Oct. 30, 1945. C. KERR, JR 2,387,913

TURBINE LOCOMOTIVE

Filed Feb. 8, 1943

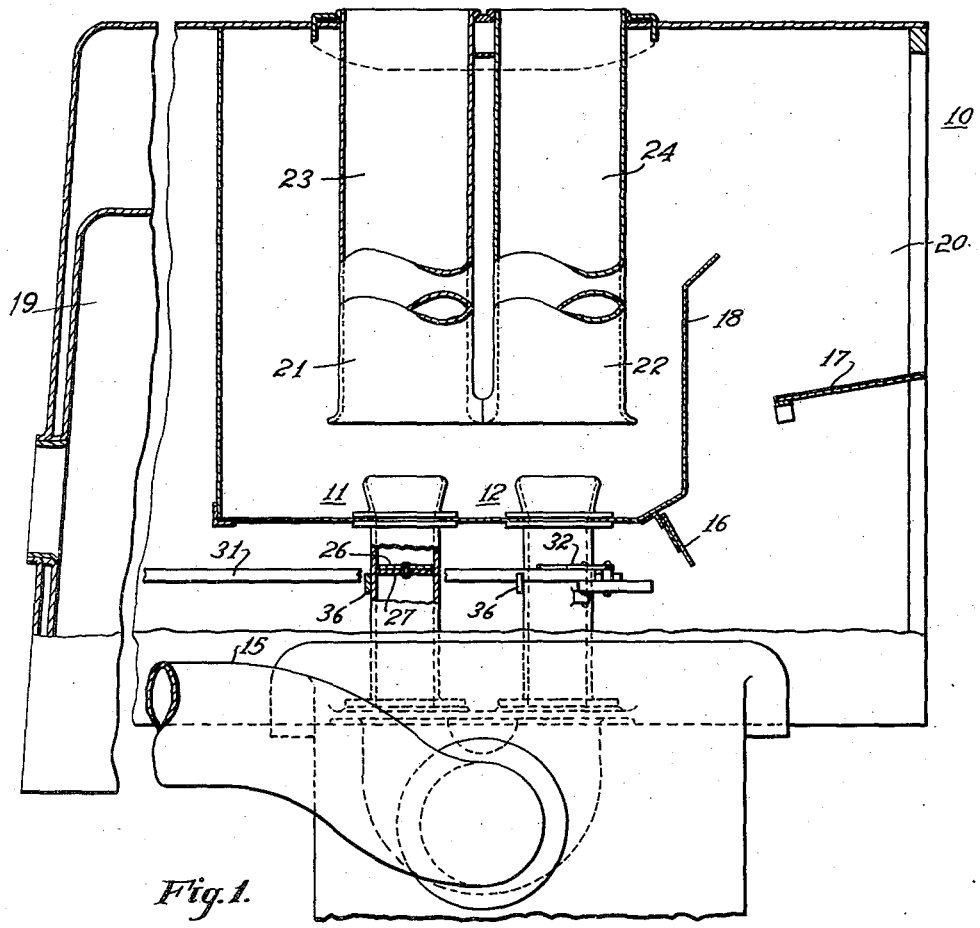

Fig. 1.

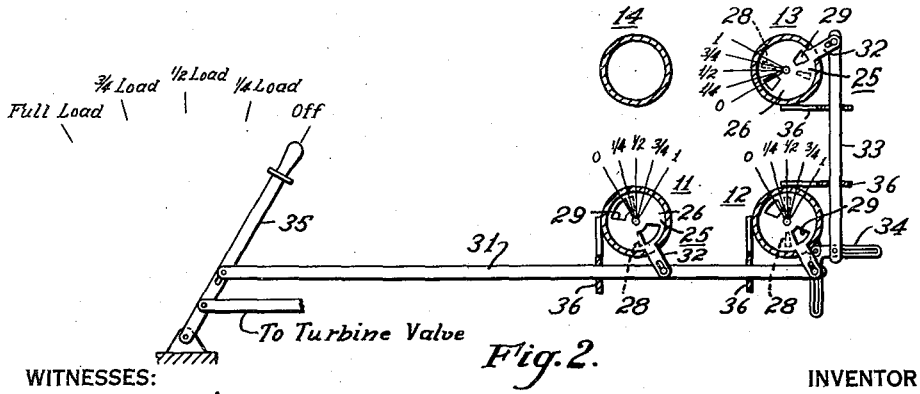

Fig. 2.

WITNESSES:

Edward Michaels

INVENTOR

Charles Kerr, Jr.

BY

ATTORNEY

Patented Oct. 30, 1945 2,387,913

UNITED STATES PATENT OFFICE

2,387,913

TURBINE LOCOMOTIVE

Charles Kerr, Jr., Edgewood, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application February 8, 1943, Serial No. 475,108

5 Claims. (Cl. 110—150)

My invention relates, generally, to locomotives and, more particularly, to steam turbine locomotives.

On a turbine locomotive it is essential to have a low back pressure at the exhaust nozzles. In order to accomplish this a plurality of smoke stacks may be provided, instead of the usual single stack, to reduce the drop through the stacks to a minimum, thereby reducing the draft required and hence reducing the back pressure.

However, the foregoing arrangement is objectionable in that, at light loads, the velocity of the smoke through the stacks will not be sufficient to eject cinders and to lift the smoke up over the operator's cab at the rear of the engine and also up over the train. The lifting of the smoke is essential to provide clear vision for the engine crew and also for satisfactory operation of the air conditioning equipment in the train.

An object of my invention is to provide a simple and efficient smoke ejection system for a turbine locomotive.

Another object of my invention is to maintain a substantially constant velocity of gases through the stacks of a locomotive.

A further object of my invention is to control the opening of the exhaust nozzles of a locomotive in accordance with the load on the locomotive.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with my invention valves are provided in the exhaust nozzles of a locomotive for controlling the flow of steam therethrough. Since the amount of gases moved through the stacks is essentially proportional to the load, the opening and closing of these valves is so controlled by the position of the main engine throttle that a substantially constant velocity of the gases is maintained.

For a fuller understanding of the nature and objects of my invention reference may be had to the following detailed description, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view, partially in elevation and partially in section, of a portion of a locomotive having exhaust nozzles embodying my invention; and

Fig. 2 is a diagrammatic view of the nozzle valves and the control device illustrated in Fig. 1.

Referring to the drawing, the structure shown therein comprises a portion of a locomotive boiler 10 which is provided with four exhaust nozzles 11, 12, 13 and 14 and four smoke stacks 21, 22, 23 and 24 for discharging the smoke produced in a firebox 19, only a portion of which is shown. As explained hereinbefore, a plurality of smoke stacks and exhaust nozzles is provided in order to decrease the back pressure on the steam turbine which supplies the power for driving the locomotive. As shown in Fig. 1, one of the exhaust nozzles is disposed directly underneath each one of the smoke stacks. Accordingly, the exhaust steam which flows from the turbine through a pipe 15 and out through the exhaust nozzles draws the smoke through the stacks. The boiler is provided with the usual baffles 16, 17 and 18 for directing the flow of smoke through the smoke box 20.

In order to maintain a substantially constant velocity of smoke through the stacks for variations in the load on the locomotive, a valve 25 is provided in each one of three of the exhaust nozzles, no valve being provided in the fourth nozzle 14. Each valve comprises a plate 26 rotatably mounted on a fixed plate 27 secured on the inside of the cylindrical nozzle. The fixed plate is provided with a pair of openings 28 and the rotatable plate is provided with a similar pair of openings 29. Each one of the rotatable plates for the nozzles 11 and 12 is connected to a link 31 by an arm 32. The rotatable plate for the nozzle 13 is connected to a link 33 which is connected to the link 31 by a bell crank lever 34, mounted on the side of the nozzle 12. The link 31 is connected to a throttle lever 35 which controls the supply of steam to the turbine (not shown) in the usual manner. Guide members 36 for the links 31 and 33 are provided on the sides of the nozzles.

As shown in Fig. 2, the openings 28 and 29 are of such a size and are so located in the plates 26 and 27 that all three of the valves are completely closed when the throttle is in the "off" position. Therefore, all of the exhaust steam from the turbine when operating at idling speed must flow through the nozzle 14 and its corresponding smoke stack 24. When the throttle is opened to ¼ load the openings 29 are over the openings 28 in the valve for the exhaust nozzle 11, thereby permitting exhaust steam to flow through this nozzle and its corresponding stack 21. When the throttle is on ½ load the openings in the rotatable plate for the nozzle 12 are moved over the openings in the fixed plate in this nozzle, thereby permitting steam to flow through this nozzle and its corresponding stack 22. It will be noted that the openings 29 in the

rotatable plate for the exhauts nozzle 11 are of sufficient size that steam continues to flow through this nozzle.

When the throttle is opened to ¾ load the openings 29 are moved over the openings 28 in the nozzle 13, thereby opening this valve along with the valves in the nozzles 12 and 11. All three valves remain open when the throttle is opened to full load. The valves close in the reverse order as the throttle is returned toward the "off" position.

In this manner the number of stacks which are operating is proportional to the throttle opening and, therefore, is proportional to the load on the locomotive. Since the volume of gases which is moved through the stacks is essentially proportional to the load, it will be seen that the present arrangement of valves provides a means of maintaining a substantially constant speed of the smoke emitting from the stacks over the entire load range of the locomotive and at the same time affords a means for attaining a low back pressure on the turbine.

It will be understood that valves of a different type from that herein illustrated may be utilized if desired. It will also be understood that the present scheme is applicable to a locomotive with any number of stacks.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a locomotive, the combination with a firebox and a smokechamber therefor, of a plurality of smokestacks for the smokechamber, an exhaust nozzle for each stack, said nozzles being disposed to exhaust steam through said stacks to create a draft through the firebox, smokechamber and stacks, a valve for each nozzle to control the exhausting of steam therethrough, a throttle device for the locomotive, and means actuated by the throttle device for opening said valves successively as the throttle is opened and closing said valves successively as the throttle is closed.

2. In a locomotive, the combination with a firebox and a smokechamber therefor, of a plurality of smokestacks for the smokechamber, an exhaust nozzle for each stack, said nozzles being disposed to exhaust steam through said stacks to create a draft through the firebox, smokechamber and stacks, valves for certain ones of said nozzles to control the exhausting of steam therethrough, a throttle device for the locomotive, and means actuated by the throttle device for opening said valves successively as the throttle is opened and closing said valves successively as the throttle is closed.

3. In a locomotive, the combination with a firebox and a smokechamber therefor, of a plurality of smokestacks for the smokechamber, an exhaust nozzle for each stack, said nozzles being disposed to exhaust steam through said stacks to create a draft through the firebox, smokechamber and stacks, a valve disposed in each nozzle to control the exhausting of steam therethrough, a throttle device for the locomotive, and means actuated by the throttle device for opening said valves one after another as the throttle is opened and closing said valves one after another as the throttle is closed.

4. In a locomotive, the combination with a firebox and a smokechamber therefor, of a plurality of smokestacks for the smokechamber, an exhaust nozzle for each stack, said nozzles being disposed to exhaust steam through said stacks to create a draft through the firebox, smokechamber and stacks, valves disposed in certain ones of said nozzles to control the exhausting of steam therethrough, a throttle device for the locomotive, and means actuated by the throttle device for opening said valves one after another in one sequence while the throttle is being opened and closing said valves one after another in the reverse sequence when the throttle is being closed.

5. In a locomotive, the combination with a firebox and a smokechamber therefor, of a plurality of smokestacks for the smokechamber, an exhaust nozzle for each stack, said nozzles being disposed to exhaust steam through said stacks to create a draft through the firebox, smokechamber and stacks, valves disposed in certain ones of said nozzles to control the exhausting of steam therethrough, a throttle device for the locomotive, and means actuated by the throttle device for opening said valves one after another in one sequence while the throttle is being opened and closing said valves one after another in the reverse sequence when the throttle is being closed, at least one of said nozzles having no valves therein and being open at all times during operation of the locomotive.

CHARLES KERR, JR.