N. T. McKEE.

LOCOMOTIVE.

APPLICATION FILED SEPT. 13, 1918.

1,298,070.

Patented Mar. 25, 1919.

2 SHEETS—SHEET 1.

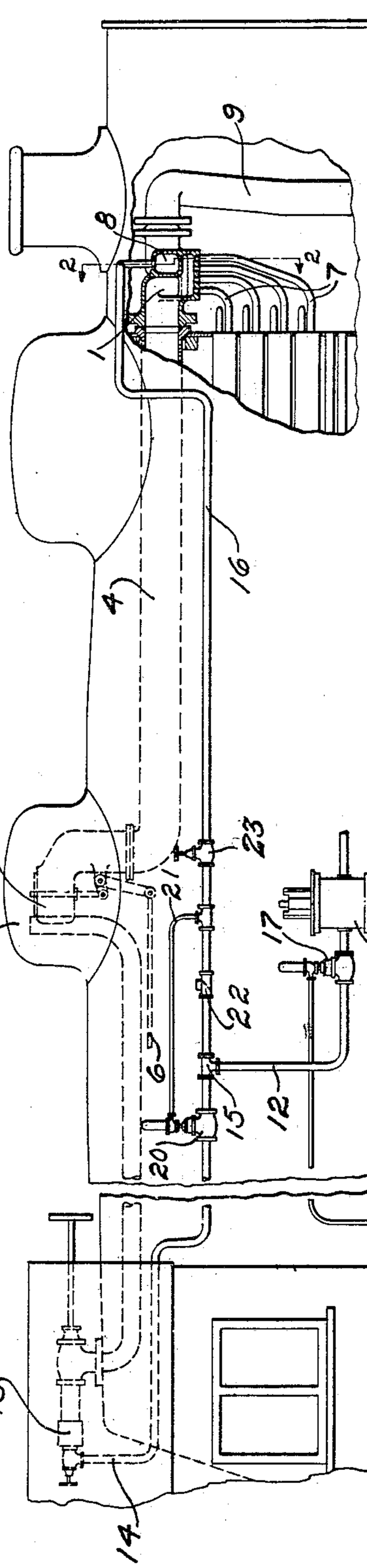

Fig. 1.

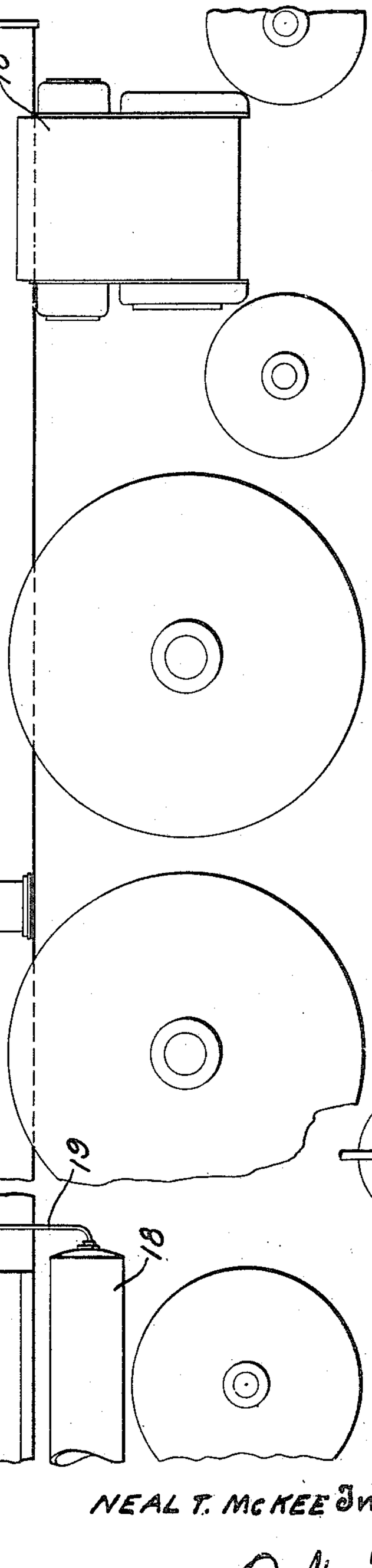

Fig. 2.

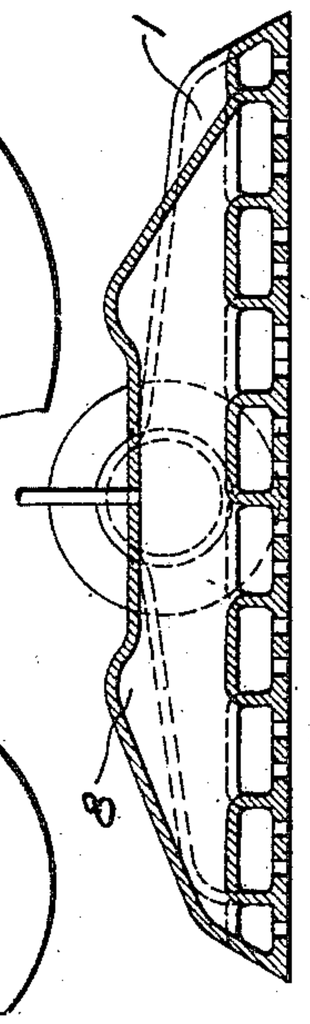

Fig. 3.

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2 SHEETS—SHEET 2.

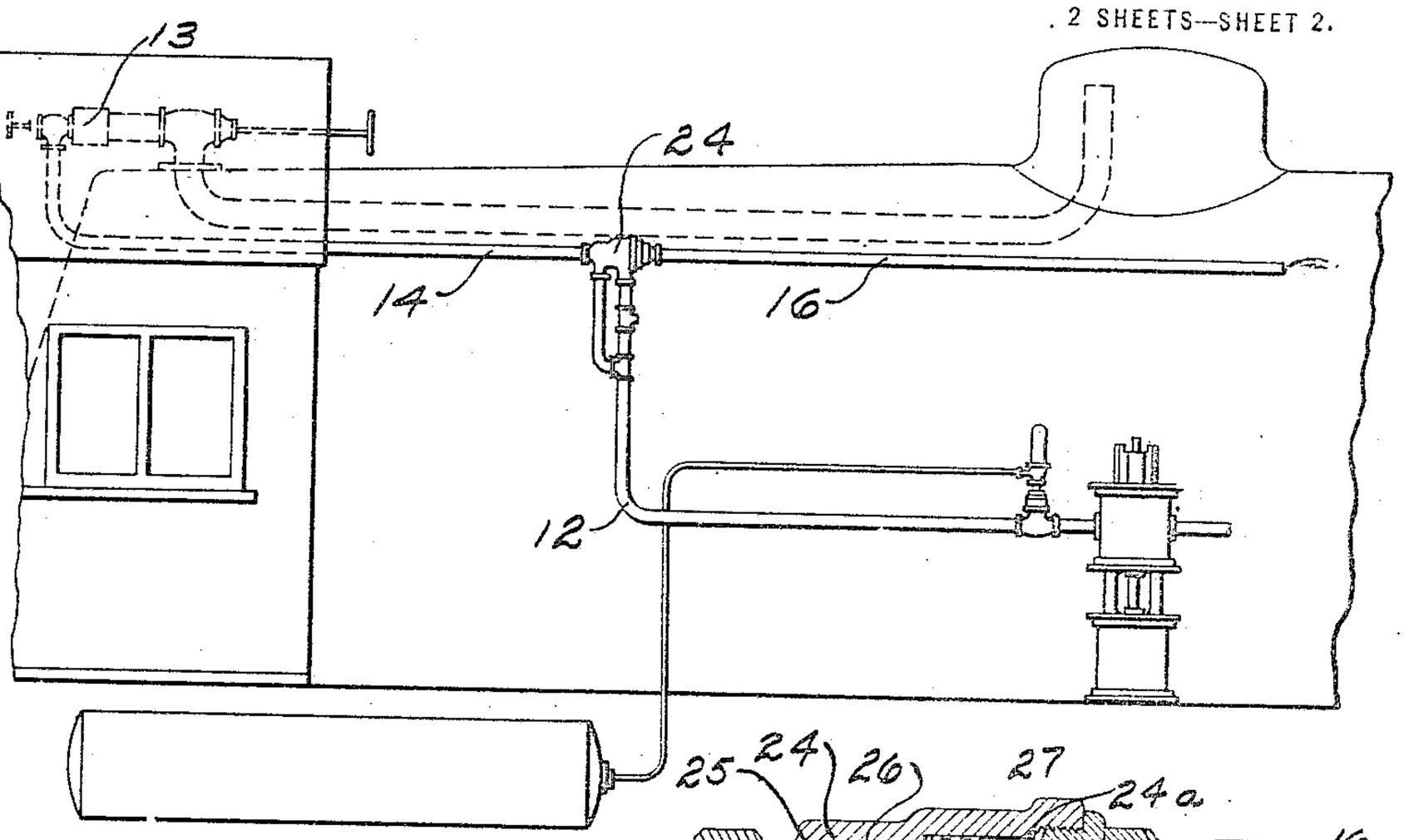


Fig. 3.

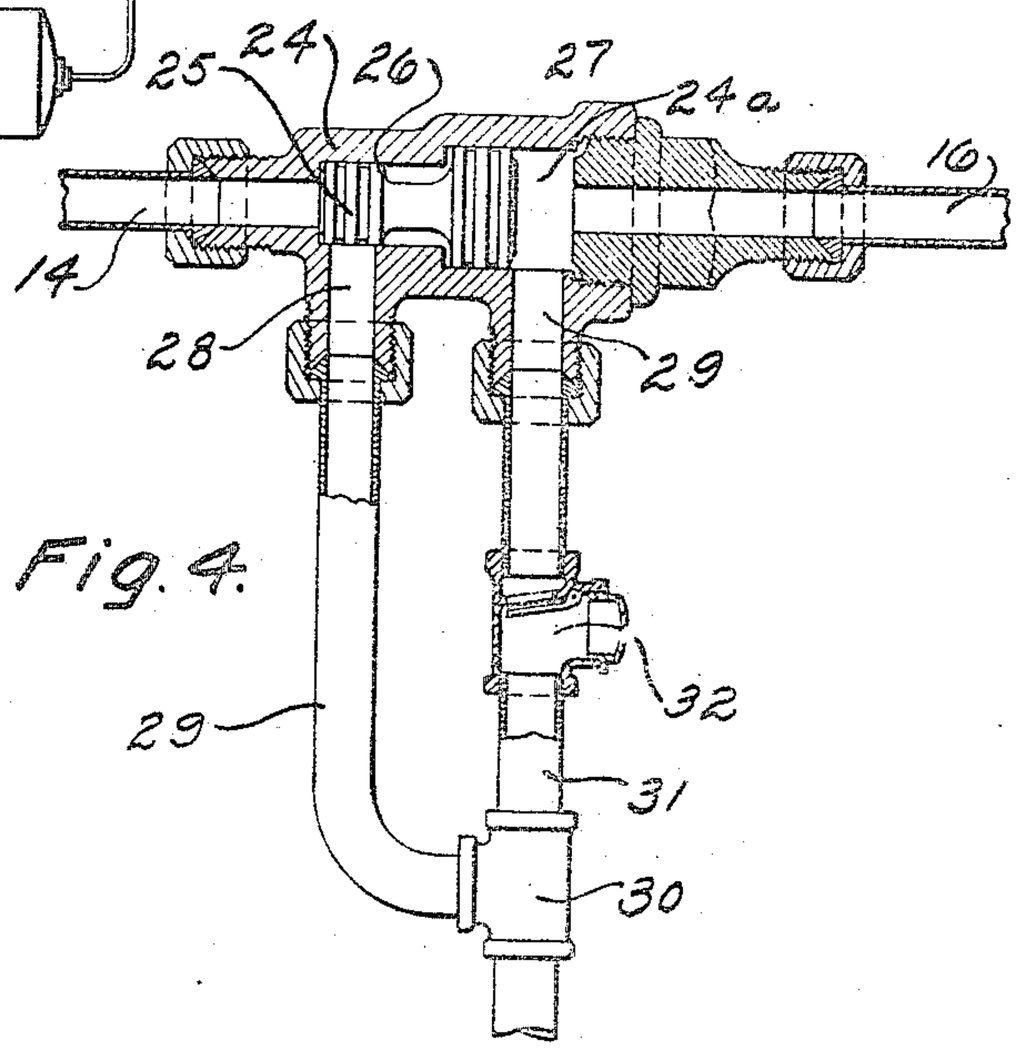
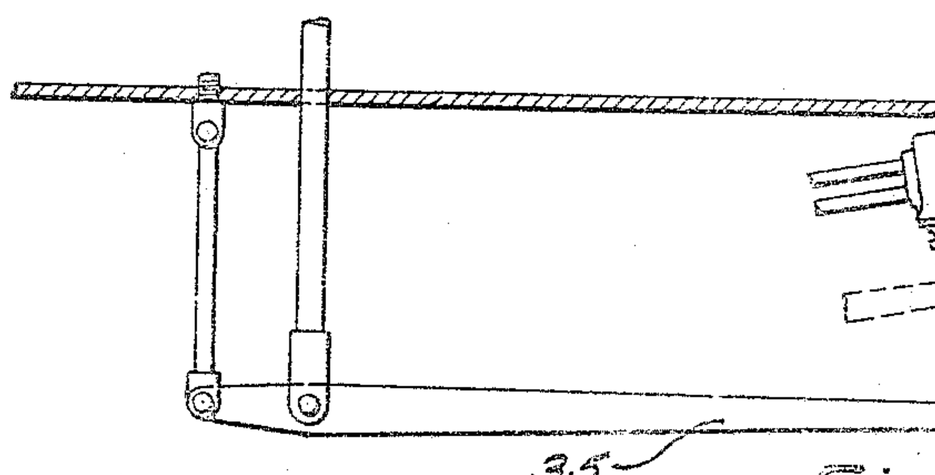


Fig. 4.



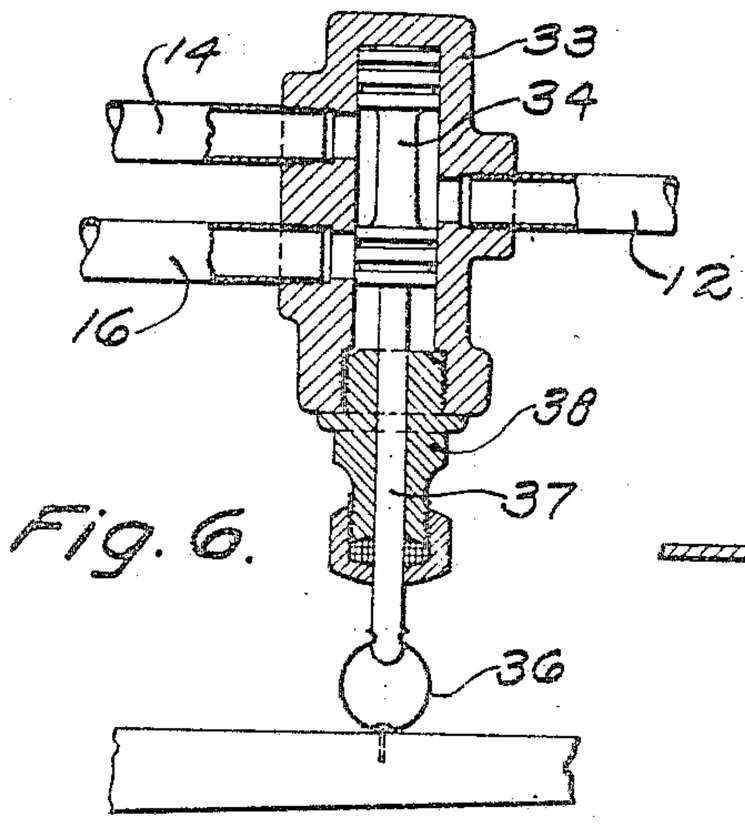


Fig. 6.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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LOCOMOTIVE.

1,298,070. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed September 13, 1918. Serial No. 253,950.

To all whom it may concern:

Be it known that I, NEAL T. McKEE, a citizen of the United States, and resident of Yonkers, N. Y., have invented certain new and useful Improvements in Locomotives, of which the following is a specification.

My invention relates to locomotives and particularly to the steam supply for the auxilaries such as the air pump, the water pump, the turbine for the headlight dynamo, and the turbine or other engine for feeding pulverized or other fuel. Under conditions of train operation such as obtain today the steam consumption in these auxiliaries amounts to a considerable fraction of the entire amount of steam developed by the boiler; and while the main engines of the locomotives are supplied with superheated steam and all the benefits of superheated steam are, therefore, obtained for them, no practicable way has yet been devised of making the benefits of superheated steam available for the auxilaries. I am aware of attempts to do this but to my knowledge they have all had such objectionable features connected with them that they have never gone into practical use. It would be a comparatively simple matter to use superheated steam for these auxiliaries, if they were operated only during periods when the locomotive is in motion and steam is being supplied to the superheater, but they are called on to work also when the steam to the main engines is shut off and as in the almost universal arrangement used on locomotives the throttle shutting off the steam supply to the main engines is located between the superheater and the boiler and not between the superheater and the engine, no superheated steam is available for use in the auxiliaries at such times. It therefore becomes necessary to make available another supply of steam during periods when the throttle is closed and the main purpose of my invention is to make provision for such a supplementary supply by means of an inexpensive and reliable mechanism.

The invention will readily be understood from the accompanying drawings in which my invention is shown, by way of illustration, in connection with the steam supply to the air pump and where Figure 1 gives in side elevation a view of the locomotive with my invention attached, certain parts being broken away to give a better view, other parts being in section and still others omitted; Fig. 2 is an enlarged sectional view of the superheater header of Fig. 1, this section being taken on line 2—2 of Fig. 1; Fig. 3 shows a view similar to Fig. 1 of a modification; Fig. 4 is a detailed sectional view of a differential piston valve used in this form; Fig. 5 is a sectional view of still another modification; Fig. 6 is an enlarged detailed view of a part of the mechanism of Fig. 5.

To describe first the form of my invention illustrated in Figs. 1 and 2, steam is supplied to chamber 1 of the superheater header 2, from the steam dome 3 of the boiler by means of the dry pipe 4, the entrance to which is controlled by the throttle 5. This throttle is operated in the usual way by means of the throttle rod 6 which extends into the engine cab. The steam which has been delivered to chamber 1 of the superheater header leaves this chamber by means of the superheater units 7, in which it is superheated and by which it is delivered to chamber 8 of the header 2. From this chamber 8 it leaves by means of the pipes 9 (only one of which shows in the figure) and is, by these pipes, delivered to the valve chests 10.

Engine 11 of the air pump receives its steam through the pipe 12. In the usual arrangement this steam pipe 12 connects directly to the turret 13 which supplies it with saturated steam from the boiler. In my improved arrangement this turret 13 also supplies steam pipe 12 with saturated steam doing so by means of the pipe 14 and the T 15, but in addition to this I supply this T 15 with superheated steam by means of the pipe 16, which as will be evident from Figs. 1 and 2, is tapped into the superheated chamber 8 of the header 2.

The pump governor 17 shuts off the steam supply to the air pump in response to pressure from the air tank 18 transmitted to it through the pipe 19. This is the usual arrangement and is not modified. A governor 20 similar in structure to the governor 17 is inserted in the saturated steam line 14, operating to close off this saturated steam supply in response to pressure existing in the steam line 16 transmitted to it through the pipe 21. The line 16 has, in addition, a check valve 22 permitting the flow of steam toward the air pump but preventing it in the opposite direction, and a globe valve 23.

The operation of this device may be briefly described as follows:

When the throttle 5 is open and steam pressure therefor exists in the superheated pipe line 16, the governor 20 will close off the saturated steam supply through the pipe 14 and the air pump 11 will therefore be operated by superheated steam from chamber 8 of the superheater header. The governor 20 is adjusted so it shuts off the saturated steam supply when the pressure in 16 is sufficient to run the air pump, and to open it at other times. When the throttle 5 is closed, the pressure in 16 and 21 will fall off and as a consequence the governor 20 will open and the saturated steam from port 13 will reach the pump through pipe 14, governor 20, T 15 and pipe 12. The check valve 22 will prevent this steam from backing up into the superheater header, reaching the main valve chest 10 and thus causing the engine to move. When the required pressure in air tank 18 has been reached the governor 17 will operate in the usual way and shut off the steam supply whether it be saturated or superheated.

It will thus be seen that I supply the air pump with superheated steam whenever such supply is available and make adequate provision for supplying it with saturated steam at other times.

In Figs. 3 and 4 is shown a modified form of my apparatus in which a differential piston valve is employed for shutting off the saturated steam when superheated steam is available and for opening it up at other times. From the turret 13 pipe 14 carries saturated steam to the valve and casing 24. The steam supply by this pipe exerts pressure upon the small piston 25 of the differential piston valve 26, while the larger piston 27 is subject to pressure of superheated steam delivered to the casing 24 by pipe 16. This differential piston valve 26 reciprocates within the appropriately shaped chamber 24a. In the position shown in Fig. 4 the differential piston valve is seen to shut off the outlet 28 and to uncover outlet 29. The outlet 28 delivers steam to pipe 29 and by means of T 30 and pipe 12 to the pump while the outlet 29 delivers steam to pipe 31, which also connects to T 30 and so is also able to deliver steam to the pump. Pipe 31 has in it a check valve 32 permitting flow toward but prohibiting flow from the pump. In the position shown in Fig. 4 superheated steam delivered from pipe 16 to pipe 31 and so to the pump, while the saturated steam supply is cut off. With the valve 26 in the position to the extreme right, it will be seen that saturated steam would be supplied while superheated steam would be cut off.

The differential piston is used in this valve so that whenever both steam supplies are available the valve will assume such a position that the saturated steam is cut off. At times when the engine throttle is closed and no superheated steam is available, there will be no pressure on the piston 27 and the valve will, therefore, assume the position to the extreme right and the pump will be supplied with saturated steam.

Still another form of my device is illustrated in Figs. 5 and 6. Here superheated steam is delivered to a valve casing 33 through pipe 16 and saturated steam is delivered to it through pipe 14. From the casing 33 the steam leaves for the air pump through pipe 12. In the interior of this valve casing there is a piston valve 34. In one of its positions—the one shown in the figure—communication is established between the saturated steam supply 14 and pipe 12, while in its opposite position this communication would be cut off and communication established between pipes 16 and 12. The position of this valve 34 is determined by throttle lever 35. This throttle lever has on it a small clip 36 which engages the end of the valve rod 37. This valve rod 37 is secured coaxially with the valve 34 and extends through the stuffing box 38. In Fig. 5 the innermost position of the throttle lever is indicated in dotted lines and in this position the clip 36, engaging valve rod 37, gives the valve 34 the position indicated in Fig. 6. When the engineer begins to open the throttle or in other words pull the throttle lever outward into the position indicated in full lines in Fig. 5, valve 34 will, at once, be given the opposite position from that indicated in Fig. 6. When it has reached this outermost position the clip will readily disengage its hold upon the end of the rod 37 and from then on the motion of the throttle lever does not affect the position of valve 34 until the engineer closes the throttle. When this occurs, as soon as the clip 36 again engages the rod 37 the continued inward motion of the throttle lever will give valve 34 its innermost position as indicated in Fig. 6.

The action on the steam supply to the air pump of the motions of the throttle lever just described will evidently be as follows:

When the throttle is closed and the lever in the dotted position indicated in Fig. 5, the air pump will be supplied with saturated steam from pipe 14 which supply can not back up into the pipe 16 as the valve 34 closes off the port leading to pipe 16. As soon as the engineer begins to open the throttle he changes the position of valve 34 to the opposite extreme and from then on superheated steam will be supplied to the air pump, the saturated supply being, of course, cut off by valve 34. This will continue as long as the throttle remains open.

I have in the above described my invention as used for supplying superheated steam to the engine of the air pump; but,

as stated near the beginning of the specification, this is merely by way of exemplification. The same general means can evidently be employed for supplying superheated steam to one or more of the other auxiliaries mentioned above while the main throttle is open and supplying saturated steam at other times. If thought desirable, a separate mechanism can be used for each steam line leading to an auxiliary; but preferably a single control will be used for a supply to all the auxiliaries in which superheated steam is to be employed. The control employed in either case may be of any of the types described above or their equivalents.

What I claim is:

1. In apparatus of the class described, the combination of a superheater, a pipe supplying it with steam, a throttle controlling the pipe, an auxiliary steam-consuming device, means to supply the auxiliary device with steam from the superheater and automatic means to supply it with steam from another point than the superheater when the throttle is closed.

2. In a locomotive having a superheater, a throttle controlled pipe supplying it with steam from the boiler, and an auxiliary steam-consuming device, the combination of a pipe connected to the auxiliary device, two conduits supplying it with steam from the superheater and with saturated steam from the steam space of the boiler respectively, and means to shut off automatically the saturated steam supply when the throttle is open and to open it at other times.

3. In a locomotive having a superheater, a main engine, and an auxiliary steam-consuming device, the combination of a throttle controlled dry-pipe supplying steam to the superheater, a steam pipe connecting the superheater to the main engine, a pipe connected to the auxiliary device, two conduits connecting said pipe respectively with the superheater and with the steam space of the boiler, and means to shut off the conduit from the steam space in response to pressure in the other conduit.

4. In a locomotive having a superheater and an auxiliary steam-consuming device, the combination of a throttle governed dry pipe supplying steam to the superheater, a pipe leading to the auxiliary device, two conduits connecting said pipe respectively with the superheater and the steam space of the boiler, a pressure controlled governor in the second named conduit and means to transmit pressure to it from the first named conduit.

NEAL T. McKEE.