C. C. WORTHINGTON.

CONDENSING APPARATUS FOR STEAM MOTOR CARRIAGES.

APPLICATION FILED JAN. 27, 1909.

1,072,894.

Patented Sept. 9, 1913.

2 SHEETS—SHEET 1.

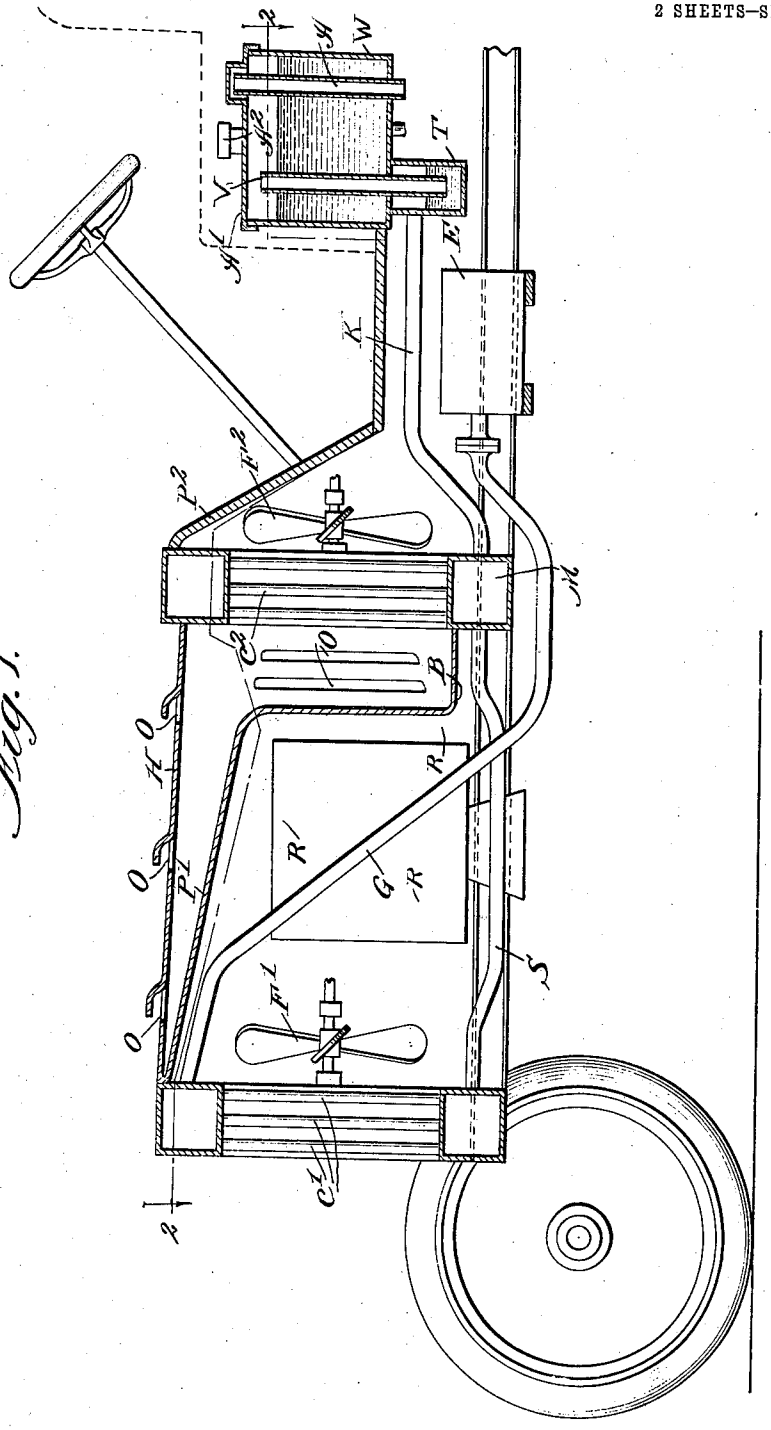


Fig. 1.

Witnesses:

Ira D. Perry

J. F. Jochum Jr.

Inventor:

Charles C. Worthington

By Brown Hopkins

Attys.

C. C. WORTHINGTON.

CONDENSING APPARATUS FOR STEAM MOTOR CARRIAGES.

APPLICATION FILED JAN. 27, 1909.

1,072,894.

Patented Sept. 9, 1913.

2 SHEETS—SHEET 2.

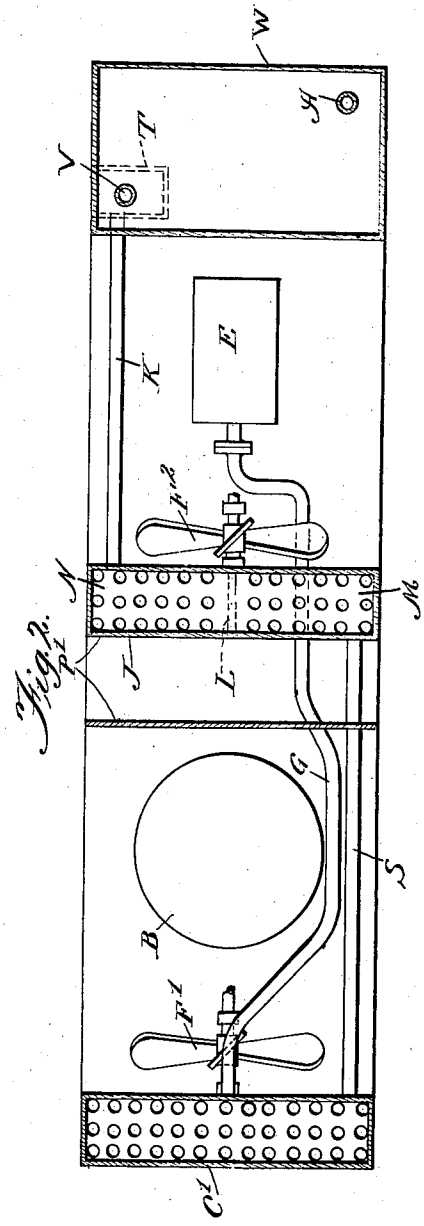


Fig. 2.

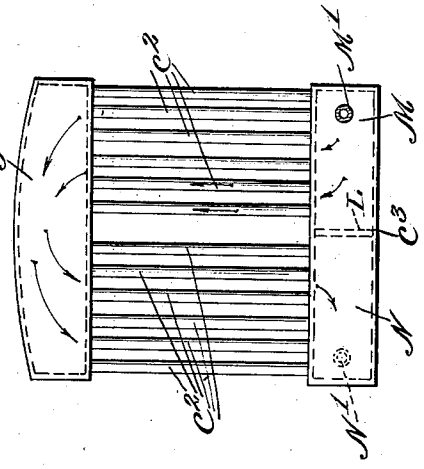


Fig. 3.

Witnesses:

Inventor:
Charles C Worthington
by Brown Hopkins
Attorneys

UNITED STATES PATENT OFFICE.

CHARLES C. WORTHINGTON, OF DUNNFIELD, NEW JERSEY.

CONDENSING APPARATUS FOR STEAM MOTOR-CARRIAGES.

1,072,894. Specification of Letters Patent. Patented Sept. 9, 1913.

Application filed January 27, 1909. Serial No. 474,582.

To all whom it may concern:

Be it known that I, CHARLES C. WORTHINGTON, a citizen of the United States, residing at Dunnfield, in the county of Warren and State of New Jersey, have invented certain new and useful Improvements in Condensing Apparatus for Steam Motor-Carriages, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of my invention is to provide improved means for effectively condensing all the steam used in the engine of a motor carriage and returning to the water supply tank without the intervention of a pump, practically all of the water evaporated in the boiler.

Another object is to increase the available condensing surface beyond that obtainable in the forward location without detracting from the appearance of the carriage, and at the same time retaining all the benefits of the circulation of cooling air, due to the forward motion of the carriage.

In the present invention the apparatus is so arranged that the steam exhausted by the engine is successively passed through two or more condensers, each condenser being so placed that it is brought in contact with a fresh and cool supply of air. Provision is also made for forcing the condensed water into the water supply tank, without the use of a pump.

This invention consists in the novel construction and combination of the several parts of the mechanism as set forth and described in the following specification and particularly pointed out in the claims.

In the drawings, Figure 1 is a longitudinal sectional view with some of the parts in elevation, of an apparatus constructed in accordance with the principles of this invention. Fig. 2 is an irregular sectional view taken on line 2—2 of Fig. 1. Fig. 3 shows an elevation of one of the condensers.

Referring to the parts by letters, and in the present exemplification of the invention: B represents the boiler or generator, C′ represents the first condenser in the series, and C^2 represents the second condenser, one of which is preferably located at the front of the vehicle and the other to the rear of and spaced from the first condenser.

E represents the engine, which may be supported in any desired manner by the framework of the vehicle.

F′ and F^2 represent two fans, the shafts of which are journaled in suitable bearings. One of the fans is located in close proximity to and in the rear of each of the condensers to constantly furnish a fresh supply of air to the outside of the condenser. These fans may be driven in any desired or suitable manner, but preferably from the engine in the ordinary and well known manner, not necessary to illustrate.

P′ represents a partition or shield placed between the condensers for the purpose of leading or directing the air, which is drawn by the fan F′ from the condenser C′ in a downward direction, so that it will pass out under the carriage, with the escaping gases from the boiler.

P^2 represents a partition or shield located back of the fan F^2 for the purpose of leading the air drawn from the condenser C^2 by the fan F^2 in a downward direction so that it will pass out under the carriage.

T represents a trap where the condensed water is collected and forced into the water supply tank W to which the trap is connected by means of a suitable pipe V which leads from the trap and terminates adjacent the upper part of the water supply tank. This pipe V may be of any desired length, but is of such a length as to extend above the water supply in the tank. The tank is also provided with an outlet pipe A, one end of which projects beyond the tank to permit the escape of any uncondensed vapors. The other end projects into the tank and terminates above the highest level of the water it is desired to maintain in the tank. A suitable closure A′ is provided for the tank, and a supply opening A^2 may be arranged in the closure. This tank may be located at any desired or convenient place, preferably under the seat of the vehicle.

H represents a detachable hood covering the boiler or generator B and extending from the upper portion of the condenser C′ to the upper portion of the condenser C^2. The partition or shield P′ is preferably attached to and supported by the hood H, so that when the hood is removed, the partition P′ is removed with it, thereby affording convenient access to the boiler B and the adjacent apparatus. The hood is preferably pro-

vided with openings O for admitting the atmosphere to the space back of the partition or shield P′, and which is drawn against the condenser C^2 by the fan F^2. A pipe G is provided which connects the exhaust outlet of the engine E with the upper portion of the condenser C′ for conveying the exhaust steam from the engine to the condenser. The condenser C^2 is provided with a lower chamber designated generally by the reference character C^3, which chamber is divided by a partition L into two compartments M, N, one of the compartments M being provided with a supply inlet opening M′, and the other compartment being provided with a discharge outlet N′ (see Fig. 3). This condenser is also provided with an upper chamber J which chamber has communication with the two compartments M, N through the medium of the connecting tubes of the condenser C^2. A pipe S connects the lower portion of the condenser C′ with the inlet compartment M of the chamber C^3, and a pipe K connects the outlet compartment N of the chamber C^3 with the trap T.

The operation of this improved apparatus is as follows: The exhaust steam from the engine E is carried by the pipe G to the top of the condenser C′, which is constantly kept in contact with a fresh supply of air drawn from in front of the carriage by means of the fan F′. The air being drawn between the tubes of the condenser C′ will circulate freely around the tubes of the condenser before it passes to the fan F′. As the air passes the fan F′, it will be forced backward against the partition or shield P′, which prevents this air which has become heated by its contact with the condenser tubes from passing backward to the condensers C^2, but directs it downward underneath the carriage where it freely escapes with the gases from the boiler B. At times the cooling effect of the air circulating around the tubes of condenser C′ is sufficient to condense in the condenser C′ all of the steam from the engine. When, however, the engine E is operated at approximately its full power, a larger amount of steam will be used and at such times a part only of the steam will be condensed in the condenser C′. The remainder will be partially cooled and carried with the condensed water to the condenser C^2 by the pipe S. In order to insure that condenser C^2 shall be kept in constant contact with a fresh supply of air drawn from the atmosphere, there are provided openings O in the sides and top of the hood H, which are located back of the partition P′, so as to prevent any possibility of the heated air passing from condenser C′ coming in contact with this fresh supply of air. These openings O are preferably made with wings inclined forward in such form as to collect the air as the carriage moves forward and direct it through the openings O to the inner side of the hood H, thus augmenting the action of the fan F^2. This location of the openings back of the partition P′ is a feature of the invention. The air entering through the openings O passes around the tubes of the condenser C^2, causing a further condensation of the steam to take place in this condenser. The fluid passing from the condenser C′ enters the compartment M of the second condenser and flows upward through some of the tubes of the condenser C^2 into the chamber J. If any steam then remains, it passes also to the chamber J and with it all the water of condensation that has thus far been formed. From the chamber J the condensed water, the remaining steam, and the uncondensed vapor then pass downward to the compartment N through the remaining tubes of condenser C^2. The remaining steam is there condensed, all of the condensed water then flowing out of the chamber N through the pipe K and into the trap T. The air which has become heated by its contact with the tubes in condenser C^2 is forced by the fan F^2 against the partition or shield P^2, from which it passes in a downward direction and escapes beneath the carriage. The partition or shield P^2 is located so that it may be used also as the dash board for the vehicle and affords a convenient place for mounting the various instruments and gages.

With the improved construction of the partition or shield P′, it will be apparent that when the vehicle is at rest, the heat of products of combustion will be prevented from rising into the faces of the occupants of the vehicle, inasmuch as they will be deflected by the partition or shield toward the front of the vehicle and away from the occupants. When the vehicle is in motion the products of combustion will be caused to flow in the opposite direction to be discharged beneath the vehicle.

In steam motor carriages it has been found necessary to have the water supply tank located at a point above the level of the feed pumps in order that the pump may at all times be supplied with water under pressure due to the difference of these levels. The practical necessity for thus insuring a free and instantaneous supply to the pump is admitted by those familiar with the art. As the height of the pump is fixed within limits it is found in practice that with the tank located above the pump, it in all cases is above the level of the outlet of the condensing apparatus from which the water of condensation issues to be returned to the tank. In systems heretofore employed this water has been lifted from the lower level of this outlet to the tank by means of pump. Any derangement of this pump may be followed by serious consequences to

the engine or condensers due to the trapping of the water, the gradual stoppage of the exhaust flow and the back pressure resulting therefrom unless a relief valve is provided to permit the water and back pressure to escape and to give notice to the driver that such derangement has occurred. One of the objects of this invention is to substitute for this expensive and unreliable set of mechanism a simple and unfailing method of returning the condensed water to the tank and of preventing all accumulation of dangerous back pressure. When the condensed water flows into the trap T, it settles to the bottom of the trap and gradually rising around and inside the pipe V, forms a water seal at the bottom of the pipe V, causing the uncondensable vapors remaining in the circulation to collect throughout the system and at the top of the trap T until back pressure has accumulated of sufficient force to overcome the slight resistance due to the height of the pipe V. The water that has been collected in the bottom of the trap T is then forced up through the pipe V and flows into the water supply tank W, while the vapor pressure escapes through the escape pipe A provided for the purpose in the tank W. This process is automatically repeated at intervals as the condensed water collects in the bottom of the trap T.

Although in the present exemplification of the invention there is shown and described the preferred construction and arrangement of the several parts, it is to be understood that various changes may be made therein without departing from the spirit of the invention.

What is claimed as new is—

1. In combination, a motor vehicle, having a hood member, a condenser located at each end of said hood member, and means coöperating with said hood member whereby separate currents of air will be directed against each of the condensers and over the surfaces of only the respective condensers by advancing the vehicle.

2. In combination a motor vehicle, a plurality of condensers mounted thereon and arranged one in advance of the other, a fan arranged adjacent each condenser for inducing a current of air against each of the condensers, and means for preventing the heated air passing from one of the condensers from being directed against another condenser.

3. In combination, a motor vehicle, a plurality of condensers mounted thereon and arranged in tandem, means for directing air against and over the outside of said condensers, and a partition disposed between said condensers to prevent the heated air from passing from one condenser and against another condenser.

4. In combination, a motor vehicle, two condensers mounted thereon, and a hood covering the space between the condensers for directing a current of air against one condenser and conveying the heated air away from the other condenser.

5. In combination, a motor vehicle, two condensers mounted thereon, a hood covering the space between the condensers, and a partition dividing said space into two sections whereby the heated air will be directed away from one condenser and unheated air will be directed to the other condenser.

6. In combination, a motor vehicle, two condensers mounted thereon, one arranged in advance of the other, means for directing air against and over the outer surface of the respective condensers, and a partition disposed between said condensers to prevent the heated air from passing from one condenser and against the other condenser.

7. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, and a partition coöperating with the hood to divide the space into two compartments, each of said condensers being arranged adjacent one of the compartments, the forward end and bottom of one of the compartments being open for the admission and exit of air and the other compartment having inlet and outlet openings for the admission and exit of air.

8. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, a partition coöperating with the hood to divide the space into two compartments, each of said condensers being arranged adjacent one of the compartments, the forward end and bottom of one of the compartments being open for the admission and exit of air and the other compartment having inlet and outlet openings for the admission and exit of air, and a fan adjacent the open end of each of said compartments for causing a circulation of the air.

9. In combination, a motor vehicle, two condensers mounted thereon, one arranged in advance of the other, a hood covering the space between the condensers, a partition dividing said space into two sections, and a fan on each side of said partition for inducing separate currents of air to the respective condensers.

10. In combination, a motor vehicle, two condensers thereon, a hood covering the space between the condensers, a partition cooperating with the hood to divide the said space into two compartments, one of said condensers being arranged at the forward end of one compartment, the other condenser being arranged at the rear end of the other compartment, and a fan arranged adjacent

each condenser and respectively on opposite sides of said partition, one of the fans inducing an unheated current of air through the forward compartment and the other fan inducing an unheated current of air through the rear compartment.

11. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, a partition coöperating with the hood to divide the said space into two compartments, said hood having openings for the purpose of inducing a current of air through the rear compartment, and a fan located in the forward compartment to induce a current of air through it.

12. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, means whereby separate currents of air will be directed against and over the outer surface of each of the condensers by the advance of the vehicle.

13. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers and a partition coöperating with the hood to divide the said space into two compartments, each of said condensers being arranged adjacent one of the compartments, both of said compartments being adapted to receive separate air currents by the advance of the vehicle.

14. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, and a partition dividing the said space into two compartments, means whereby air will directly engage the forward condenser, and means for deflecting air against the rear condenser by the advance of the vehicle.

15. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers and a partition coöperating with the hood to divide the said space into two compartments, one of said condensers being arranged adjacent the rear compartment, said hood having openings for the free admission of air to the rear compartment whereby said compartment will be adapted to receive an air current by the advance of the vehicle.

16. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, a partition dividing the said space into two compartments, said hood having openings back of the partition only, and means whereby a current of air induced by the advance of the vehicle will enter one of the compartments through its forward end only, and another current of air will enter the other compartment through the said openings.

17. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, and a partition coöperating with the hood to divide the said space into two compartments, said hood having openings back of the partition, one of said condensers being arranged at the forward end of one compartment the other condenser being arranged at the rear end of the other compartment, said compartment being adapted to receive separate air currents by the advance of the vehicle.

18. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, a partition dividing the said space into two compartments, said hood being provided with openings, means whereby a current of air will be induced by the advance of the vehicle to enter one compartment through its forward end only, and the other compartment through the said openings, and a fan arranged adjacent each condenser and respectively on opposite sides of the partition.

19. In combination, a motor vehicle, two condensers mounted thereon and a hood covering the space between the condensers, and a generator located in said space.

20. In combination, a motor vehicle, two condensers mounted thereon, a hood covering the space between the condensers, a generator located in said space, and a partition disposed between the condensers to prevent the products of combustion from the generator from passing to and against one of the condensers.

21. In combination, a motor vehicle, two condensers mounted thereon, a hood covering the space between the condensers, a generator located in said space and a partition arranged between and spaced from the condensers, said partition partially surrounding the said generator for conducting the products of combustion away from the generator.

22. In combination, a motor vehicle, two condensers mounted thereon, a generator, a hood covering the space between the condensers and a partition arranged to divide said space into two compartments, one of said compartments being adapted to convey away the products of combustion from the generator.

23. In combination, a motor vehicle, two spaced condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, a partition coöperating with the hood to divide the said space into two compartments, said hood being provided with apertures back of the partition for admitting air to

the rear compartment to be directed against the rear condenser, and a generator in the forward compartment, said partition being spaced from the generator to prevent the air currents directed to the rear condenser through the rear compartment from contacting with any of the heated portion of the said generator.

24. The combination of a motor vehicle, a generator mounted thereon, a hood open in front and having a discharge opening under the car and an inclined partition within said hood extending from the bottom of said hood upward and toward the front thereof.

25. The combination of a motor vehicle, a generator mounted upon the front of the vehicle, a hood covering the generator, said hood having an open front, means for causing currents of air to circulate into the hood through the front thereof and around the generator, and means for causing the air heated by the generator to pass out of the hood through the front thereof when the air is not passing into said hood.

26. In combination, a motor vehicle, two condensers mounted thereon and arranged one in advance of the other, a hood covering the space between the condensers, a generator arranged in said space, a partition cooperating with the hood to divide the space into two compartments and to separate the condensers, and means whereby separate currents of air may be induced through each of the compartments and condensers.

27. In combination, a motor vehicle, a condenser mounted thereon for condensing the exhaust vapor from the engine, a generator, a fluid supply tank for the generator, a trap for receiving the fluid from the condenser, and means whereby the pressure in the condenser will discharge the accumulated condensed fluid in the trap into the tank.

28. In combination, a motor vehicle, a condenser mounted thereon for condensing the exhaust vapor from the engine, a generator, a fluid supply tank for the generator, a trap for receiving the fluid from the condenser, and means whereby the pressure in the condenser will intermittently discharge the accumulated condensed fluid in the trap into the tank at a higher level.

29. In combination, a motor vehicle, a condenser mounted thereon for condensing the exhaust vapor from the engine, a generator, a fluid supply tank for the generator, a trap for receiving the fluid from the condenser, said tank being located at a higher level than the trap, and means whereby the pressure in the condenser will discharge the condensed fluid from the trap into the tank.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this seventh day of January A. D. 1909.

CHAS. C. WORTHINGTON.

Witnesses:

M. R. WORTHINGTON.

C. N. COLLIERE.