

June 30, 1925.

1,543,732

J. H. STALEY

PREHEATING HUMIDIFIER

Filed Dec. 6, 1924

Fig. 1.

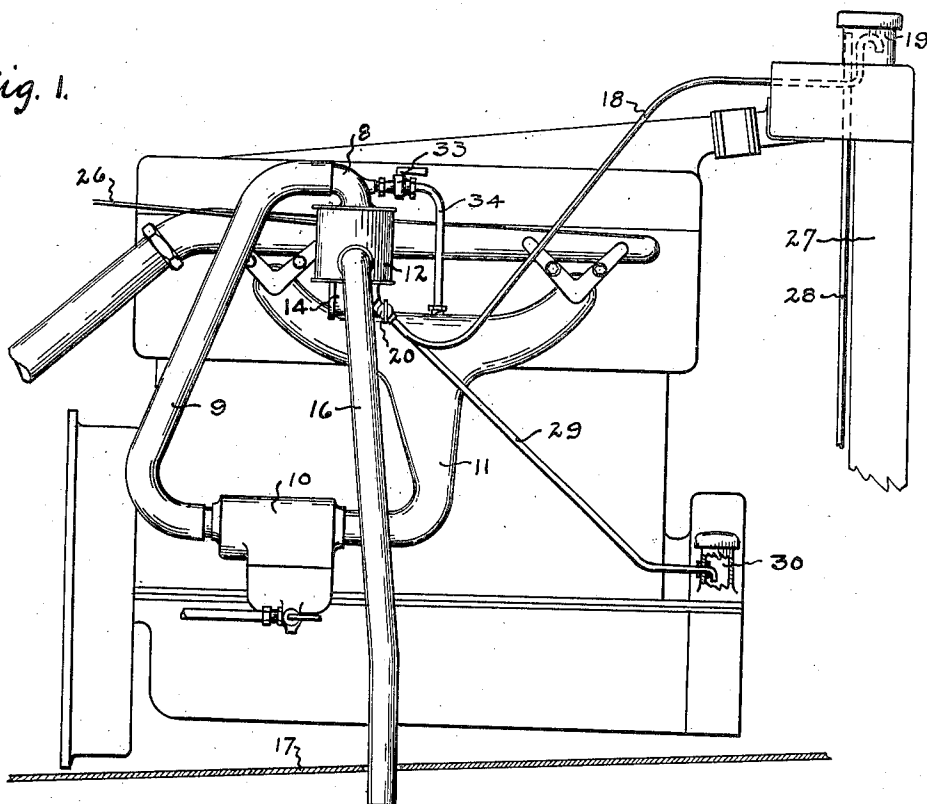


Fig. 2

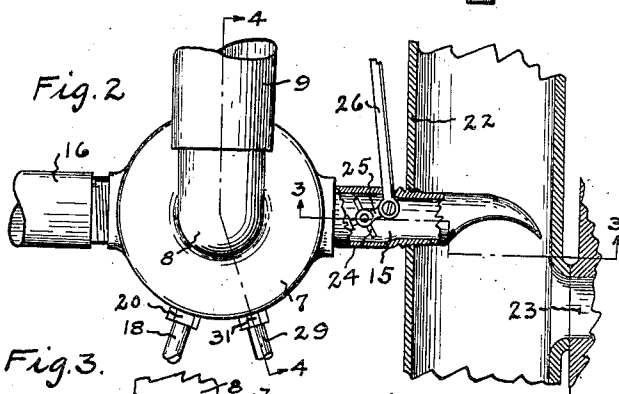
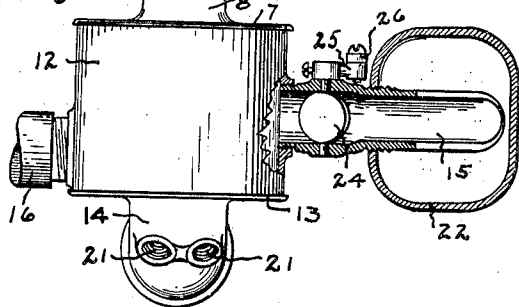


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOSEPH H. STALEY, OF COLUMBUS, INDIANA.

PREHEATING HUMIDIFIER.

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To all whom it may concern:

Be it known that I, JOSEPH H. STALEY, a citizen of the United States, residing at Columbus, in the county of Bartholomew and State of Indiana, have invented new and useful Improvements in Preheating Humidifiers, of which the following is a specification.

It was determined experimentally many years ago that the introduction of steam directly into the cylinder of a hot-tube ignited kerosene motor produced a vastly more smoothly running motor with the entire elimination of the theretofore customary knock or pound. Similarly, it has been observed in the more refined type of gasoline burning motors employed to-day that much better operation is secured both at night in the presence of the damper air and on damp or rainy days.

Realizing the effect of water vapor upon the operation of the motor, many inventors have sought to devise means whereby such vapor can readily and suitably be introduced to meet all requirements, but it is evident from the new work appearing from time to time that the entirely successful operation of such means has not been attained heretofore.

My invention comprises means of taking vapor from the top of the usual radiator for cooling the engine-jacket water and thoroughly incorporating this vapor in a mixing chamber with the entire inrushing air going through the carburetor, in the presence of heated walls, and at the same time drawing the heated gases present in the crankcase into this mixing chamber for passage back into the motor cylinder. My invention not only provides for the carburetor intake air taking up the maximum possible vapor but at the same time provides for the preheating of such air with a control means for decreasing the heat during the motor operation in excessively hot weather so as to avoid loss of power. My device is exceedingly simple, eliminates the usual carburetor air-intake stove on the exhaust manifold, is effective under all operating conditions, providing quick heating means for warming the intake-air in cold weather starting, avoids flooding and choking the motor by radiator boiling as encountered in the usual humidifying device, and can readily be applied to any motor at a very reasonable cost.

I accomplish these and such other objects as may become apparent in the following description, by the means as illustrated in the accompanying drawing, in which

Fig. 1 is a right side elevation of a motor showing my economizing humidifier applied thereto and the upper portion of a radiator in connection therewith; Fig. 2, an enlarged plan view of the humidifier with fragments of the exhaust manifold and the therein entering interceptor tube removed; Fig. 3 a front vertical elevation of the humidifier with a vertical section taken through the exhaust manifold and the interceptor tube on the line 3—3 of Fig. 2; and Fig. 4, a further enlarged vertical section through the humidifier taken on the line 4—4 of Fig. 2.

Like characters of reference indicate like parts throughout the various views.

I form a hollow ellipsoidal member 5 for the purpose of a mixing and heating chamber, with the external annular radiating fins 6, such member being integral by its upper end with the top cover plate 7 likewise containing as an integral part thereof the backwardly-turned L 8 which contains a passage from the member 5 discharging into the carburetor intake pipe 9, in turn secured to and discharging through the carburetor 10 into the engine intake manifold 11. An outer chamber is formed to enclose the member 5 by engaging the upper end of the cylindrical housing 12 against the annular shoulder about the outer circumferential edge of the cover plate 7 and there securing the housing 12 by a base plate 13 similarly formed with an annular shoulder as the cover plate 7, to engage the lower end of the housing 12, as the base plate 13 is screw-threadedly engaged about the lower end of the member 5.

A backwardly turned L 14 is formed on the under side of the base plate 13 and its internal passage is restricted as the passage discharges into the ellipsoidal member 5, producing in effect a Venturi tube. The interceptor tube 15 is screw-threadedly engaged by one end in the housing 12 and has its extending length slightly reduced in diameter to permit the tube to be screw-threadedly engaged in the exhaust manifold 22 so as to have the outer end further projecting into the manifold substantially across

to the opposite wall of the manifold. This projecting end of the interceptor tube 15 is cupped, and shaped to properly deflect the exhaust gases through the tube 15 to within the housing 12 around about the outside of the member 5. The exhaust gas so deflected is allowed to exhaust from within the housing 12 into the exhaust pipe 16 leading from the housing 12 on the side opposite and
 10 above or below the interceptor tube 15, (here shown below), down through and discharging below the motor pan 17.

Referring to Fig. 2, it will be noticed that the interceptor tube 15 is introduced
 15 into the manifold 22 immediately back of one of the cylinder exhaust ports 23 discharging into the manifold. By so placing the tube 15, exhaust gas of the maximum temperature is deflected from the manifold directly into the housing 12. A butterfly
 20 valve 24 is placed within the tube 15 between the housing 12 and the manifold 22 and is operated by the lever 25 and the connected control rod 26.

A vapor conducting tube 18 leads from
 25 within the radiator filler neck 19 back and down to a stop cock 20 which screw-threadedly engages in one of the two passages 21 entering the lower L 14 from the front side.
 30 The radiator 27 is equipped with the usual overflow pipe 28. A tube 29 having its lower end passed through the breather tube 30 below the usual screen (not shown) and turned down to prevent the entrance of oil
 35 or foreign objects entering the breather tube 29, discharges by its upper end through a stop cock 31 into the other of the two passages 21 in the L 14. A nozzle 32 is securely fitted in each of the passages 21 so as
 40 to extend inwardly within the L and is turned upward to terminate its discharge orifice centrally within the most restricted portion of the passage through the L 14 into the member 5 as in Fig. 4 where in the
 45 section but one nozzle 32 shows.

Though not absolutely essential to the successful operation of my device, it may be of some benefit to employ the carburetor
 50 by-pass stop cock 33, screw-threadedly entering the top L 8, and tube 34 discharging from the stop-cock 33 directly into the intake manifold 11.

Especial attention is drawn to the position of the injecting nozzle 32 in that by so locating it, such water as may be drawn over
 55 through the tube 18, as may happen when the radiator is boiling or the water is thrown upwardly in the radiator in driving a car over rough roads, will drain down and out
 60 through the L 14 and can not be conducted along the wall over into the carburetor. A screen 35 is placed over the intake opening of the L 14 to prevent drawing in of
 65 foreign objects.

The operation of my preheating humidifier

is simple and involves no moving parts other than the setting of the stop cocks and the heat controlling butterfly valve 24. As the motor is cranked a partial vacuum
 70 is produced in its intake manifold 11 thereby producing an in-rush of atmospheric air into the lower L 14, through the restricted passage, and into the mixing chamber 5, and by so doing the greatest vacuum
 75 is produced in that restricted area at the terminating ends of the nozzles 32. This vacuum causes an in-rush of air through the tube 18 from the top of the radiator
 80 above the surface of the water, thereby drawing off the vapor there present and injecting it through the nozzle 32 into the chamber 5. The stop cock 20 may be so
 85 adjusted as to give the desired quantity of vapor as demanded. Similarly, air is drawn through the tube 29 from the crankcase bringing the gases there contained and injecting them through the other nozzle 32
 90 into the mixing chamber 5. By virtue of the shape of the chamber 5 and the nature of its inlet and outlet passages, considerable turbulence of the gases, vapor, and air is
 95 created so as to obtain a completely mixed resultant product. By opening the butterfly valve 24 the exhaust gas passes into the housing 12 around the fins 6 and out the pipe
 100 16 such that the wall of the mixing chamber member 5 is brought to an exceedingly high temperature such that the contained gaseous mixture is heated.

With the continued production of the
 105 partial vacuum in the manifold 11, the mixture rushes from the chamber 5 through the L 8, the pipe 9, the carburetor 10 where the gasoline is taken up and on into the
 110 intake manifold 11 and from there to the cylinders in the usual manner. It will be noted that the stop cock 31 may be shut off to prevent the flow of gases from the crank case or the entire tube 29 to the breather
 115 pipe 30 may be omitted if desired, since such gases do not affect the vapor supply but are only utilized to effect a further economy in the motor operation.

Having fully described my invention in the form now best known to me, though it
 120 obviously may be varied in structural details without departing from the spirit of the invention, what I claim as new and desire to secure by United States Letters
 125 Patent is:

1. The combination with a hydrocarbon motor having a crank-case, a radiator, an exhaust manifold, and a carburetor air-intake pipe, of an auxiliary mixing chamber
 130 through which all of the air passes that enters the carburetor, said mixing chamber discharging into said intake pipe, and said auxiliary mixing chamber having an intake passage to form a Venturi tube in conjunction with said mixing chamber; pipes
 135

discharging vapors into said intake passage conducted from said radiator and the crankcase of said motor; and means of heating said mixing chamber.

5 2. In a hydrocarbon motor, the combination with a radiator water vapor supplying means, an exhaust manifold, and a carburetor air-intake pipe, of an auxiliary mixing chamber discharging into said carburetor
10 air-intake pipe such that all air passing through the motor carburetor passes through said chamber; an intake L on the intake end of said auxiliary mixing chamber having its discharge opening into said mixing chamber restricted to form a Venturi
15 tube in conjunction with said chamber; a pipe discharging into said intake member at its most restricted section, said pipe entering by its other end said radiator and having its intake above the normal water line
20 in said radiator; and means of heating said mixing chamber.

3. In a hydrocarbon motor, the combination with water vapor supplying means, an
25 exhaust manifold, and a carburetor air-intake pipe, of an auxiliary mixing chamber discharging into said carburetor air-intake pipe such that all air passing through the motor carburetor passes through said
30 chamber, the intake end of said auxiliary mixing chamber having its discharge opening into said mixing chamber restricted to form a Venturi tube in conjunction with said chamber; a pipe discharging into the
35 intake of said mixing chamber, said pipe entering by its other end said water vapor supplying means and having its intake above the normal water line in said means; a housing surrounding said mixing chamber;
40 a conduit conducting exhaust gases from said exhaust manifold into said housing; and a discharge pipe from said housing, said discharge pipe leaving said housing at a point staggered and not opposite the
45 inlet of said conduit.

4. In a hydrocarbon motor, the combination with water vapor supplying means, an
exhaust manifold, and a carburetor air-intake pipe, of an auxiliary mixing chamber
50 discharging into said carburetor air-intake pipe such that all air passing through the motor carburetor passes through said chamber, said auxiliary mixing chamber having its intake passage restricted to form a Venturi tube in conjunction with said chamber;
55 a pipe discharging into said intake passage at its most restricted section, said pipe entering by its other end said water vapor supplying means; a housing surrounding said mixing chamber; an interceptor tube discharging within said housing and entering said exhaust manifold and extending substantially across to the opposite wall within said manifold, said interceptor tube
60 being inserted in said manifold at a point

immediately back of a port discharging from said motor into said manifold, and said interceptor tube having its projecting end cupped and scoop-shaped to deflect the
70 gases entering said manifold through said tube to within said housing; a discharge pipe from said housing; and means cooperating with said interceptor tube of controlling the flow of exhaust gases into said
75 housing.

5. In a hydrocarbon motor, the combination with water vapor supplying means, an exhaust manifold, and a carburetor air-intake pipe, of an auxiliary mixing chamber
80 discharging into said carburetor air-intake pipe such that all air entering the motor carburetor passes through said mixing chamber, said auxiliary mixing chamber having its intake passage into said mixing chamber restricted to form a Venturi tube in conjunction with said chamber, nozzles fixed in said
85 intake passage to have their discharge ends projecting into, the most restricted section of the passage; vapor conducting pipes discharging into said nozzles conducting
90 vapor from the said water vapor supplying means and vapor from the crankcase of said motor; stop-cocks in said conducting pipes; and means cooperating with said exhaust manifold of heating said mixing chamber.
95

6. In a hydrocarbon motor, the combination with a radiator, an exhaust manifold, an intake manifold, and a carburetor
100 air-intake pipe, of an auxiliary mixing chamber discharging into said carburetor air-intake pipe such that all air passing through the motor carburetor passes through said chamber; an intake member of said auxiliary mixing chamber having its discharge opening into said mixing chamber
105 restricted to form a Venturi tube in conjunction with said chamber; a pipe discharging into said intake member at the most restricted section, said pipe entering by its other end said radiator and having its intake above the normal water line in said radiator; means cooperating with said exhaust manifold of heating said mixing
110 chamber; and carburetor by-pass means for passing a portion of the products discharging from said mixing chamber directly into said intake manifold.

7. In a hydrocarbon motor, the combination with a radiator, an exhaust manifold, an intake manifold, and a carburetor
120 air-intake pipe, of an auxiliary mixing chamber discharging into said carburetor air-intake pipe such that all air passing through the carburetor is drawn through said chamber; an intake member of said auxiliary mixing chamber having its discharge opening into said mixing chamber
125 restricted to form a Venturi tube in conjunction with said chamber; a water vapor pipe leading from said radiator and dis-

charging into said intake member; a crankcase vapor pipe leading from the crankcase of the motor and discharging into said intake member; means cooperating with said exhaust manifold of heating said mixing chamber; and carburetor by-pass means discharging from the discharge of said mixing chamber into said intake manifold.

8. A humidifier comprising a mixing chamber having a discharging L; a housing surrounding said chamber; a housing cover plate carried between the discharging L and the chamber; annular radiating fins projecting outwardly from the outer side of the chamber within the housing; an intake end housing cover plate engaging the intake end of said chamber; an intake L in said intake end cover plate, said intake L having its intake opening substantially of the same area as that of the said discharging L, and said intake L having its internal passage restricted from said intake opening to its discharge into said mixing chamber; a screen over the end of said intake L intake opening; a nozzle in said passage terminating in its most restricted passage area; a tube adapted to be fitted by its intake end into a radiator to take vapor from above the radiator water and discharge into said nozzle; a control valve in said tube; an interceptor tube engaged by one end in the wall of said housing and adapted to be inserted through and engaged in the wall of an exhaust manifold of a motor, said interceptor tube having an end to project within the exhaust manifold cupped and scoop-shaped to deflect the exhaust gases through the tube into the said housing; a valve in said interceptor tube; and a discharge pipe from said housing.

Signed at Columbus, county of Bartholomew, State of Indiana, this the 3rd day of Dec. 1924.

JOSEPH H. STALEY.