

No. 693,190

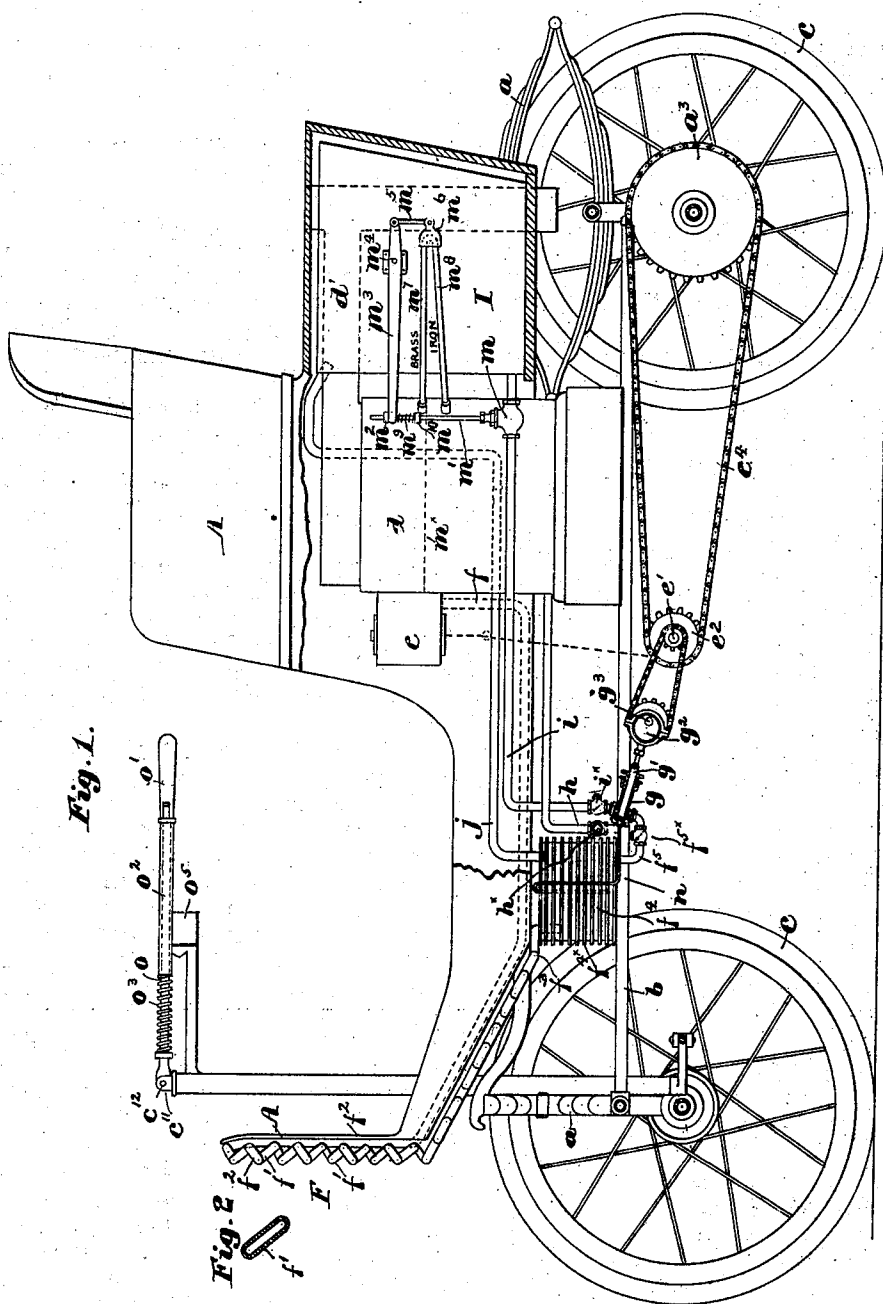
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W. L. TOBEY.

BOILER FEEDER FOR MOTOR VEHICLES.

(Application filed Feb. 7, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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BOILER-FEEDER FOR MOTOR-VEHICLES.

SPECIFICATION forming part of Letters Patent No. 693,190, dated February 11, 1902.

Application filed February 7, 1901. Serial No. 46,343. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. TOBEY, a citizen of the United States, residing at Winthrop, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Boiler-Feeders for Motor-Vehicles, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to motor-vehicles and motive-power apparatus therefor, my invention being intended to simplify and improve vehicles and apparatus of this character to enable the same to be more easily handled or controlled and to render the same less objectionable by reducing to a minimum the steam permitted to escape therefrom and at the same time increase their capacity for long-distance traveling.

Figure 1 of the drawings illustrates in side elevation a motor-vehicle provided with a motive-power apparatus made in accordance with my invention, and Fig. 2 is a sectional detail of one of the tubes of the condensing apparatus to be referred to.

Referring to the drawings, in the embodiment of my invention there shown for the purpose of illustration, A indicates the body of a usual motor-vehicle, the same being shown as mounted in usual manner upon springs *a*, carried by a frame *b*, constituting part of the running-gear of the vehicle, mounted upon usual wheels *c*. The body A carries in usual manner and position a boiler *d*, heated by a gasolene or other burner, (not shown,) said boiler being suitably connected with an engine *e* of desired type, it being provided, for instance, with a crank-shaft *e'*, geared to the rear or driving wheels of the vehicle in suitable manner, as by the sprocket-wheels *e² e³* and the connecting-chain *e⁴*. The exhaust from the engine is conducted in suitable manner, as by the pipe *f*, preferably exposed to the air, along the outside of the vehicle-body, the same leading to a condenser apparatus, as F, arranged in desired position upon the vehicle. In the present embodiment of my invention the condenser apparatus F consists of a series of long flattened tubes or conduits *f'*, one of which is shown in cross-section, Fig. 2, the said tubes being alternately

connected, first at one and then at the other side of the vehicle, by connections *f²*, whereby the exhaust-steam discharged thereinto is caused to travel back and forth throughout the lengths of the several tubes from one to the other side of the vehicle. These tubes being flattened in cross-section cause the exhaust-steam passing through the same to be spread out into a wide thin body the more easily to give off its contained heat and bring about a quick condensation of the steam. In the present embodiment of my invention these condenser-tubes are arranged at the front of the vehicle and preferably in front of the usual dasher A', where they will receive the full benefit of the air while the vehicle is in motion, which air, being cooler than the exhaust-steam, tends to cool, and thereby condense, the same. To present a larger effective area to the action of the cooling-air, I prefer to arrange the condenser-tubes *f'* obliquely, as shown in the drawings, one slightly overlapping the other, whereby a maximum exposed area is obtained without reducing the number of tubes employed, which number should, I consider, be as large as possible. While I have found the circulation of air in and around tubes of this character to be sufficient to bring about the requisite condensation of exhaust-steam, yet so far as my invention generally is concerned it is obvious that the condenser tubes or apparatus may be cooled in any other suitable or desired manner. For the best results I make the condenser-tubes *f'* of a suitable composition of clay or pottery of a decidedly porous nature, which permits of the more ready discharge of the heat contained within the tubes and at the same time permits the latter to be cooled more readily by contact with the exterior air. After passing through the condenser apparatus F the exhaust, whether or not wholly in the form of water of condensation, is discharged through the pipe *f³* into a hot-well or receptacle *f⁴*, where it is further cooled or condensed. To facilitate this further cooling of the exhaust within the hot-well, I have provided the outer walls of the latter with projecting ribs or surfaces *f^{4x}*, which increase the radiating or cooling surface of the hot-well. From the bottom of the hot-well *f⁴* a boiler-feed or supply pipe *f⁵* leads to the in-

let or supply end of a suitable boiler-feed device, (shown as a pump g ,) and the outlet-pipe h from this boiler-feed device g leads to the boiler d , whereby the pump delivers into the boiler to maintain the water-supply therein. The pump g may be of suitable or desired construction, it being here shown as of the plunger type, its plunger g' being actuated by an eccentric g^2 on a shaft g^3 , belted to or otherwise connected with and driven by the crank-shaft e' . While the pump may be directly actuated from the crank-shaft or other actuating means, I prefer a connection in the manner shown in order to reduce the speed of the pump as compared with that of the engine, which latter ordinarily runs at extremely high speeds. The boiler-feed pump g has a second source of feed-water supply through the pipe i , leading to the usual water-supply tank, as I, carried by the vehicle-body and here shown as arranged in the rear of the boiler d . This water-tank I may be filled in usual or desired manner. Any uncondensed steam or vapor within the hot-well f^4 is permitted to escape therefrom through a pipe j , discharging into the exit or smoke flue of the boiler d or its burner.

The pump-supply pipe f^5 is provided with a check-valve f^{5x} , and the pump-supply pipe i is provided with a check-valve i^x , the said valves being arranged to permit flow of water to the pump, but closing against delivery of the water from the pump. The delivery-pipe h of the pump is also provided with a check-valve h^x , that opens only to the discharge of the pump. All these check-valves for the best results should be arranged in horizontal positions, although I have here shown two of them in upright positions to simplify the illustrations of my apparatus.

The supply of feed-water through the pipe i from the main supply-tank I is controlled by a suitable valve m , (shown as close to the tank,) its stem m' being provided with a collar m^2 , beneath which is arranged the forked end of a lever m^3 , fulcrumed at m^4 upon the side of the tank or other suitable support. The short end of the lever m^3 is connected by a link m^5 with a cap m^6 , connecting and finishing communication between the free ends of the tubes m^7 m^8 , entering at their opposite ends the boiler d . The pipes m^7 m^8 are shown connected with the boiler above and below, respectively, the normal water-level in the boiler, which water-level is indicated by the dotted line m^x . The two tubes m^7 m^8 are of metals having different coefficient of expansion. For example, the tube m^7 is of brass and the tube m^8 is of iron, and the iron tube m^8 is intended always to be filled with water—that is, the water-level is supposed always to stand above this tube—while the brass tube m^7 is filled with water or steam, according to the level of the water in the boiler. When the water-level rises and fills the tube m^7 , the latter contracts and shortens relatively to the iron tube m^8 , thereby raising the cap m^6 , caus-

ing the short arm of the lever m^3 to be raised and the long arm thereof to be depressed, the latter acting through the spring m^9 and the collar m^{10} on the stem with the valve m to close the latter and cut off any possible supply of feed-water from the tank I to the feed-pump. The spring m^9 takes up any excess of movement of the lever m^3 with reference to the valve-seat, thus avoiding possible injury to the valve-seat by excessive movement of said lever. The valve m remains closed, cutting off supply of feed-water from the tank just as long as the condensation from the exhaust-steam enters the hot-well in sufficient quantity to supply the pump g with the water needed to maintain the water-level in the boiler; but the moment this supply becomes inadequate to maintain the water-level the said water-level will fall below the brass tube m^7 and permit steam from the boiler to enter said tube, and by reason of the excessive latent heat that it contains as compared with the water cause the said tube to expand and lengthen rapidly and with reference to the iron tube m^8 , thereby depressing the cap m^6 upon the ends of the tubes. This causes the long arm of the lever to be raised, acting through the collar m^2 to lift the valve-stem m' , open the valve, and permit the pump to draw water through the pipe i from the tank I in sufficient quantity to make good the deficiency of supply of water of condensation in the hot-well f^4 . In this way the pump in the normal operation of the vehicle draws only from the supply-tank I as may be necessary from time to time to make up the required supply of feed-water over and above what is furnished by the water of condensation in the hot-well. Thus the supply of feed-water in the tank I is conserved and the capacity of the vehicle to travel long distances is increased. The feed-water supply from the hot-well is always hot, being freshly condensed, and hence requires less fuel to raise it to a steam-generating temperature, and the visible exhaust from the vehicle is entirely or largely eliminated, according to the efficiency of the condensing apparatus at any particular time. Any uncondensed exhaust or vapor rising from the hot-well being discharged into the smoke-flue is quickly mixed with the gases escaping therethrough and is further reduced thereby to a wholly or practically invisible state, so that my improved vehicle may be said to operate practically without visible escaping steam.

In motive-power apparatus of the general character here shown, especially when used in motor-vehicles where the operation of the pump and the pump-supply is not constant or uniform, it is common to encounter difficulty in the operation of the pump, due to the presence of air drawn into the pump-cylinder either with the water or when the water-supply is slack, and this air is frequently compressed within the pump-cylinder upon successive strokes of the plunger, so that when

water is finally supplied to the pump the air-pressure within the pump opposes the opening of the check-valve in the supply-pipe and prevents the water in the supply-pipe from flowing to or reaching the pump-cylinder, and the presence of air in the pump-cylinder is always a detriment to the efficient working of the pump. To eliminate this difficulty, I have, in accordance with my invention, provided the pump with an auxiliary or air discharge in the form of a small pipe *n*, leading from the discharge end of the pump-cylinder into the hot-well, or it may be elsewhere discharged, if desired. This air discharge or pipe is preferably normally open, so that at each stroke of the pump water or air is drawn into and discharged through this pipe. For example, the end of the pipe within the hot-well is dropped to a level that leaves said end normally immersed below the water-level, so that at each stroke of the pump a small quantity of water is drawn into the pump through this pipe and is also discharged through this pipe back into the hot-well; but the capacity of this pipe is so small compared with the regular discharge and delivery pipes of the pump that its effect upon the operation of the pump is infinitesimal. If, however, any air be drawn into the pump-cylinder, it also is expelled from the pump-cylinder through this pipe at each stroke, thus preventing any accumulation of air-pressure sufficient to prevent water flowing to the pump, and by thus insuring the operation of the pump as long as the water-supply lasts fulfils a purpose that greatly outweighs the comparatively slight impairment of the efficiency of the pump due to the constant slight discharge through it that does not reach the boiler. The importance of the function of preventing accumulation of air in the pump-cylinder is apparent when it is remembered that the operator of the motor-vehicle should be able to assume that so long as his pump is in operation and his water-supply adequate the feed to the boiler will be regular and sufficient, yet, as now commonly constructed, if any air leaks into the pump while the latter is in operation, even though the water-supply be sufficient, the pump will fail to do its work, and the operator is all the time unconscious of the fact unless upon a close examination of the water-glass, and water-glasses are not always reliable.

I have herein disclosed my invention in its various features in a manner to enable the same to be fully understood; but my invention is not limited to the particular embodiment or adaptation here shown and described, for obviously it may be varied in its various features and aspects without departing from the spirit and scope of the invention.

Having described my invention, and without limiting myself to details, what I claim, and desire to secure by Letters Patent, is—

1. In a motor-vehicle containing a steam-boiler and a condenser, a feed device having

a plurality of sources of supply, one of which is supplied from said condenser and the other from a source independent of said condenser, and means governed by the water-level within the boiler to automatically control the supply of feed-water through said sources to said pump.

2. In a motor-vehicle the combination of an engine, a boiler, a condenser, a boiler-feed device having a plurality of sources of supply, one supplied by said condenser and the other from a source independent thereof, and two deliveries for said pump, one of which is normally open, and the other of which communicates with said boiler.

3. In a motor-vehicle the combination with a boiler, a feed device having a plurality of sources of feed-supply, and means governed by the water-level within the boiler for regulating the relative quantity of feed-water supply through said sources of feed-supply.

4. A motor-vehicle provided with an engine, a boiler therefor, its feed-pump, having a single delivery to said boiler and a plurality of sources of supply, said pump drawing principally through one source of supply, and means responsive to changes in the water-level within the said boiler to regulate the amount of water drawn through the other of said sources of supply.

5. A motor-vehicle provided with an engine, a boiler therefor and its feed-pump, provided with a single delivery and a plurality of sources of supply with means responsive to changes in the water-level within said boiler to automatically cause one source of supply to make up the deficiency of another, thereby to maintain constantly the required capacity of the pump.

6. A motor-vehicle provided with an engine, a boiler therefor and its feed-pump having a normally open discharge independent of the pump-delivery, with means responsive to changes in the water-level within said boiler to govern the quantity of water delivered by said pump through said delivery.

7. A motor-vehicle provided with an engine, a boiler therefor and its feed-pump, having a source of feed-supply, a check-valve intermediate said source and said pump, an air-discharge between said pump and said source and independent of the normal pump-delivery, and means responsive to changes in the water-level within said boiler to regulate the quantity of water delivered by said pump through its said delivery.

8. A motor-vehicle provided with an engine, a boiler therefor and a feed-pump having an air-discharge pipe independent of the pump-delivery and through which water is normally discharged when the pump is working at the required capacity and delivering also through its said delivery, air being discharged through said discharge-pipe when air accumulates within the pump, and means responsive to changes in the water-level within said boiler to regulate the delivery of said pump.

9. A motor-vehicle provided with an engine, a boiler therefor, its feed-pump, means responsive to changes in the water-level within the said boiler to regulate the supply by said pump, and an air-discharge for said pump through which contents of the pump are discharged at each stroke thereof.

10. A motor-vehicle provided with an engine, a boiler therefor, its feed-pump, means responsive to changes in the water-level within the said boiler to regulate the supply by said pump, and an open discharge for said pump through which contents of the pump are discharged at each stroke thereof.

11. In a motor-vehicle an engine, a boiler, a feed-pump therefor having a plurality of sources of supply, and a discharge-pipe independent of the main delivery-pipe of said pump and through which a part of the contents of the pump is discharged at each stroke of the latter for the purpose described.

12. In a motor-vehicle the combination with an engine, its boiler, a condensing apparatus connected with the exhaust for said engine, and a feed-water-supply tank, of a boiler-feed device connected with said condenser and said boiler-feed tank, and means whereby said boiler-feed device draws from said condenser and said tank in varying relative proportions to maintain the water-level within said boiler.

13. In a motor-vehicle the combination with an engine, its boiler, a condensing apparatus connected with the exhaust for said engine, and a feed-water-supply tank, of a boiler-feed device connected with said condensing apparatus and said tank and means governed by the water-level within said boiler and controlling the supply from said water-tank to said feed device.

14. In a motor-vehicle the combination with an engine, its boiler, a condensing apparatus, a feed-water tank, and a chamber or hot-well receiving the discharge from said condensing apparatus, of a boiler-feed device drawing from said chamber and delivering into said boiler, a connection between said tank and said pump and a vapor-outlet for said chamber.

15. In a motor-vehicle the combination with an engine, its boiler, a condensing apparatus, a feed-water tank, and a chamber or hot-well receiving the discharge from said condensing apparatus, of a boiler-feed device drawing from said chamber and delivering into said boiler, a connection between said tank and said pump and a discharge-pipe from said pump entering said chamber.

16. In a motor-vehicle the combination with

an engine, its boiler, a condensing apparatus, a feed-water tank, and a chamber or hot-well receiving the discharge from said condensing apparatus, of a boiler-feed device drawing from said chamber and delivering into said boiler, a connection between said tank and said pump, a vapor-outlet for said chamber, and a discharge-pipe for said pump entering said chamber.

17. In a motor-vehicle, an engine, its boiler, a condensing apparatus connected with the exhaust for said engine, a feed-water-supply tank, a boiler-feed device connected with said condenser and said boiler-feed tank, and means whereby said boiler-feed device draws from said condenser and said tank in varying relative proportions to maintain the water-level within said boiler.

18. In a motor-vehicle, an engine, its boiler, a condensing apparatus connected with the exhaust for said engine, a feed-water-supply tank, a boiler-feed device connected with said condensing apparatus and said tank and means governed by the water-level within said boiler and controlling the supply from said water-tank to said feed device.

19. In a motor-vehicle, an engine, its boiler, a condensing apparatus, a feed-water tank, a chamber or hot-well receiving the discharge from said condensing apparatus, a boiler-feed device drawing from said chamber and delivering into said boiler, a connection between said tank and said pump and a vapor-outlet for said chamber.

20. In a motor-vehicle, an engine, its boiler, a condensing apparatus, a feed-water tank, a chamber or hot-well receiving the discharge from said condensing apparatus, a boiler-feed device drawing from said chamber and delivering into said boiler, a connection between said tank and said pump and a discharge-pipe from said pump entering said chamber.

21. In a motor-vehicle, an engine, its boiler, a condensing apparatus, a feed-water tank, a chamber or hot-well receiving the discharge from said condensing apparatus, a boiler-feed device drawing from said chamber and delivering into said boiler, a connection between said tank and said pump, a vapor-outlet for said chamber, and a discharge-pipe for said pump entering said chamber.

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

WILLIAM L. TOBEY.

Witnesses:

FREDERICK L. EMERY,
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