No. 795,915. PATENTED AUG. 1, 1905.

W. M. JEWELL.

LOCOMOTIVE ENGINE.

APPLICATION FILED OCT. 6, 1902.

3 SHEETS—SHEET 1.

Fig. 1.

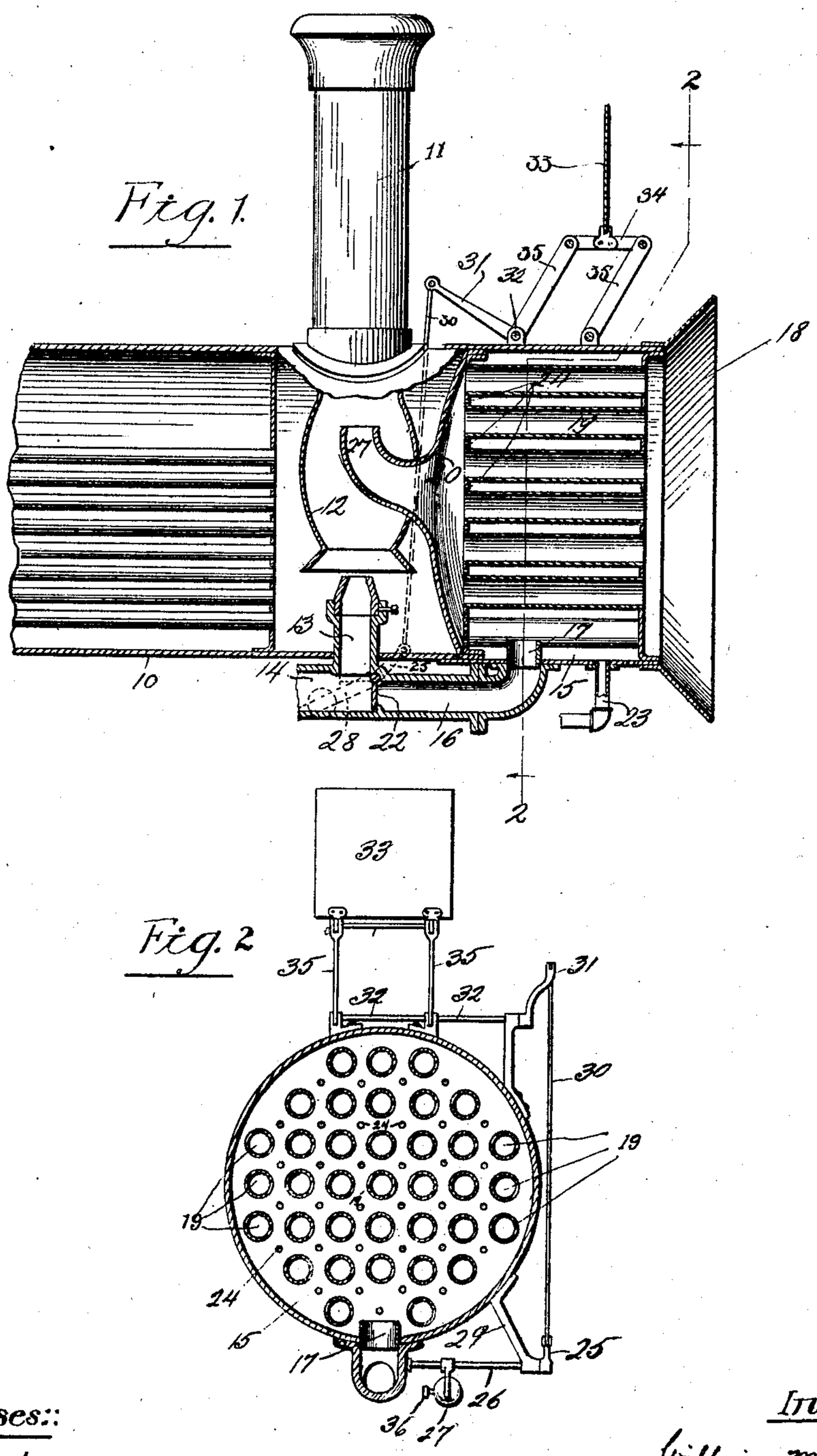

Fig. 2.

Witnesses::
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Inventor:
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3 SHEETS—SHEET 2.

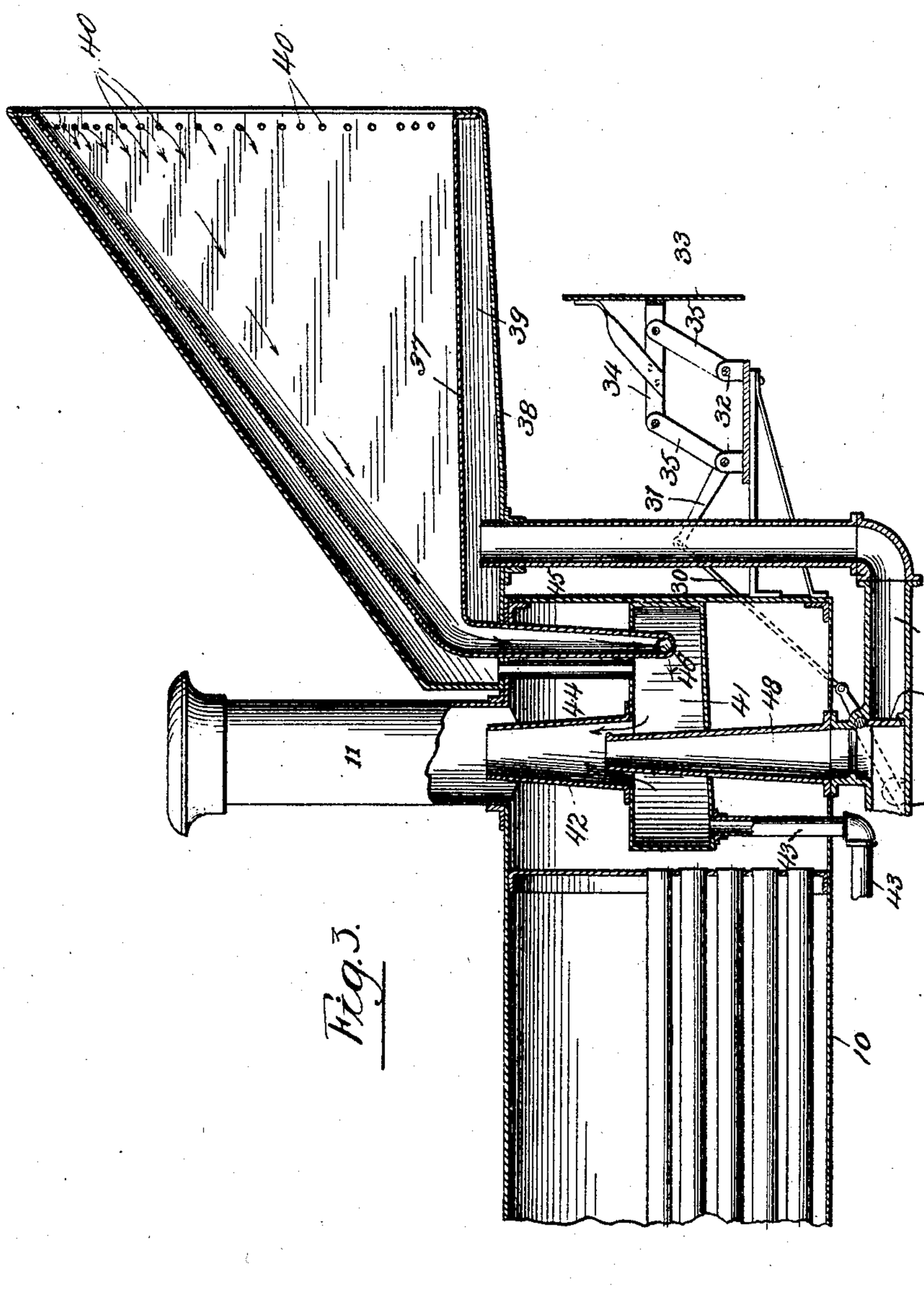

Fig. 3.

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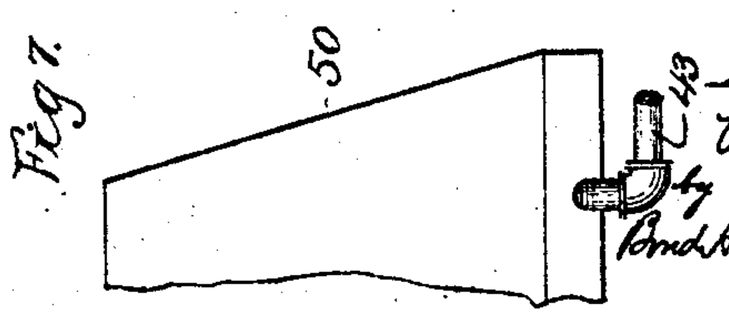

Fig 7.

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3 SHEETS—SHEET 3.

Fig. 4.

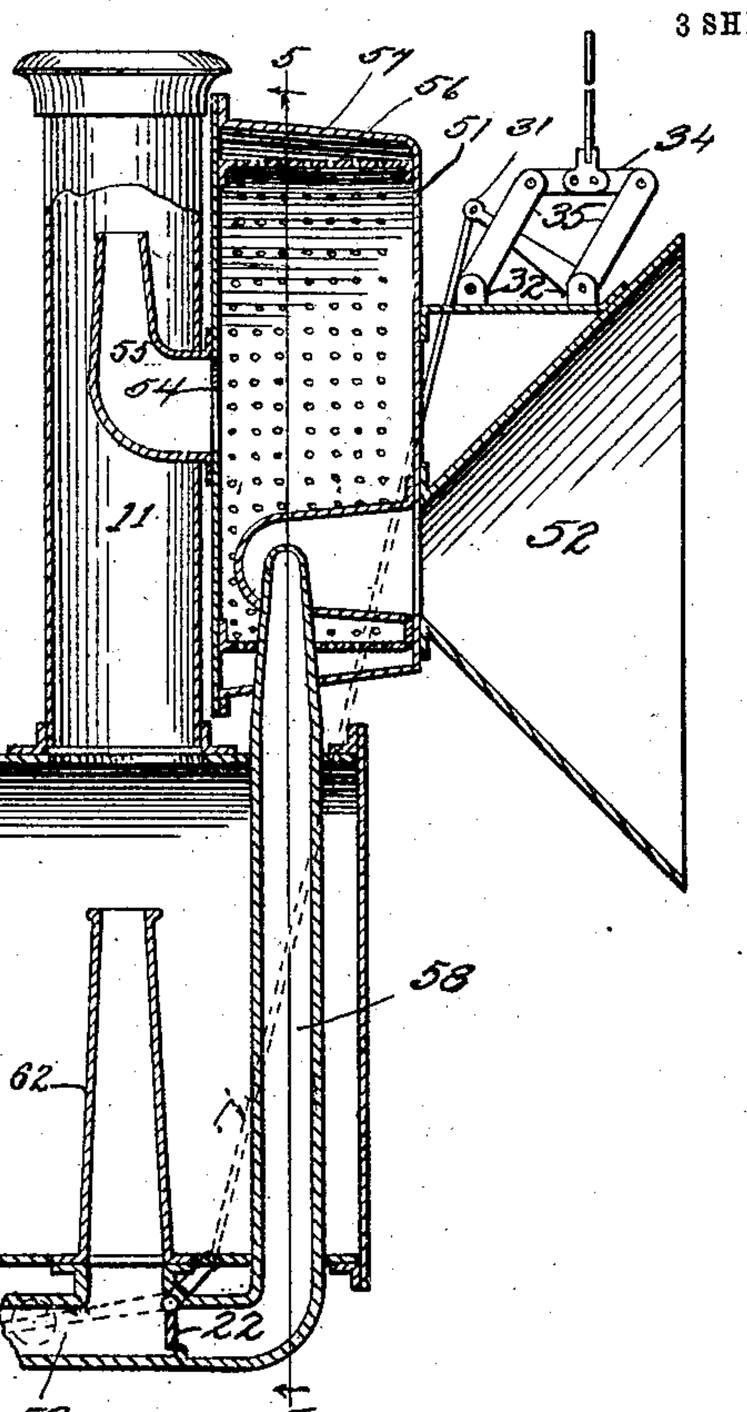


Fig. 6

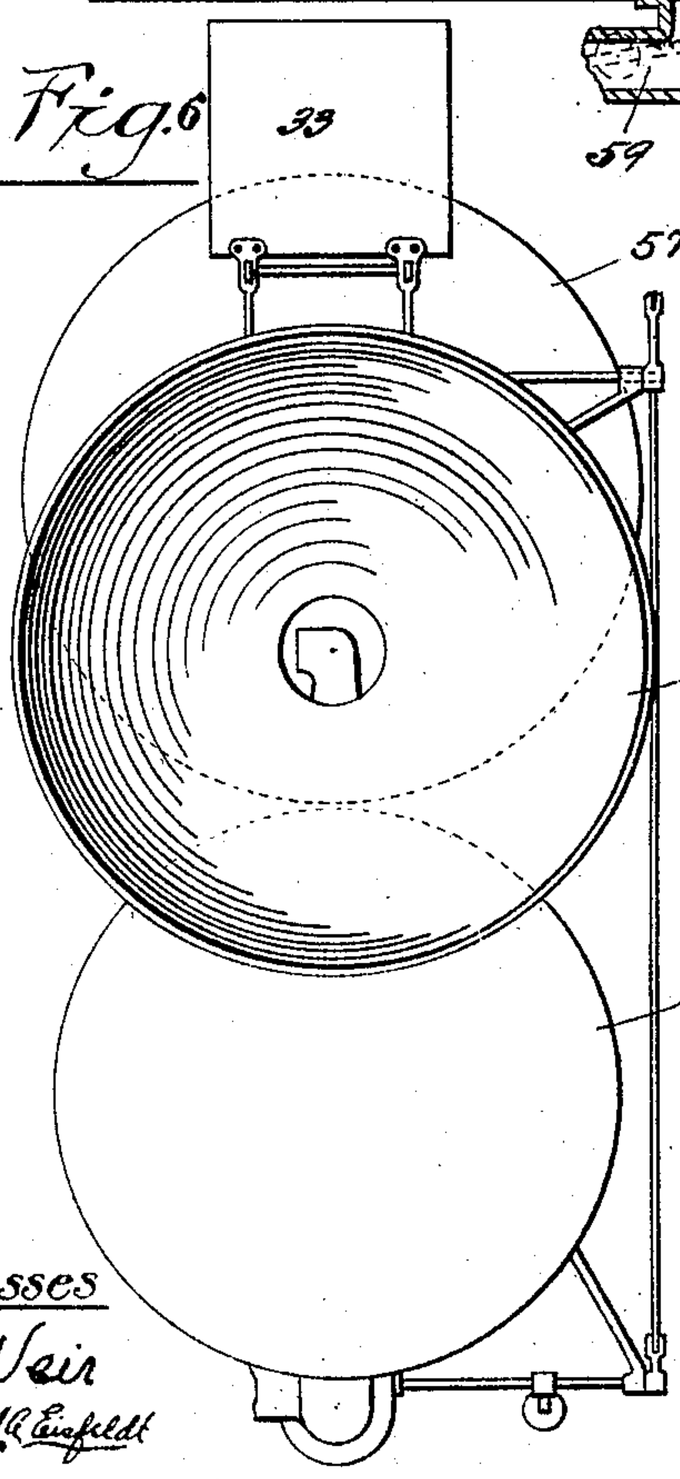
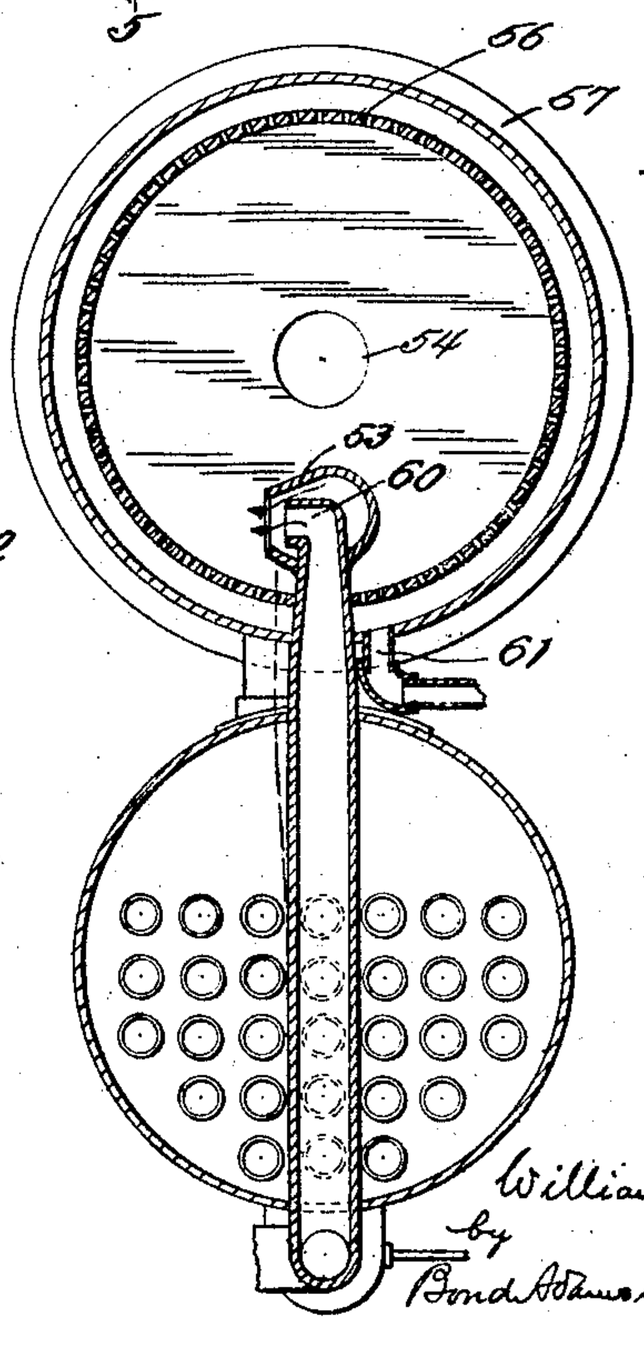


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM M. JEWELL, OF WINNETKA, ILLINOIS.

LOCOMOTIVE-ENGINE.

No. 795,915. Specification of Letters Patent. Patented Aug. 1, 1905.

Application filed October 6, 1902. Serial No. 126,175.

To all whom it may concern:

Be it known that I, WILLIAM M. JEWELL, a citizen of the United States, residing at Winnetka, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Locomotive-Engines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to locomotive-engines, and has for its object to provide a locomotive-engine with means for condensing the exhaust-steam, so that it may be again used in the boiler.

As is generally understood, the practice at present is and for many years has been to supply the locomotive-boiler with water from a tank or reservoir in the tender, and while such tanks have considerable capacity it is necessary frequently to replenish the supply of water. This has been accomplished in two ways. The more common practice is to supply the tank in the tender from reservoirs or water-tanks placed at different stations along the railroad, and as the tender-tanks must be refilled at frequent intervals it has been found necessary to provide water-tanks at short intervals along the road. The other method at present employed is to provide tanks between the rails of the track, the tender being provided with suitable mechanism for taking up water from such tanks as the locomotive passes over them, so that the tender-tanks could be refilled without the stoppage of the train. Both these practices are objectionable for several reasons. Not only is the expense of building the tanks considerable, but the cost of maintenance is great, as each tank requires some one to take care of it and maintain the water-supply. Moreover, it is usually necessary to provide means for pumping water into such tanks from a source of supply which is sometimes quite remote, and as in many parts of the country water is scarce the problem of supplying water to the water-tanks is frequently a very serious one. On some roads running through an arid country it has been found necessary for each locomotive to take on an enormous supply of water in order that it may have sufficient to carry it to the next point where a further supply of water is available, thus adding greatly to the expense of operating the road. A still further objection is that the available water in many places is unfit for use for steam purposes. Nevertheless where locomotives are dependent upon the water obtained along the line of road they are compelled to use it regardless of its suitability, with consequent injury to the boilers.

To overcome these objections and to provide means by which a locomotive may be operated indefinitely with a single filling of the tank in its tender with water are the objects of my invention. The advantages of a construction which will accomplish these objects are obvious, as it would then be possible to fill the tank in the tender originally with water from the best source of supply and the locomotive be operated by the use of such water until such time as it became convenient to replenish the supply.

To this end my invention consists in providing a locomotive with suitable means for condensing the exhaust-steam, so that it can be reused in the boiler.

It further consists in accomplishing the condensation of the exhaust-steam without interfering with the draft. This is an important feature of my invention, inasmuch as locomotives are dependent in a large measure on the use of exhaust-steam to maintain a sufficient draft to keep up the fires under the boiler, and heretofore it has been impracticable to condense the exhaust-steam, for the reason that if the steam were condensed it would interfere with the draft and seriously impair, if not destroy, the efficiency of the locomotive.

My invention further consists in providing means by which the motion of the locomotive is taken advantage of to condense the exhaust-steam and to supply the requisite draft; also, in providing means for employing the exhaust-steam to maintain the draft when the locomotive is stationary or moving at a slow rate of speed, and, further, in providing automatic mechanism for maintaining the draft regardless of the speed of the locomotive.

In addition to the broad features above described my invention also includes certain features of construction which are hereinafter fully described and are specifically pointed out in the claims; but it should be understood that the construction described, except in so far as it is specifically claimed, may be varied, as my invention is not restricted to the specific features of the construction described, but includes as well the broad and generic features described in this specification and pointed out in the broader claims.

In the accompanying drawings, Figure 1 is a partial longitudinal section of the forward portion of a locomotive-boiler, illustrating my

improvements. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is a partial longitudinal section of a locomotive-boiler, illustrating a modified arrangement. Fig. 4 is a similar view showing a further modification. Fig. 5 is a vertical section on line 5 5 of Fig. 4, and Fig. 6 is a front view of the apparatus shown in Fig. 4.

Referring to the drawings, 10 indicates the locomotive-boiler, 11 the stack, and 12 the usual exhaust-pipe, into which exhaust-steam is discharged to create the draft.

13 indicates the usual nozzle, through which the exhaust-steam is discharged into the exhaust-pipe 12.

14 indicates an exhaust-passage which receives the exhaust-steam from the cylinders. The nozzle 13 communicates with the passage 14, so that the exhaust-steam coming from the cylinders is discharged through the nozzle 13 into the exhaust-pipe 12.

15 indicates a condensing-chamber arranged in advance of the boiler 10 and exhaust-pipe 12, as shown in Fig. 1. The condensing-chamber 15 receives exhaust-steam from the passage 14 through an extension-passage 16, provided with a nipple 17, as shown. The object of the nipple 17 is to prevent water of condensation from flowing back into the exhaust-passage, and to that end it projects a short distance above the bottom of the condensing-chamber 15, as shown in Fig. 1. The condensing-chamber 15 is provided with a flaring flange 18 around its forward margin, which operates to direct air through longitudinal passages 19, which extend through the condensing-chamber 15. The passages 19 are preferably tubular in form, as shown in Fig. 2, so that the condensing-chamber is somewhat of the nature of a short tubular boiler. The arrangement is such that as the locomotive moves forward or backward if a condenser is provided at the rear end also air is caused to pass through the passages 19, thereby operating to cool the steam within the condensing-chamber 15. The air entering at the front end of the condenser passes out at the rear end thereof into a funnel 20, having a nozzle 21, which enters the exhaust-pipe 12 and is turned up, so as to discharge into the stack. The result is that the air that passes through the condenser is discharged into the stack, and consequently creates a greater or less draft in the exhaust-pipe in the same manner as does the exhaust-steam when it is discharged directly thereinto. It will be observed that the exhaust-pipe 12, as shown in Fig. 1, is open at the bottom and communicates with the space at the front end of the boiler, so that the suction caused by either the exhaust-steam or the air discharged through the nozzle 21 causes a draft through the boiler-flues. The force of the draft caused by the air, as above described, depends, of course, to some extent on the speed of the engine, and to provide for utilizing the exhaust-steam to maintain the draft when the speed of the engine is insufficient to maintain it at the proper point I provide a valve 22, which is placed in the exhaust-passage 14 between the nozzle 13 and the extension 16 of the exhaust-passage, which valve when in the position shown in Fig. 1 serves to direct the exhaust-steam through the nozzle 13 directly into the exhaust-pipe 12. By rocking said valve into the position shown in dotted lines in Fig. 1 the nozzle 13 is cut off from the exhaust-passage 14, and exhaust-steam then passes through the extension 16 and nipple 17 into the condensing-chamber, where it is condensed. The water of condensation is carried back to the boiler for reuse through a pipe 23, which communicates with the bottom of the condensing-chamber 15 and runs back to the tender.

It will be understood, of course, that the reservoir to which the water of condensation is conducted may be in the tender or at any other suitable point, as that is immaterial to my invention, which contemplates the reuse in the boiler of the water of condensation, and such water may be used again when still warm or may be allowed to cool before being used again, as desired.

In order to prevent any possible back pressure in the condensing-chamber 15, perforations 24 are provided in the inner face of the condenser, as shown in Figs. 1 and 2, so that any uncondensed exhaust-steam may escape into the funnel 20 and be then carried up through nozzle 21 and discharged into the exhaust-pipe. Ordinarily, however, and particularly in cold weather, all the exhaust-steam will be condensed and returned to the boiler.

In order to automatically control the position of the valve 22, and thereby direct the exhaust-steam either through the nozzle 13 into the exhaust-pipe or into the condensing-chamber 15, I provide a lever 25, which is mounted upon the shaft 26, which carries the valve 22. Said shaft is journaled in the exhaust-passage 14 and carries a counterbalance 27 upon the end of an arm 28, as shown in Figs. 1 and 2. The lever 25 is operated by a rod 30, connected at its lower end to said lever and its upper end to an arm 31, mounted on a rock-shaft 32, journaled in suitable brackets at the top of the condensing-chamber, as shown. The rock-shaft 32 is operated by means of a plate 33, carried on a support 34, mounted on parallel bars 35, one of said bars being mounted on the rock-shaft 32, as shown in Fig. 1. The plate 33 is arranged to be moved back by wind-pressure when the locomotive moves at a predetermined rate of speed. Consequently when it is moved back it rocks the parallel bars 35, rocking the rock-shaft 32 and throwing down the lever 31 and connecting-bar 30. The result is that the lever 25 is rocked to carry the valve 22 into its

horizontal position, connecting the extension 16 with the exhaust-passage 14 and directing the exhaust-steam into the condensing-chamber. When the pressure falls below a certain point, the counterbalance 27 restores the valve 22 to its vertical position and also carries the plate 33 forward, the weight of the plate 33 and its supporting parts assisting this movement. Obviously by adjusting the position of the counterbalance 27 on its arm 28 the pressure necessary to move the plate 33 may be adjusted at pleasure. To this end the counterbalance 27 is made adjustable upon its arm 28 and is held in position by a set-screw 36, as shown in Fig. 2.

In Fig. 3 I have shown a modified arrangement of condensing-chamber, the connections being also somewhat different from those shown in Figs. 1 and 2. In the construction shown in Fig. 3 I provide a condenser in the form of a double funnel composed of inner and outer walls 37 38, respectively, forming a condensing-chamber 39. Near the mouth of the funnel the inner wall is provided with a number of perforations 40, through which excess of exhaust-steam which may remain uncondensed may be discharged into the funnel and be then carried back, as will be hereinafter described. 41 indicates a centrifugal chamber arranged in the space forward of the boiler and under the stack 11. The centrifugal chamber 41 communicates with an exhaust-pipe 42, which is placed above it, and discharges into the stack 11, sufficient space being provided around the exhaust-pipe 42 to secure the requisite draft. As shown in Fig. 3, the bottom of the centrifugal chamber 41 is sloping, so that water therein is directed to a return-pipe 43, similar to the return-pipe 23, by which the water of condensation is conducted back to the boiler. 44 indicates a pipe which connects the lower portion of the condensing-chamber 34 with the centrifugal chamber 41. 45 indicates a pipe which conducts air from the funnel into the centrifugal chamber 41. The pipe 45 is provided with a nozzle 46, arranged tangentially in the centrifugal chamber 41, which discharges tangentially into the centrifugal chamber 41, so that air entering said chamber from the funnel is given a violent whirling motion before it passes up through the exhaust-pipe 42 into the stack. The object of this arrangement is to separate from the incoming air any moisture that it may contain owing to the escape into the funnel of uncondensed exhaust-steam through the perforations 40. By this means the incoming air before passing into the exhaust-pipe 42 is effectually relieved of its contained moisture, which is recovered and returned to the boiler through the pipe 43. 47 indicates the exhaust-passage through which exhaust-steam from the cylinders is supplied to the exhaust-pipe 42 or to the condensing-chamber 39, as desired. The exhaust-passage 47 is similar to the exhaust-passage 14 and is provided with a nozzle 48, which passes through the centrifugal chamber 41 and discharges into the exhaust-pipe 42. The exhaust-passage 47 is also provided with an extension 49, which communicates with the condensing-chamber 39 and with the valve 22 and operating mechanism therefor, already described. In this construction, however, I prefer to arrange the plate 33 below the condensing-chamber instead of above it, as in the construction shown in Fig. 1. 50 indicates the tender in which the water-tank is located.

In Figs. 4, 5, 6 and I have shown a still further modification. In the latter construction I employ a condensing-chamber 51, arranged in front of the stack 11, said chamber being circular in form and receiving air through a funnel 52, arranging in front of the chamber 51, and discharging thereinto through a tangentially-arranged nozzle 53. The air when discharged into the chamber 51 is given a whirling motion and thence passes through an axial opening 54 into a nozzle 55, arranged in the stack, and discharging in an upward direction therein, thereby creating the necessary draft. The condensing-chamber 51 is provided with a perforated interior plate 56, which is circular in form and is placed a short distance from the periphery of the tank 51, thereby providing a space 57 for water of condensation. Exhaust-steam is supplied to the condensing-chamber through an extension 58 of an exhaust-passage 59, similar to the exhaust-passages 14 and 47. The extension 58 extends into the nozzle 53, where it also is provided with a tangentially-disposed nozzle 60, as shown in Fig. 5, so that the exhaust-steam also is discharged tangentially into the condensing-chamber 51, thereby permitting the condensation of the steam and the separation of the moisture from the incoming air. 61 indicates the return-pipe, through which the water of condensation is carried back to the boiler. 62 indicates the exhaust-steam nozzle through which the exhaust-steam is discharged directly into the stack. In this construction the nozzle 62 takes the place of the usual exhaust-pipe. In this construction also I employ the valve 22, with the devices for operating it already described.

From the foregoing description it will be seen that I provide for condensing the exhaust-steam and recovering practically all of the water of condensation and that this is accomplished without interference with the draft. Of course where it is necessary to make use of the exhaust-steam to maintain the draft, as where the locomotive is running slowly or is stopped, the exhaust-steam that passes into the stack is lost; but this amounts to only a very small proportion of the total exhaust, and I am therefore able to recover nearly all of the water employed in the boiler.

It will be understood, of course, that my

improvements may be applied at both ends of the engine, if desired, so that the advantages thereof may be derived when the locomotive is running backward as well as when it runs forward. This is particularly desirable in locomotives employed for suburban service.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. A locomotive-engine provided with a boiler, a condensing-chamber arranged in advance of the boiler and adapted to receive exhaust-steam from the engine, said chamber being arranged to permit air to flow therethrough whereby it is cooled by movement of the engine, and means for conducting the water of condensation back to the boiler, substantially as described.

2. A locomotive-engine provided with a boiler, a condensing-chamber arranged in advance of the boiler and adapted to receive exhaust-steam from the engine, said chamber being arranged to permit air to flow therethrough whereby it is cooled by movement of the locomotive, a smoke-stack, means for discharging air into said stack, and means for conducting water of condensation back to the boiler, substantially as described.

3. A locomotive-engine provided with a boiler, a condensing-chamber arranged in advance of the boiler and adapted to receive exhaust-steam from the engine, said chamber being arranged to permit air to flow therethrough whereby it is cooled by movement of the locomotive, a stack, means for conducting air from said condensing-chamber back to the stack, and means for conducting water of condensation back to the boiler, substantially as described.

4. A locomotive-engine provided with a condensing-chamber arranged in advance of the boiler, in combination with means for conducting exhaust-steam to said condensing-chamber, a smoke-stack, and means for directing atmospheric air into said stack for maintaining the draft, substantially as described.

5. A locomotive-engine provided with a condenser having a condensing-chamber adapted to receive exhaust-steam from the engine, said condenser being arranged in advance of the boiler, whereby the current of air created by the movement of the engine operates to condense the steam, and means for conducting the air from said condenser back to the smoke-stack of the engine, substantially as described.

6. A locomotive-engine provided with a boiler a condensing-chamber arranged in advance of the boiler adapted to receive exhaust-steam from the engine, means for discharging a current of air into the smoke-stack to create a draft, and means for directing exhaust-steam into the smoke-stack, substantially as described.

7. A locomotive-engine provided with means for directing a current of air into the smoke-stack to create a draft, in combination with means for directing exhaust-steam into the stack, valve mechanism for controlling the admission of air or steam to the stack and means controlled by the speed of the locomotive for operating said valve mechanism, substantially as described.

8. A locomotive-engine provided with means for directing a current of air into the smoke-stack to create a draft, in combination with means for directing exhaust-steam into the stack, valve mechanism for controlling the admission of air or steam to the stack means controlled by the speed of the locomotive for operating said valve mechanism, and means for condensing the exhaust-steam, substantially as described.

9. A locomotive-engine provided with means for directing a current of air into the smoke-stack to create a draft, in combination with means for directing exhaust-steam into the stack, automatic valve mechanism for controlling the admission of air or steam to the stack, and means for condensing the exhaust-steam, substantially as described.

10. A locomotive-engine provided with means for directing a current of air into the smoke-stack to create a draft, in combination with means for directing exhaust-steam into the stack, valve mechanism operated by air-pressure caused by the motion of the engine for controlling the admission of air or steam to the stack, and means for condensing the exhaust-steam, substantially as described.

11. A locomotive-engine provided with a stack, an exhaust-pipe adapted to discharge thereinto, a condenser arranged forward of the exhaust-pipe, said condenser being open at the front and arranged to communicate with said exhaust-pipe, whereby air may pass through said condenser and be discharged into said exhaust-pipe, and means for supplying exhaust-steam to said condenser, substantially as described.

12. A locomotive-engine provided with a stack, an exhaust-pipe adapted to discharge thereinto, a condenser arranged forward of the exhaust-pipe, said condenser being open at the front and arranged to communicate with said exhaust-pipe, whereby air may pass through said condenser and be discharged into said exhaust-pipe, means for supplying exhaust-steam to said exhaust-pipe and to said condenser, and valve mechanism for cutting off the exhaust-steam from said exhaust-pipe and directing it to said condenser, substantially as described.

13. A locomotive-engine provided with a stack, an exhaust-pipe adapted to discharge thereinto, a condenser arranged forward of the exhaust-pipe, said condenser having one or more passages therethrough, said passages being arranged to communicate with said exhaust-pipe and being open at the front, where-

by air may pass through said condenser and be discharged into said exhaust-pipe, means for supplying exhaust-steam to said exhaust-pipe and to said condenser, valve mechanism for directing the exhaust-steam to said exhaust-pipe or to said condenser, and means controlled by the speed of the engine for operating said valve mechanism to admit steam to said condenser when the speed is great and to admit the exhaust-steam to said exhaust-pipe when the speed of the locomotive falls below a certain point, substantially as described.

14. A locomotive-engine provided with a stack, an exhaust-pipe adapted to discharge thereinto, a condenser arranged forward of the exhaust-pipe, said condenser having one or more passages therethrough, said passages being arranged to communicate with said exhaust-pipe and being open at the front, whereby air may pass through said condenser and be discharged into said exhaust-pipe, means for supplying exhaust-steam to said exhaust-pipe and to said condenser, valve mechanism for directing the exhaust-steam to said exhaust-pipe or to said condenser, means controlled by the speed of the engine for operating said valve mechanism to admit steam to said condenser when the speed is great and to admit the exhaust-steam to said exhaust-pipe when the speed of the locomotive falls below a certain point, and means for adjusting said valve-operating mechanism, substantially as described.

15. A locomotive-engine provided with a stack, an exhaust-pipe adapted to discharge thereinto, a condenser arranged forward of the exhaust-pipe, said condenser having one or more passages therethrough, said passages being arranged to communicate at the rear with said exhaust-pipe and being open at the front, whereby air may pass through said condenser and be discharged into said exhaust-pipe, means for supplying exhaust-steam to said condenser, and a return-pipe for conducting the water of condensation back to the tender, substantially as described.

16. A locomotive-engine provided with a stack, a condenser arranged forward of the stack, said condenser consisting of a suitable condensing-chamber having one or more passages therethrough, said passages being open in front to permit air to pass therethrough, means for conducting the air passing through said condenser to the stack, one or more perforations in the wall of said condenser to permit of the escape of uncondensed exhaust-steam, means for conducting the water of condensation back for reuse, and means for supplying exhaust-steam to said condenser, substantially as described.

17. A locomotive-engine provided with a stack, a condenser arranged forward of the stack, said condenser consisting of a suitable condensing-chamber having one or more passages therethrough, said passages being open in front to permit air to pass therethrough, means for conducting the air passing through said condenser to the stack, one or more perforations in the wall of said condenser to permit of the escape of uncondensed exhaust-steam, means for conducting the water of condensation back for reuse, means for supplying exhaust-steam to said condenser, and means for discharging exhaust-steam into the stack, substantially as described.

18. A locomotive-engine provided with a stack, a condenser arranged forward of the stack, said condenser consisting of a suitable condensing-chamber having one or more passages therethrough, said passages being open in front to permit air to pass therethrough, means for conducting the air passing through said condenser to the stack, one or more perforations in the wall of said condenser to permit of the escape of uncondensed exhaust-steam, means for conducting the water of condensation back for reuse, means for supplying exhaust-steam to said condenser, means for discharging exhaust-steam into the stack, and valve mechanism for directing the exhaust-steam into the stack or into the condensing-chamber, as desired, substantially as described.

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