No. 646,282. Patented Mar. 27, 1900.

E. T. HEADECH.

HYDROCARBON MOTOR.

(Application filed May 22, 1899.)

(No Model.)

Fig. 1.

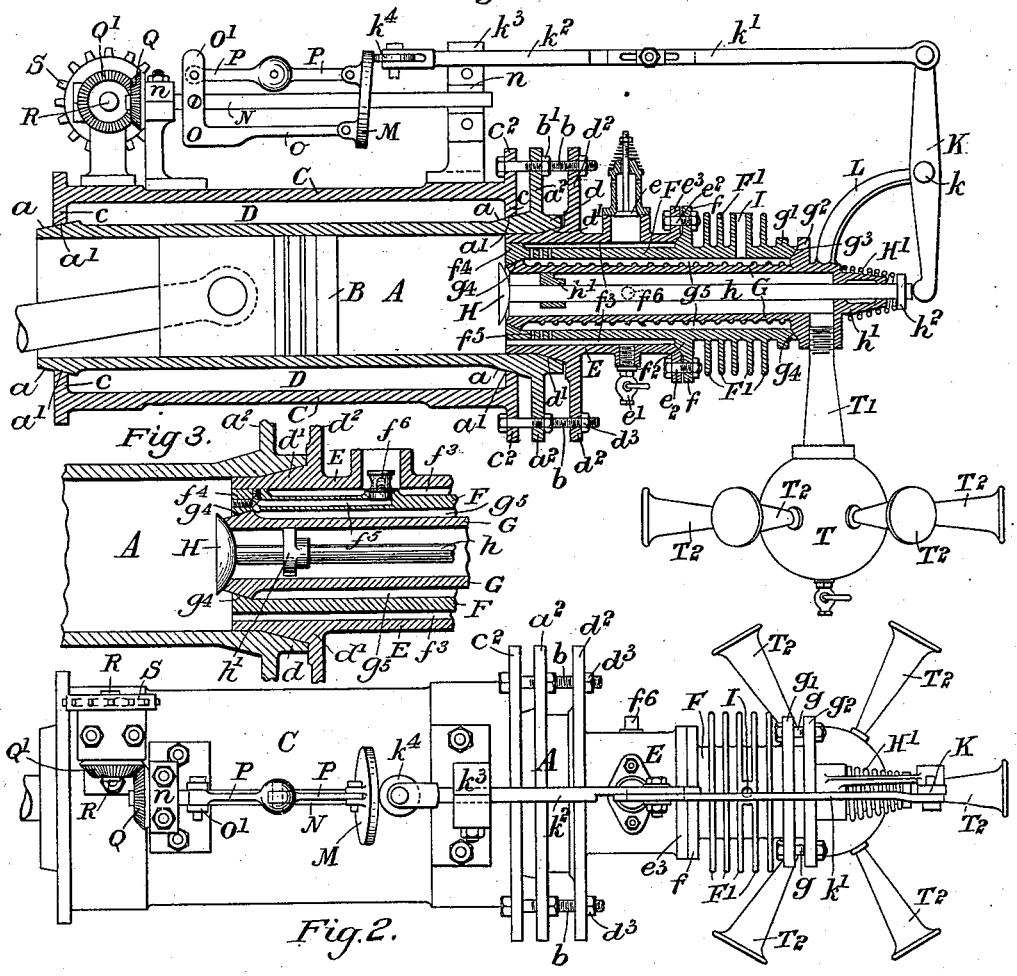

Fig 3.

Fig. 2.

WITNESSES

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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 HEADECH, 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 certain new and useful Improvements in Hydrocarbon-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 apparatus.

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-conducting 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 projections which fit the bore of the cylinder, enabling it to be held firmly in position. A portion 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 facilitate 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 cylinder end, fitting with a coned or plain joint. The valve-box carries an air-valve on a detachable fitting or case for admission of the air to an annular space formed between the outer tube and the cylinder-walls, also a relief-valve for lowering compression suddenly, if required, and an ignition-plug. The ignition may be effected by an electric current or by other means common among internal-combustion motors.

Oil is conducted into an annular space between the outer tube and an inner tube constituting the exhaust-passage at or about the center of the radiating part already described. To the outer end of the inner tube is connected, by a flange and conical joint, the exhaust outlet pipe or passage. The inner tube is fitted 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 semicircular-faced. The external surface of the inner tube may be screw-threaded or provided with grooves through its entire length within the outer tube, so as to provide a greater heating-surface on which to spray the oil, the inner tube projecting beyond the end of the outer tube at its outer end to allow of a connection 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 collar or washer on the end of the said spindle.

The exhaust gases or products of combustion 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 cylinder 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 receptacle 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 annular 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-return 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 cylinders 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 T^2, 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 ascertained 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 one within another so as to form annular spaces between the cylinders the inner tube constituting a passage for the exhaust products of combustion the annular space between the innermost tube or cylinder and the next 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 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 and passages from the said mixing-chamber to the motor-cylinder, substantially as hereinbefore described.

2. In a hydrocarbon-motor, the combination of the motor-cylinder with an oil-vaporizer, consisting of three tubes, one within the other and projecting into the motor-cylinder 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 chamber, and the annular space between the outermost tube and the next inner tube constituting a mixing-chamber, the several tubes being fitted to each other and to the motor-cylinder with inclined contacting surfaces to form fluid-tight joints, means for admitting oil to the vaporizing-chamber, and for admitting air to the mixing-chamber, perforations through which the vaporized oil can pass to the mixing-chamber and passages from the latter to the motor-cylinder, all substantially as described.

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

E. T. HEADECH.

Witnesses:
WILLIAM FREDERICK UPTON,
WILLIAM JOHN WEEKS.