

No. 642,943.

Patented Feb. 6, 1900.

G. E. WHITNEY & H. HOWARD.  
MOTOR VEHICLE.

(Application filed Feb. 4, 1899.)

(No Model.)

2 Sheets—Sheet 1.

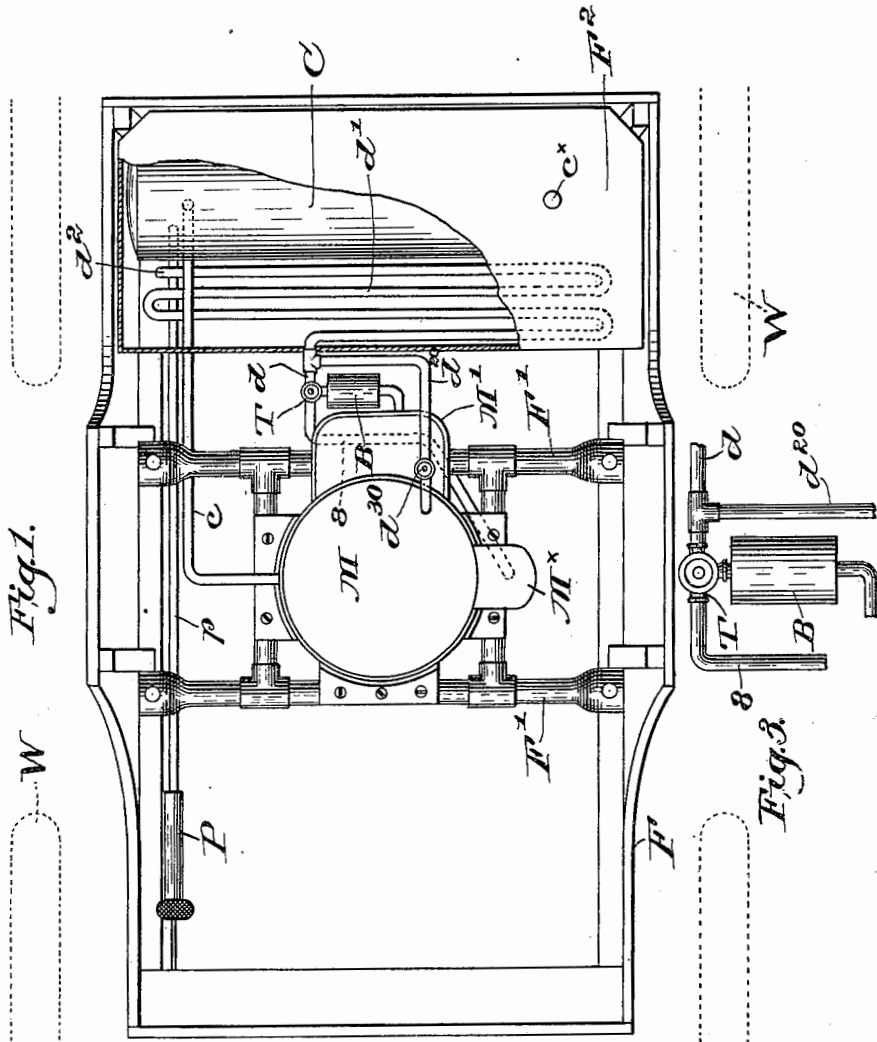


Fig. 1.

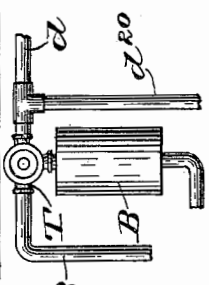


Fig. 3.

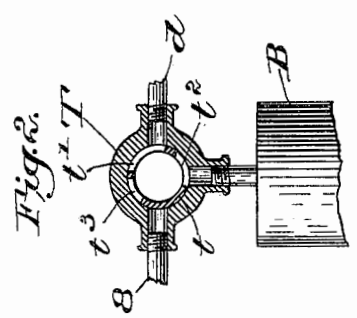


Fig. 2.

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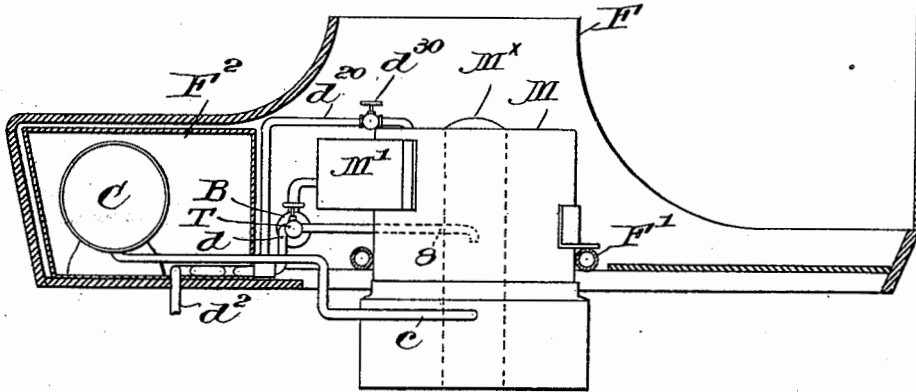
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2 Sheets—Sheet 2.

Fig. 4.



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# UNITED STATES PATENT OFFICE.

GEORGE E. WHITNEY, OF BOSTON, AND HENRY HOWARD, OF BROOKLINE, MASSACHUSETTS; SAID WHITNEY ASSIGNOR AND SAID HOWARD ASSIGNOR OF ONE-HALF HIS RIGHT TO THE WHITNEY MOTOR WAGON COMPANY, OF KITTERY, MAINE.

## MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 642,943, dated February 6, 1900.

Application filed February 4, 1899. Serial No. 704,464. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE E. WHITNEY, of Boston, county of Suffolk, and HENRY HOWARD, of Brookline, county of Norfolk, State of Massachusetts, have invented an Improvement in Motor-Vehicles, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates more particularly to motor-vehicles of the type wherein the power is provided by a steam or other expansible-medium motor burning hydrocarbon or other liquid fuel; and it has for its objects, primarily, the utilization of heat, preferably from the motor, to create a pressure sufficient to effect the feed of the fuel to the point at which it is used, and, secondarily, the heating of the feed-water and, if desired, the condensation of the exhaust of the motor more or less completely, these several features being adapted to be employed with special advantage in motor-vehicles. It is well known that in such vehicles a gravity-feed of the liquid fuel can be used to a very limited extent, if at all, pressure upon the fuel being utilized to feed the same; but this pressure has been heretofore created manually by suitable pumping devices manipulated from time to time as required.

By our present invention we utilize thermal action to create or generate a pressure upon the liquid fuel sufficient to effect feed thereof, and such thermal action being applied extraneously to the fuel-receptacle we relieve the operative of the manual generation of such pressure after the apparatus has been started. We can effect such thermal action by the exhaust of the motor, thus increasing the efficiency of the apparatus by making otherwise waste heat perform useful work.

Various novel features of our invention will be hereinafter fully described in the specification and particularly pointed out in the claims.

Figure 1 is a top or plan view of a sufficient portion of a motor-vehicle and motor to be understood with one embodiment of our in-

vention applied thereto, the body of the vehicle being shown and the feed-water tank partially broken out. Fig. 2 is an enlarged detail in section of the three-way cock for controlling the feed-pressure on the liquid fuel. Fig. 3 is an enlarged detail in elevation of a portion of the apparatus shown in Fig. 1, to be referred to; and Fig. 4 is a partial side elevation of the apparatus shown in Fig. 1, the vehicle-body and the feed-water tank being shown in section.

Any suitable steam-motor or other expansible medium may be employed comprising a steam or other generator and an engine, and such a steam-motor may be used as shown and described in United States Patent No. 601,218, granted the 22d day of March, 1898, and in Fig. 1 the boiler M, stack or flue M<sup>x</sup> for the escape of the products of combustion, a hood or jacket M', surrounding the cylinders and valve-chests of the engine and mounted on the boiler, may be substantially as shown and described in said patent, the exhaust passing through a muffler B of any suitable construction to deaden the sound of the exhaust, and in our present invention the exhaust preferably passes thence to the means for utilizing the exhaust to effect the feed of the fuel, to be described.

We have herein shown the motor as mounted on cross-bars F', secured to the body F of a motor-vehicle, the wheels W being partially indicated by dotted lines in Fig. 1, and the boot or back of the body is in the present instance shown as provided with a tank F<sup>2</sup> for the feed-water, the top or cover of the tank being partially broken out, the said tank being suitably connected with the boiler.

A preferably cylindrical receptacle C for naphtha or other liquid fuel is herein arranged to be heated extraneously by the exhaust from the motor, and a convenient means to achieve this end is to mount the receptacle C in the tank, so that the water in the latter will more or less surround said receptacle, a manually-operated air-pump P being connected with the latter by a pipe p to generate the necessary pressure when raising steam in the motor, and a filling-inlet c<sup>x</sup> is provided

for the receptacle. Inasmuch as it is also advantageous to heat the feed-water, we have herein shown the apparatus so constructed that the feeding pressure for the liquid fuel is created or generated by the heating of the feed-water, and in connection with the latter if the exhaust-steam from the motor is used such exhaust-steam may be more or less condensed, so that when it finally escapes into the atmosphere there is little or no visible vapor. In the patent referred to other means are provided for coacting upon or treating the exhaust that it will be invisible, or substantially so, at ordinary temperatures of the atmosphere.

Referring to Figs. 1 and 4, a pipe  $d$  enters the feed-water tank  $F^2$  and is connected with a series of bends  $d'$  therein, preferably extended lengthwise thereof, the end  $d^2$  of the bends passing out of the tank to the outer air, while the pipe  $d$  communicates with the source of the heating medium through a three-way cock  $T$  and the muffler  $B$ , if the motor-exhaust is utilized, as in the present instance. A pipe  $8$  leads from the three-way cock to the stack of the motor, so that by means of the cock the exhaust can be turned into either the pipe  $d$  or into the stack through the pipe  $8$ , or partly to each, the construction of the valve being shown clearly in section in Fig. 2, wherein the communication is shown as direct from the muffler through the valve to the pipe-bends  $d'$  in the tank  $F^2$ .

It is to be understood that while we have herein shown the apparatus as constructed and arranged to utilize the motor-exhaust as the medium for generating feeding pressure for the fuel our invention is not restricted thereto, as live steam or other heating medium could be employed, as will be described.

A pipe  $c$ , Figs. 1 and 4, leads from the receptacle  $C$  to the furnace of the motor, (not shown in detail,) at which the fuel is to be utilized and of any suitable construction.

As to the operation of the apparatus herein illustrated, the necessary feeding pressure on the fuel is generated by the pump  $P$  when it is desired to first start the motor, and thereafter the pressure is generated or maintained by or through heating of the liquid fuel in the receptacle  $C$ , the apparatus shown being adapted to heat such receptacle by the rise in temperature of the feed-water due to passage of the motor-exhaust to the bends  $d'$ . After the apparatus has been running and has been brought to a standstill there would be no exhaust, and the water in the tank would gradually cool, with a consequent reduction of the feed-pressure on the fuel, and to obviate the use of the pump or other manual pressure-generator to restore such pressure and also maintain the motor in condition for instant use we have provided means for maintaining the requisite fuel-feeding pressure by or through the thermal action of the live steam or other medium of the motor. For this purpose we herein connect the steam-space of the

boiler  $M$  and the pipe  $d$  by a branch  $d^{20}$ , Figs. 1 and 3, a valve  $d^{30}$  in the branch permitting the live steam to pass to the pipe  $d$  or cutting off communication between said pipe and the branch, as would be the case when the apparatus is running under ordinary conditions. Obviously the three-way cock  $T$  must be so turned to prevent the passage of the live steam from the branch  $d^{20}$  out through the stack when feeding pressure is generated by the described action of live steam.

From the foregoing description it will be obvious that the heating of the liquid fuel will tend to vaporize a portion thereof with an attendant creation or generation of pressure, this pressure being utilized to effect the feed of the fuel to the combustion-point, and the pressure increases or decreases with the rise or fall of the temperature to which the main body of the liquid fuel is subjected.

It will be manifest from the foregoing description and the drawings that the heating of the fuel to vaporize a portion thereof sufficient to exert feeding pressure upon the fuel is effected by the application of heat, whatever be the means of so applying the heat, extraneously to the receptacle in which the liquid fuel is contained. By providing for such extraneous application of heat we are enabled to avoid the multiplication of joints and connections with the fuel-receptacle, as would be necessary in case a heating-pipe should be extended through the receptacle, for instance, and the apparatus is much simplified and made stronger by the absence of such joints and connections.

The regulation of the temperature is controlled by the three-way cock  $T$ , as by means of the latter the heating medium can be directed wholly to the pipe-bends or partly thereto and partly to the stack of the motor, or it may be shut off altogether from the bends and directed wholly to the stack.

Referring to Fig. 2, the valve  $t$  of the three-way cock is provided with suitable ports  $t'$   $t''$   $t^3$ , so constructed and arranged that the hereinafore-described operation of the cock will effect the desired results.

Our invention is not restricted to the precise construction and arrangement shown, as the same may be modified or rearranged without departing from the spirit and scope of our invention.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An expansible-medium motor, a receptacle for liquid fuel therefor, means to conduct said fuel to the point at which it is utilized, and means utilizing the exhaust of the motor to heat extraneously the said receptacle and by partial vaporization of its contents create pressure upon and to effect feed of such liquid-fuel contents through the conducting means therefor.

2. In a motor-vehicle, an expansible-medium motor, a receptacle for liquid fuel therefor,

and means to subject the liquid fuel to feeding pressure by or through thermal action of the motor-exhaust extraneously applied to the said receptacle.

5 3. In a motor-vehicle, a steam-motor, a feed-water tank, a liquid-fuel receptacle, and means to heat the feed-water and thereby create pressure within the fuel-receptacle to effect feed of the fuel.

10 4. In a motor-vehicle, a steam-motor, a feed-water tank, a liquid-fuel receptacle, and means to utilize the exhaust from the motor to heat the feed-water and thereby create pressure within the fuel-receptacle to effect feed of the fuel.

15 5. In a motor-vehicle, a steam-motor, a feed-water tank, a liquid-fuel receptacle therein, and means to utilize the motor-exhaust to heat the contents of the tank, the heating of the feed-water operating to create pressure within the receptacle to effect feed of the liquid fuel.

20 6. A steam-motor, a feed-water tank therefor, heating means for the feed-water, connected with the motor-exhaust, a liquid-fuel receptacle in the tank, to be heated by the contents of the latter, and a manually-actuated controlling device to govern the passage of the exhaust to the tank-heating means.

30 7. In a motor-vehicle, a steam-motor having

a stack, a feed-water tank, a condenser therein, connections between the motor-exhaust and said condenser and stack, a liquid-fuel receptacle in the tank, and a manually-actuated controlling device to govern the passage 35 of the exhaust to the condenser and stack.

8. In a motor-vehicle, a steam-motor, a liquid-fuel receptacle, means to generate feeding pressure on the liquid fuel by extraneously heating the receptacle by the motor-exhaust, and also extraneously by live steam 40 from the motor, and independent controlling devices to utilize live or exhaust steam for such extraneous heating.

9. In a motor-vehicle, a steam-motor, a feed- 45 water tank, a condenser therein, connected with the exhaust of the motor, a liquid-fuel receptacle in said tank, to be heated by the feed-water, whereby the pressure created in said receptacle will effect feed of the liquid 50 fuel, and a controlling device to regulate the operation of the condenser.

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

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HENRY HOWARD.

Witnesses:

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