the motor will continue to work until the supply of oil to the vaporizer is cut off. Should the speed of the motor increase above the normal speed, the toggle-levers P of the governing device will by the excessive centrifugal force imparted thereto fly outward and draw the disk M into a position more nearly at right angles to the spindle N, and consequently reduce the extent of motion of the valve H, and thereby retard or prevent the escape from the cylinder of the products of combustion, and so reduce the speed of the motor, whereupon the toggle-levers P will resume their normal position and incline the disk M to the necessary angle to open the valve H to the extent required to admit of free egress of the exhaust products from the cylinder. It will thus be seen that the governor will maintain the motor at an approximately-uniform speed. Instead of admitting the oil-vapor into the annular space f^3 from the space g^5 through perforations in the cylinder F into the annular air-space f^3 and thence to the cylinder A, as hereinbefore described, the said vapors may pass from the said space g^5 into a tubular passage f^5 , Fig. 3, in the wall of the cylinder F and past a non-return valve f^6 into the annular space f^3 , and thence, together with air admitted at e between the lugs or projections f^4 , into the compression-space of the cylinder A. The mixed air and vapor is compressed by the inward stroke of the piston and exploded,

as hereinbefore described. The non-return valve f^6 prevents pressure from being set up in the vaporizing-space g^5 .

Having now particularly described and as-
 5 certain the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a hydrocarbon-motor an oil-vaporizer comprising three tubes or cylinders arranged
 10 one within another so as to form annular spaces between the cylinders the inner tube constituting a passage for the exhaust prod-
 ucts of combustion the annular space between the innermost tube or cylinder and the next
 15 tube or cylinder surrounding it constituting the oil-vaporizing chamber, and the annular space between the outermost tube or cylinder and the next inner tube or cylinder constituting an air and vapor mixing chamber; means
 20 for admitting oil to the vaporizing - chamber; and for admitting air into the mixing-chamber; perforations or passages through which the vaporized oil can pass from the vaporizing-chamber into the mixing-chamber
 25 and passages from the said mixing-chamber to the motor-cylinder, substantially as here-
 inbefore described.

2. In a hydrocarbon-motor, the combina-
 tion of the motor-cylinder with an oil-vapo-
 rizer, consisting of three tubes, one within 30
 the other and projecting into the motor-cyl-
 inder and forming annular spaces between
 the tubes, the inner tube for the exhaust, the
 annular space between the innermost tube
 and the next constituting the oil-vaporizing 35
 chamber, and the annular space between the
 outermost tube and the next inner tube con-
 stituting a mixing-chamber, the several tubes
 being fitted to each other and to the motor-
 cylinder with inclined contacting surfaces to 40
 form fluid-tight joints, means for admitting
 oil to the vaporizing-chamber, and for admit-
 ting air to the mixing-chamber, perforations
 through which the vaporized oil can pass to
 the mixing-chamber and passages from the 45
 latter to the motor-cylinder, all substantially
 as described.

In testimony whereof I have signed this
 specification in the presence of two subscrib-
 ing witnesses.

E. T. HEADECH.

Witnesses:

WILLIAM FREDERICK UPTON,
 WILLIAM JOHN WEEKS.