F. W. MILLER.

BOILER WASHING AND FILLING SYSTEM.

APPLICATION FILED NOV. 9, 1910.

997,504.

Patented July 11, 1911.

2 SHEETS—SHEET 1

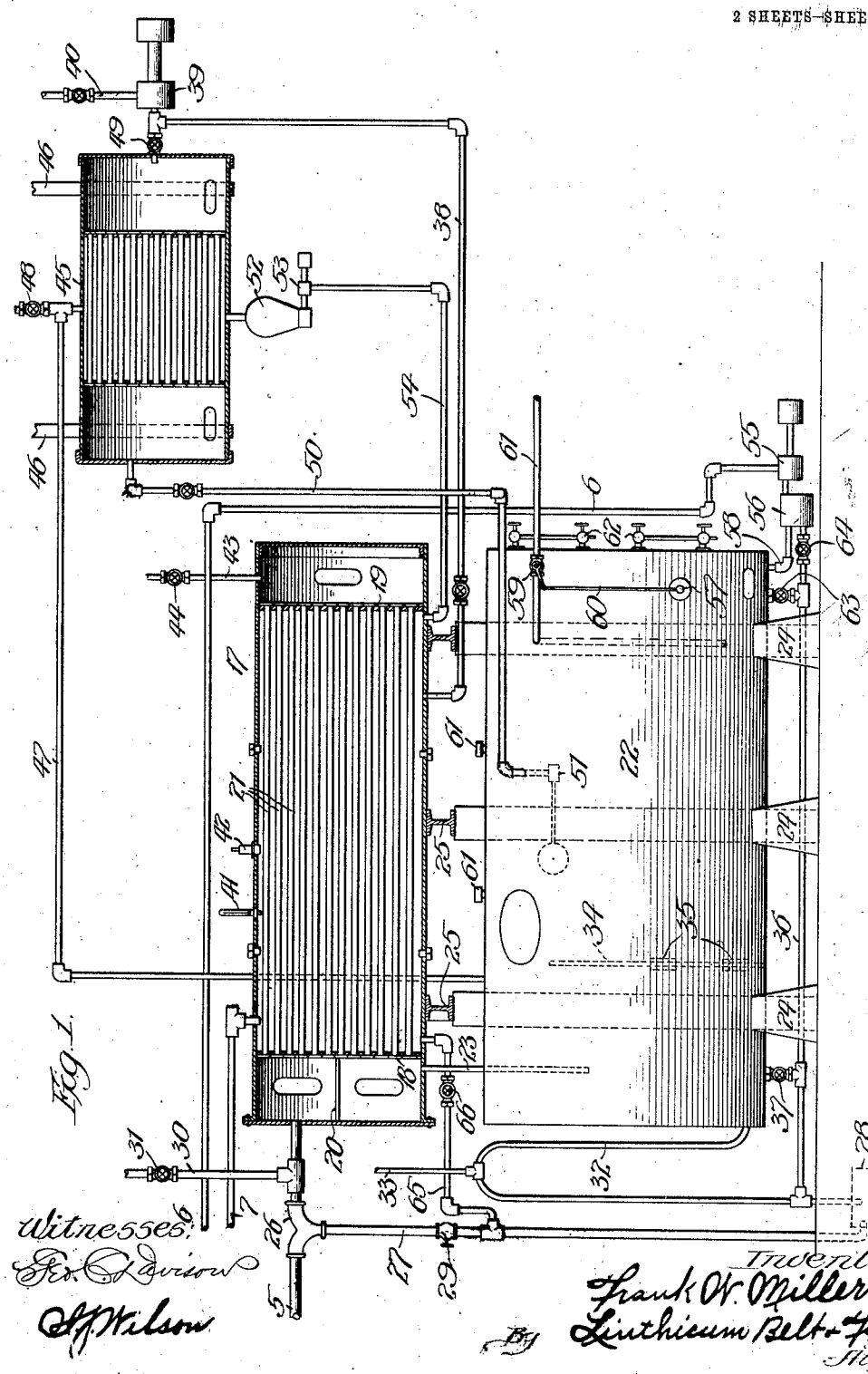

Fig. 1.

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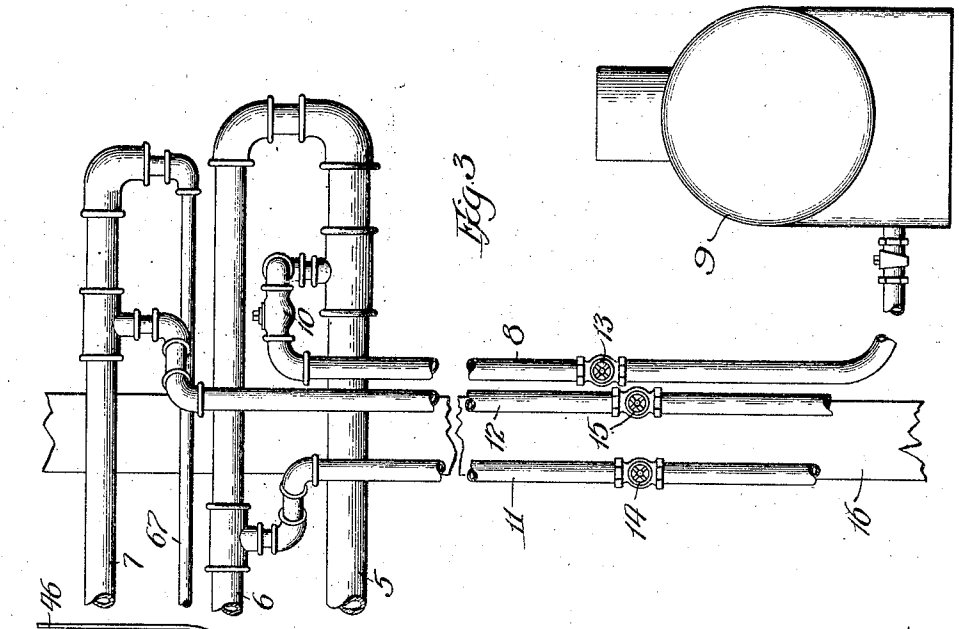

Fig. 3

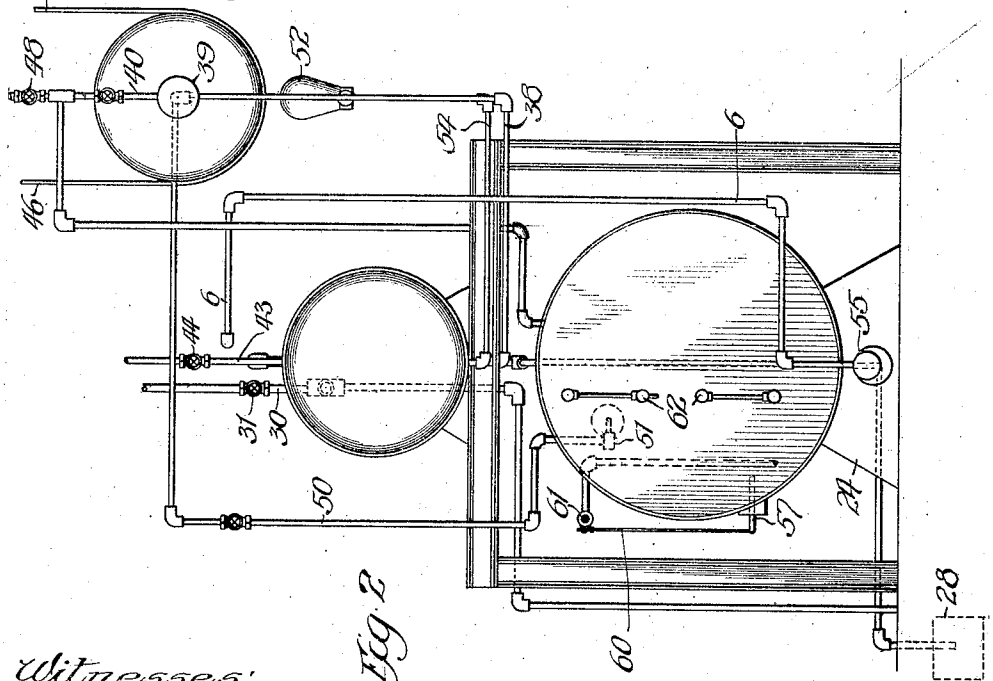

Fig. 2

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BOILER WASHING AND FILLING SYSTEM.

997,504. Specification of Letters Patent. Patented July 11, 1911.

Application filed November 9, 1910. Serial No. 591,414.

To all whom it may concern:

Be it known that I, FRANK W. MILLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Boiler Washing and Filling Systems, of which the following is a specification.

This invention relates to boiler washing and filling systems and aims to provide a system in which the water and steam blown off from a boiler may be employed for heating clean fresh water with which the boiler is to be refilled.

One of the objects of this invention is to conserve both the steam and water blown off from a boiler, the system being so constructed and arranged that the blown-off water may be employed for washout purposes while the blown-off steam is condensed and mingled with the fresh refilling water.

Another object of the invention is the provision of a device where the blown-off steam and water from a boiler may be discharged directly into the sewer, if desired.

A further object consists in certain construction and arrangement whereby clean fresh water may be delivered by a single pump to the washout water reservoir and the refilling water heater simultaneously.

Still another object is the provision of a pump and receiver in connection with a surface condenser for the purpose of injecting the water of condensation from the blown-off steam directly into the refilling water heater.

Other objects and advantages of this invention will become apparent as it is better understood by reference to the following description when taken in connection with the accompanying drawings illustrating a preferred embodiment thereof.

Referring to the drawings—Figure 1 is a side elevation, partially in section, of a boiler washing and filling system embodying my invention. Fig. 2 is an end elevation thereof; and Fig. 3 is an elevation of the ends of the pipe lines and the drops connected therewith.

When this invention is to be installed for the purpose of washing and refilling locomotive boilers, for which this system is particularly adapted, the roundhouse is equipped with a series of pipes comprising a blow-off main 5, a hot water washout main 6, and a refilling water main 7. These mains extend around the roundhouse and are provided at suitable intervals with drops which are adapted to be connected with the locomotive boilers over the pits.

As shown in Fig. 3, the blow-off main has connected thereto a blow-off drop 8 which may be provided at its lower end with a flexible pipe adapted to be connected to a locomotive boiler diagrammatically illustrated at 9. The blow-off drop is preferably provided with a check-valve 10 which prevents passage of steam or water from the blow-off main to the boiler. A drop 11 is connected with the washout main and a similar drop 12 is connected with the refilling main. Each of the drops 8, 11 and 12 is provided with controlling valves 13, 14 and 15, respectively, by means of which communication between any of the lines and the boiler may be controlled. The drops are preferably suspended near and attached to the vertical posts 16 which are located between the stalls or pits of the roundhouse. One set of drops may be employed for a pair of adjacent pits or stalls so that it is only necessary to locate the drops between alternate pairs of stalls.

The blow-off main 5 is connected with one end of a filling water heater 17 supplied with inner heads 18 and 19 and with a baffle-plate 20 above which the blow-off main enters the heater. A plurality of tubes or flues 21 are fixedly secured at either end to the inner heads to establish communication between the chambers formed outside the inner heads of the heater. These tubes are spaced apart so as to afford considerable space around them between the inner heads of the heater for the accommodation of the filling water to be heated, as will be later described.

A wash-water reservoir 22 is located beneath the filling water heater, said reservoir being connected with the chamber below the baffle-plate of the heater by a pipe 23 which extends into the reservoir below the normal level of the water therein for the purpose of preventing the return of steam from the reservoir to the heater. The reservoir may be suitably supported in saddles 24 or other supporting means while the heater 17 is preferably carried upon girders or I-beams 25 directly above the reservoir. It will be obvious that any other preferred arrange-

ment of the reservoir and heater may be resorted to if found more convenient.

The blow-off line 5 is equipped with a Y-connection 26, the lower branch of which communicates with a vertically disposed pipe 27 discharging at its lower end into the sewer 28. As the steam and water are blown off from the boiler through the pipe 5, they will be deflected downwardly by the Y-fitting, and any scale, sediment or other solid matter carried by the blow-off products will be collected in the pipe 27 while the steam and water pass on into the heater. A valve 29 is provided in the pipe 27 which may be opened to permit the accumulation of scale and sediment to be discharged to the sewer at suitable intervals. It will be understood also, that this valve may be opened during the blowing-off operation, if preferred, in which instance the blown-off steam and water would be discharged directly to the sewer instead of passing through the heater. A pipe 30 leading from the power plant which is usually located in the neighborhood of the roundhouse, is connected with the blow-off pipe 5 for the purpose of conveying the exhaust steam from the power plant to the heater thereby saving the heat units of the exhaust steam which are customarily discharged to the atmosphere and lost. A check-valve 31 is preferably interposed in the pipe 30 to prevent blown-off steam and water from backing up into the exhaust steam pipe. The blown-off steam and water and the exhaust steam discharged into the refilling heater above the baffle-plate 20, pass through the heating tubes to the chamber at the other end of the heater and then back through the lower heating tubes to the chamber beneath the baffle-plate 20 from whence they are discharged into the reservoir 22 through the pipe 23.

The reservoir 22 is provided with an overflow pipe 32 which is adapted to draw the water from the bottom of the reservoir when the reservoir becomes full and discharge it to the sewer 28. In order to prevent the overflow from siphoning all the water from the reservoir a small vent-pipe 33 is attached to the crown of the overflow. A surge plate 34 provided with suitable openings 35 is located in the reservoir near one end thereof so that any sediment deposited by the pipe 23 in the reservoir will settle and be retained in this end by the plate from whence it may be discharged upon opening the hand-valve, to the sewer through pipe 36.

The water which is to be heated in the heater 17 and discharged through the filling pipe 7 for refilling the boiler, is supplied to the heater around the tubes 21 through a pipe 38. The water is forced through this pipe under pressure to the heater by means of a pump 39 which is connected to any suitable source of water supply by a pipe 40. In order that the temperature of the water within the heater may be readily ascertained, a thermometer 41 is preferably located at the top of the heater and to prevent accumulation of excess pressure the heater is provided with a safety-valve 42. One of the compartments outside the inner head of the heater may communicate with the atmosphere through pipe 43 which is preferably provided with a back-pressure valve 44.

The hot blown-off steam and water in passing through the heater will heat the refilling water surrounding the tubes 21 to a temperature suitable for refilling the boiler, the steam and water being then discharged into the lower reservoir, as previously described. Since the discharge end of the pipe 23 is located below the normal level of the water in the reservoir the steam will tend to accumulate in the top of the reservoir above the water level. In order to save as much as possible of the heat units of this steam and to utilize the steam itself for refilling purposes, I have provided a surface condenser by means of which the steam is condensed, and also means for pumping the water of condensation into the refilling heater where it is mingled with the refilling water. To accomplish this purpose, a surface condenser 45 of any preferred type or construction, is supported preferably by straps 46 or other preferred supporting means adjacent the heater. A pipe 47 communicates at one end with the top of the reservoir 22 and at its other end with the surface condenser so that the steam which accumulates in the reservoir will rise through the pipe 47 and be discharged into the condenser where it will be condensed in the usual manner. In order to prevent the formation of a vacuum in the condenser the usual back-pressure valve 48 is provided.

Cold water is supplied to the condenser from the pump 39 through a pipe controlled by a valve 49. From the condenser the water is conducted by a pipe 50 to the reservoir 22, the admission of this water to the reservoir being controlled by a float-valve 51. The water of condensation produced by the condenser is collected in a receiver 52 which is connected with a pump 53, the operation of said pump being controlled by the height of the accumulated water in the receiver, so that when a certain quantity of water of condensation has been accumulated, the pump is set in operation to force this water through the pipe 54 into the heating 17 where is is mixed with the refilling water which has been supplied through the pipe 38.

By collecting the surplus blown-off steam which accumulates in the reservoir and con-

densing it, this water of condensation which is still hot, is saved, and this clean distilled water is injected directly into the heater from whence it is supplied to the boiler for refilling purposes. In localities where water is scarce and expensive to obtain, this saving of the steam which is blown off from the boiler is of considerable value and importance. Furthermore, the heat units carried by the water of condensation derived from the steam, are saved and returned directly to the boiler, thus reducing the time and fuel required to get up steam again in the boiler.

The blown-off water which is stored in the reservoir 22 is saved and employed for washing out the boiler after the steam and water have been blown off. This washout water is drawn from the tank by a pump 55 through a strainer box 56 and is discharged from the pump directly to the washout line 6. As shown in Fig. 3, the end of the washout line may be connected with the end of the blow-off line so that a circulation of washout water may be established in the line for the purpose of maintaining the water which drops at the desired temperature, and an individual return pipe 61 may be connected with the end of refilling main 7 for the same purpose.

For the purpose of maintaining the washout water in the reservoir at the desired temperature, a thermostat 57 is arranged to project into the reservoir near the outlet pipe 58, and this thermostat automatically controls a valve 59 by means of a link and connection 60, said valve being interposed in a pipe 61 which is adapted to supply live steam to the reservoir. By this automatic means live steam may be admitted to the reservoir to maintain the washout water therein at the desired temperature. When the washout water discharged from the boiler is insufficient to meet the demands for the wash-water and the height of the water falls below a predetermined level, the float-valve 51 automatically opens and permits fresh water from the condenser to flow into the reservoir until the predetermined level is again reached.

In order to prevent a vacuum forming in the reservoir 22, suitable air-relief valves 61 are located in the top thereof. Water gages 62 may be located at one end of the reservoir for indicating the height of the water therein. The reservoir may be drained when desired by means of the pipe 36 through the valves 37 and 63 located at either end of the reservoir, respectively. The strainer box 56 may also be drained by opening the valve 64. The chamber surrounding the tubes in the heater 17 may be drained into the sewer through the pipes 27 and 65 by means of the valve 66. It will be understood, of course, that the reservoir heater and condenser are supplied with the requisite number of man-holes and hand-holes.

In my improved system, as above described, all of the blown-off steam and water from a boiler are utilized for heating clean fresh water which is to be used for refilling the boiler. Not only are the heat units of the steam and water transferred to the fresh filling water but the blown-off water itself is utilized for washing out the boiler prior to refilling, while the blown-off steam is condensed and mingled with the fresh refilling water. The use of all the blown-off products of the boiler for washing out and refilling the boiler again, make this system very efficient, economical and desirable.

While I have shown and described a preferred embodiment of my invention, it will be obvious that various minor, mechanical details may be changed without departing from the spirit thereof or sacrificing any of the material advantages, and that while the system has been shown and described as particularly adaptable for cleaning and refilling locomotive boilers, it will be equally as efficient and desirable for cleaning and refilling stationary boilers.

What I desire to claim is:

1. A boiler washing and filling system comprising a reservoir for containing water for washout purposes, a heater for containing water for refilling purposes, means for conducting the blown-off steam and water through said heater to the reservoir, a condenser, a conduit for conducting the uncondensed steam from the reservoir to the condenser, means for supplying clean fresh water to the heater, and means for discharging the water of condensation into the heater where it is mingled with said clean fresh water.

2. A boiler washing and filling system, comprising a reservoir adapted to contain washout water, a heater for heating the refilling water, a pipe for conducting the blown-off steam and water from a boiler to said heater, a pipe for conducting said blown-off steam and water from the heater to the reservoir, means for supplying clean fresh water to the heater, a surface condenser, a pipe for conducting the surplus steam in said reservoir to said condenser, and means for mingling the water of condensation from the condenser with the clean fresh water in the heater.

3. A boiler washing and filling system, comprising a reservoir adapted to receive the blown-off steam and water from a boiler, a filling water heater through which said steam and water passes to said reservoir, means for controlling the admission of live steam to said reservoir for the purpose of regulating the temperature of the water therein, means for conducting the water from said reservoir to the boiler for wash-

out purposes, means for condensing the surplus steam in the reservoir and injecting said water of condensation into the filling water heater, means for supplying clean fresh water to the heater, and a refilling line for conveying said mingled clean filling water and water of condensation to the boiler for refilling purposes.

4. In a boiler washing and filling system, the combination of a reservoir for washing water, a filling water heater, means for conducting the blown-off steam and water to said reservoir, a surface condenser, a pipe for conducting the steam collected in said reservoir to the condenser means for injecting the water of condensation from said condenser into the heater, means for supplying clean fresh water to the heater where it is mingled with said water of condensation, and a conduit for delivering the condensing water from the condenser to the reservoir where it is mingled with the blown-off water.

5. In a boiler washing and filling system, the combination of a reservoir for washing water, a refilling water heater, means for conducting blown-off steam and water to said heater, a connection from said heater whereby the blown-off steam and water are discharged into said reservoir, a condenser, means for conducting the steam rising uncondensed in said reservoir to said condenser, means for injecting the condensed steam into the filling water heater where it is mingled with the refilling water, means for supplying cold clean water to said refilling heater and to said condenser, and means for conducting the clean water from said condenser to said reservoir.

6. In a boiler washing and filling system, the combination of a reservoir, a filling water heater, a blow-off pipe through which water and steam are blown off from a boiler to said heater, a pipe for conducting exhaust steam from a power plant to said blow-off pipe, a check-valve located in said exhaust pipe, a pipe for discharging the steam and water from the heater to the reservoir, a surface condenser, a pipe for conducting the surplus steam from said reservoir to said condenser, and a pump and receiver for collecting and introducing the water of condensation into the heater.

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