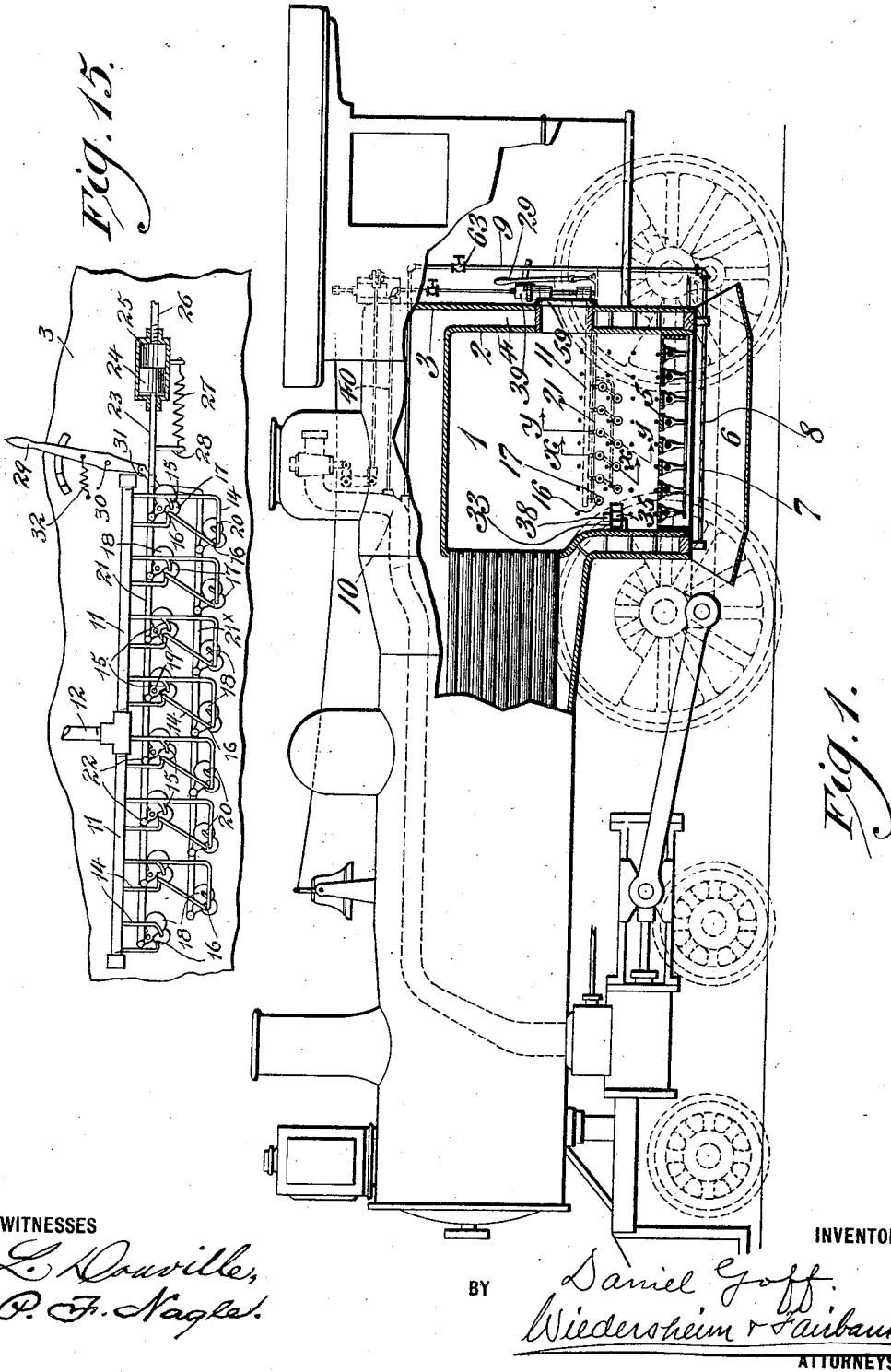


D. GOFF.
LOCOMOTIVE FURNACE.
APPLICATION FILED JAN. 16, 1911.

1,046,583.

Patented Dec. 10, 1912.
3 SHEETS—SHEET 1.



WITNESSES
L. Rouville,
P. F. Nagle.

BY

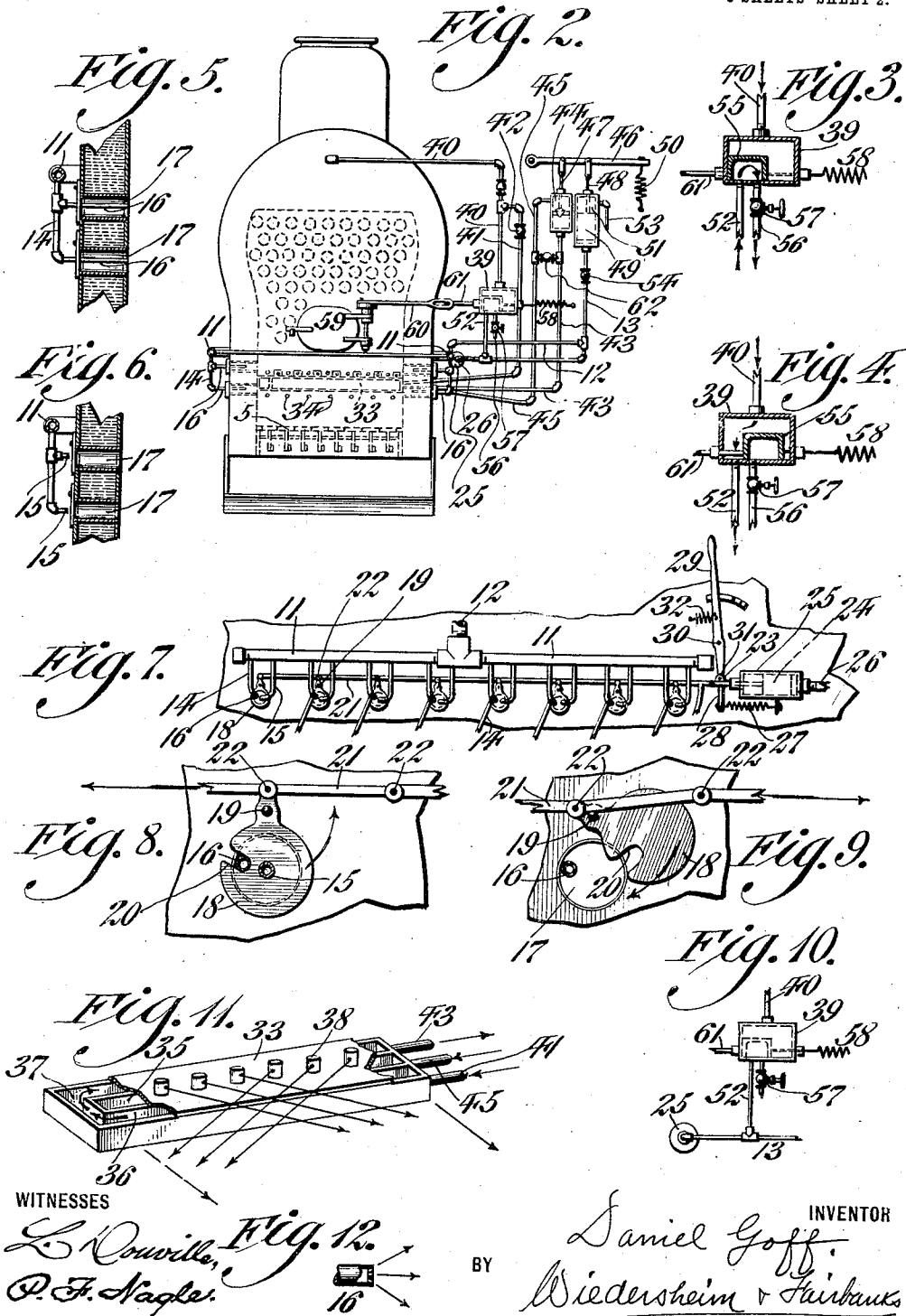
INVENTOR
Daniel Goff.
Wiedersheim & Haibank,
ATTORNEYS

D. GOFF.
LOCOMOTIVE FURNACE.
APPLICATION FILED JAN. 16, 1911.

1,046,583.

Patented Dec. 10, 1912.

3 SHEETS—SHEET 2.



WITNESSES

L. Douville,
P. F. Nagler.

Fig. 12.
16

BY

INVENTOR
Daniel Goff.
Wiedersheim & Fairbanks
ATTORNEYS

1,046,583.

Patented Dec. 10, 1912.

3 SHEETS—SHEET 3.

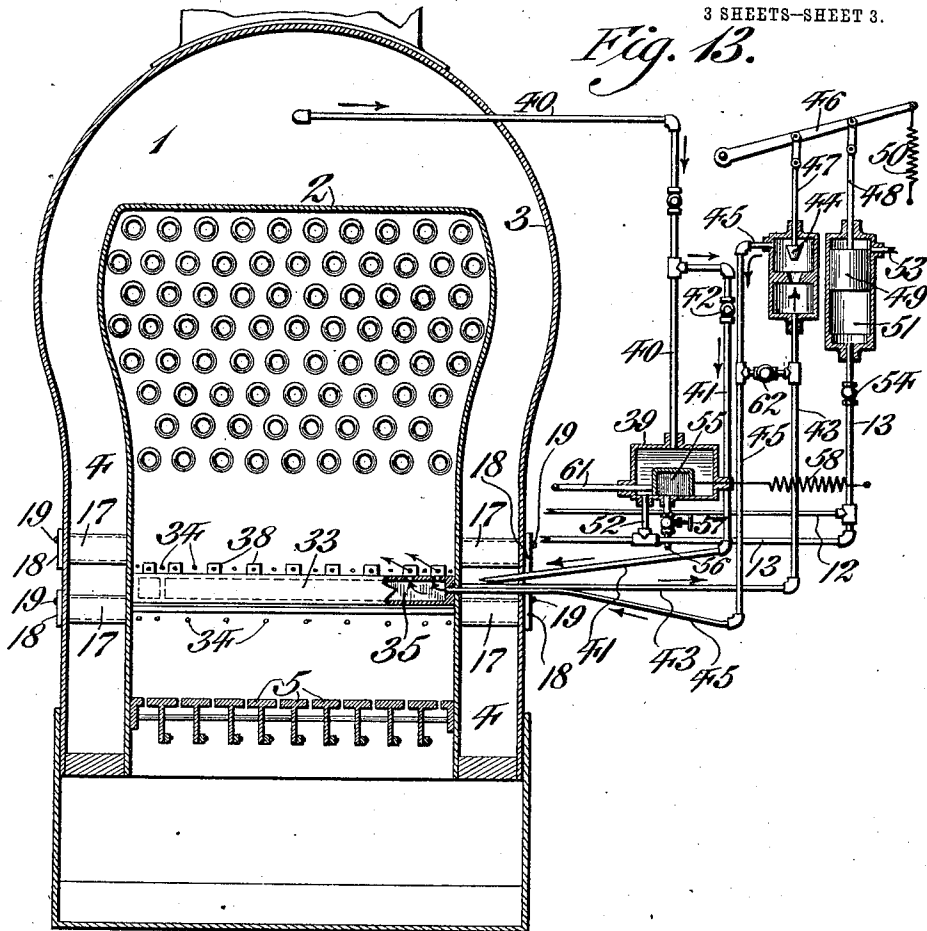
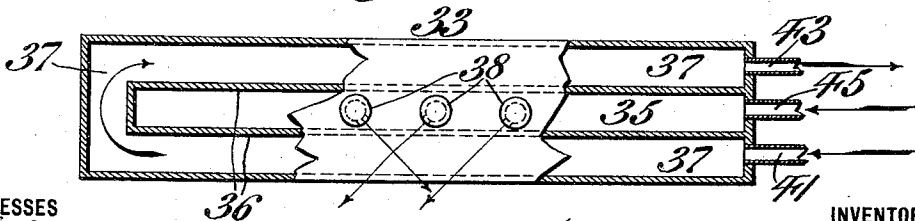


Fig. 14.



WITNESSES

L. Douville,
O. F. Nagle.

BY

Daniel Goff.
Wiedersheim & Sanibauds.

INVENTOR

ATTORNEYS

UNITED STATES PATENT OFFICE.

DANIEL GOFF, OF MILLVILLE, NEW JERSEY, ASSIGNOR TO GOFF GRAVITY BOILER
FEED COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

LOCOMOTIVE-FURNACE.

1,046,583.

Specification of Letters Patent.

Patented Dec. 10, 1912.

Application filed January 16, 1911. Serial No. 602,754.

To all whom it may concern:

Be it known that I, DANIEL GOFF, a citizen of the United States, residing at Millville, county of Cumberland, State of New Jersey, have invented a new and useful Locomotive-Furnace, of which the following is a specification.

This invention relates to a new and useful induced draft and smoke consumer for use in connection with a locomotive type of boiler or of the type shown in my copending application, No. 590,850, filed November 5th, 1910, but no claims are here made for subject matter claimed in said application, such as the steam chamber with the jacket forming chambers around the steam chamber, the communications between the chambers and the boiler, the valve controlling the communication, and means for actuating the valve by the steam from the boiler.

It has for an object to provide a construction whereby steam and air may be introduced in suitable quantities into the fire box at an advantageous point to cause a more complete combustion of the fuel products and serve as an efficient draft producing means. The introduction of the steam and air is regulated by a suitable apparatus which may be controlled either manually or automatically, whereby the quantities of the mixture may be proportioned properly to produce the desired combustion.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a side elevation of a locomotive, a portion thereof being broken away in order to show a fire box embodying my invention. Fig. 2 represents an end elevation of the same showing the control for the auxiliary steam supply device, cer-

tain of the parts being omitted for the sake of clearness. Figs. 3 and 4 represent sectional details of a valve structure shown in Fig. 2. Fig. 5 represents a section on line $x-x$ Fig. 1. Fig. 6 represents a section on line $y-y$ Fig. 1. Fig. 7 represents a portion of the injector control mechanism. Fig. 8 represents a detail of one of the injector valves in closed position. Fig. 9 represents a detail of the same in open position. Fig. 10 represents a detail of the main control valve. Fig. 11 represents a detail partly broken away, of the superheater box. Fig. 12 represents one of the steam nozzles. Fig. 13 represents on a larger scale, a cross section, through the combustion chamber showing the steam distributing means partly in elevation and partly in section. Fig. 14 represents, on a larger scale, a part section and part elevation of the superheater box. Fig. 15 represents, on an enlarged scale, a portion of the mechanism showing the means for operating the valves in unison.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates a fire box of a locomotive type of boiler, the same being formed in the usual manner by the inner shell 2 and the outer shell 3, said shells forming between them the usual water leg 4.

5 designates a plurality of grate bars forming the grate proper at the lower portion of the fire box, said grate bars being of any desired construction adapted to carry out the required functions. Air is passed through the grate bars 5, in the present instance, from the bottom of the fire box and preferably directed thereto by means of the open-ended shield 6, which serves to deflect a current of air beneath the grate when the locomotive is running and thereby produce the necessary draft to support combustion.

7 designates suitable conduits located beneath the grate bar 5 and provided with perforations 8 adapted to discharge steam through said grate, thus mixing it with the air supplied from the shield 6. These conduits 7 are connected by a pipe 9 to a suitable source of steam supply, such as the dry pipe 10.

11 designates a header located at each side of the fire box and preferably exterior thereof, the said header being adapted to

receive steam from a supply pipe 12 connected to a pipe 13, the admission of steam to the latter, in the present instance, being controlled by an automatic regulator presently to be described. Each header 11 has a plurality of conduits 14 arranged in pairs for each inlet, one conduit, at each inlet, having a nozzle 15 and the other conduit, at each inlet, having a nozzle 16, whereby there are two nozzles, 15 and 16, in sets at each inlet and in alinement with their respective air inlets 17 formed in the walls of the fire box 1 and passing through the water leg 4.

It will be noted that the nozzles 15 of each set of nozzles terminate at a point exterior of the inlets 17 while the other spreader nozzles 16, the ends of which are shown in detail in Fig. 12, extend into the inlets 17 whereby a double injector action is provided in order to draw in the necessary supply of air with the steam, while the nozzles 16 serve to spread or distribute the air and steam as will be evident. Each inlet 17 is controlled, as here shown, by means of a valve 18, suitably pivoted at 19 and having a cut away portion 20 therein to permit the nozzle 16 to pass therethrough. It will be noted that the action of this valve 18 in closed position is to cut off a supply of air to the respective inlets and also closes the inlets 17 with respect to one set of nozzles. It is preferable to provide means for operating the several valves in unison and for this purpose I provide a bar 21 which is suitably connected at 22 to each of the valves 18 and also joined to the piston rod 23 of a piston 24 in the cylinder 25. The cylinder 25 is connected by a pipe 26 to a suitable source of steam supply controlled by the regulating mechanism already referred to, by which it is operated to open the valves 18, at predetermined times. A spring 27 is connected by a lever 28 to the rod 21 and serves, in the present instance, to return the valves to normal or closed position. In order to operate the valves 18 manually a hand lever 29, suitably pivoted at 30 to the shell 3 or like fixed part, joins the rod 21 by the connection 31. In order to return the lever 29 to normal position, a spring 32 is employed, the function of which is perfectly obvious. A bar 21* suitably connected with the bar 21 is connected with each of the lower set of valves in order that all of the valves will be operated in unison.

33 designates a steam box or superheater device preferably disposed transversely of the fire box, in the present instance being secured to the rear wall thereof and suitably positioned with respect to the stay bolts 34, as will be apparent by reference to Fig. 2.

35 designates a compartment formed within the box 33 by means of a partition wall

36 which forms, with the box walls, a space or conduit 37 through which live steam is passed prior to entering the compartment 35. It will be noted that the box 33 is preferably provided with a plurality of discharge nozzles 38 for the purpose of delivering steam outwardly into the fire box and these nozzles are preferably arranged to eject steam in various directions across the interior of the fire box in order that the steam and products may be thoroughly mixed. In order to regulate the discharge of steam from the compartment 35, I preferably employ both a manual and an automatic mechanism, the same consisting, as herein disclosed, of a steam chest 39 receiving steam from the pipe 40 which is preferably supplied by suitable connection to the dry pipe 10. A branch pipe 41 leads from the pipe 40 to the conduit or passage way 37 and has a valve 42 therein to control the admission of steam to the said conduit, while a pipe 43 leads from the opposite side of the passage 37 to one side of a pressure operated valve 44. The opposite side of the valve 44 communicates with a pipe 45 leading to the compartment 35 so that when the said valve is open, steam has free access to the nozzles 38 and is discharged into the fire box. The valve 44 is controlled, in the present instance, by an arm 46 suitably pivoted to a stationary part and connected to the stem 47 of the valve 44 and having connection also by a rod 48 to the piston 49. The arm 46 is maintained in normal position as here shown, through the medium of a spring 50, the operation of which will be readily understood. The piston 49 is located in a suitable cylinder 51, with which the pipe 13 communicates, it being noted that this pipe 13 has connection by way of pipe 12 and pipe 52 with the steam chest 39.

53 designates a suitable exhaust conduit for the cylinder 51.

The valve 54 is preferably located in the pipe 13 for manual control, if desired. The supply of steam to the pipe 13 is controlled, in the present instance, by means of a slide valve 55 located in the cylinder 39 and which also governs the exhaust pipe 56 in which is located a valve 57 for a purpose to be hereinafter described.

58 designates a spring secured to the slide valve 55 for the purpose of operating the valve in one direction while movement in the opposite direction is accomplished by the closing of the furnace door 59, it being noted that a link 60 and rod 61 form a suitable connection between the valve 55 and door 59. The construction just described permits the spring 58 to open the valve as soon as the furnace door is opened, while the closing of the door brings the valve to closed position against the tension of the spring 48, it being noted that the connection

between the rods 60 and 61 is a lost motion connection to prevent breaking of the several parts.

In the operation of the device, the steam normally passes by way of pipe 40, pipe 41, passage way 37 of box 33 and pipe 43 to the valve 44, through which it has no escape as long as the same is closed. As soon, however, as the furnace door is opened to replenish the fire or the like, the valve 55 is shifted by the spring 58 to permit the pipe 52 to be opened to direct flow of steam from the supply pipe 40, the pressure thereof raising the piston 49 and operating the arm 46. The movement of the arm 46 causes the valve 44 to open and permit steam to flow from pipe 43 by way of pipe 45 to the compartment 35 and there be discharged through the nozzles 38. Closing of the furnace door 59 shifts the valve 55 and brings the valve-chest 39 into communication with the exhaust 56 so that the piston 49 is relieved of pressure and the spring 50 returns the arm 46 to close the valve 44. The function of the valve in the exhaust 56 is to afford a means for retarding the return of the cylinder so that a dash pot effect is provided which maintains the valve 44 open for a predetermined length of time. For manual operation of the mechanism a by-pass and valve 62 are positioned between the pipes 45 and 43 so that should it be desired to admit steam to the compartment 35 at a time when the furnace door is closed it only becomes necessary to open this valve 62, whereupon steam is passed around the valve 44 and passes directly to the desired point. In connection with the opening of the valve 55 it will be noted that the steam which passes through the pipe 52, has a divided path, one branch of which leads by way of pipe 12 to the headers 11, another branch by way of pipe 26 to cylinder 25 while the third or main branch leads directly to the cylinder 51, as before described. The steam entering the cylinder 25 shifts the piston 24, thereby opening simultaneously the several valves 18 in order to allow the steam which now has communication with the headers 11, to be discharged through the several nozzles 15 and 16, this action bringing a supply of air through the ports 17 into the fire box to be mixed with the discharging steam.

The conduits 7 normally deliver steam below the grate 5 during the operation of the locomotive though the supply may readily be regulated manually through the medium of valve 63.

It will now be apparent that I have devised a novel and useful construction of an induced draft and smoke consumer which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and

while I have, in the present instance, shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character stated, a locomotive boiler, a fire box therefor having a plurality of air inlets in opposite walls thereof, a suitable grate, a plurality of sets of steam nozzles alined with said air inlets, one set of said nozzles projecting into said air inlets and the other set terminating exteriorly thereof, a superheater box transversely disposed in said fire box, and provided with a plurality of steam discharge nozzles, means for conducting steam to said superheater, a furnace door for said fire box, and means controlled by the movement of said door for regulating the flow of steam to said steam nozzles.

2. In a device of the character stated, a locomotive boiler, a fire box therefor having a plurality of air inlets in opposite walls thereof, a suitable grate, a steam header located at each side of said fire box adjacent said inlets and communicating with the steam space of said boiler, a plurality of sets of nozzles alined with said openings and connected to said headers, one set of said nozzles projecting into said inlets and the other set terminating exteriorly thereof, a valve for each inlet, means for simultaneously operating all of said valves, a furnace door for said fire box, and means controlled by the movement of said door for controlling the operation of said valve means.

3. In a device of the character stated, a locomotive boiler, a fire box therefor having a plurality of air inlets in opposite walls thereof, a suitable grate, a steam header located at each side of said fire box adjacent said inlets and communicating with the steam space of said boiler, a plurality of sets of nozzles alined with said openings and connected to said headers, one set of said nozzles projecting into said inlets and the other set terminating exteriorly thereof, a valve for each inlet, means for simultaneously operating all of said valves, a furnace door for said fire box, means controlled by the movement of said door for controlling the operation of said valve means, and manual means for operating said valves.

4. In a device of the character stated, a locomotive boiler, a fire box therefor having a plurality of air inlets in opposite walls thereof, a suitable grate, a plurality of sets

of steam nozzles alined with said air inlets, one set of said nozzles projecting into said air inlets and the other set terminating exteriorly thereof, a superheater box transversely disposed in said fire box and provided with a plurality of steam discharge nozzles, means for conducting steam to said superheater box, and means for regulating the flow of steam to said steam nozzles.

10 5. In a device of the character stated, a locomotive boiler, a fire box therefor having a plurality of air inlets in opposite walls thereof, a suitable grate, a steam header located at each side of said fire box adjacent

said inlets, and communicating with the steam space of said boiler, a plurality of sets of nozzles alined with said openings and connected to said headers, one set of said nozzles projecting into said inlets and the other set terminating exteriorly thereof, a valve for each inlet, means for simultaneously operating each of said valves, and means for controlling the operation of said valve means.

15 20

DANIEL GOFF.

Witnesses:

C. D. McVAY,
F. A. NEWTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."