May 27, 1930. P. JULIUSBURGER 1,759,986

CHANGE-OVER DEVICE FOR BOILER FEED WATER HEATERS AND SIMILAR APPARATUS, ESPECIALLY APPLICABLE FOR LOCOMOTIVES

Filed Dec. 8, 1925 2 Sheets-Sheet 1

FIG. 1.

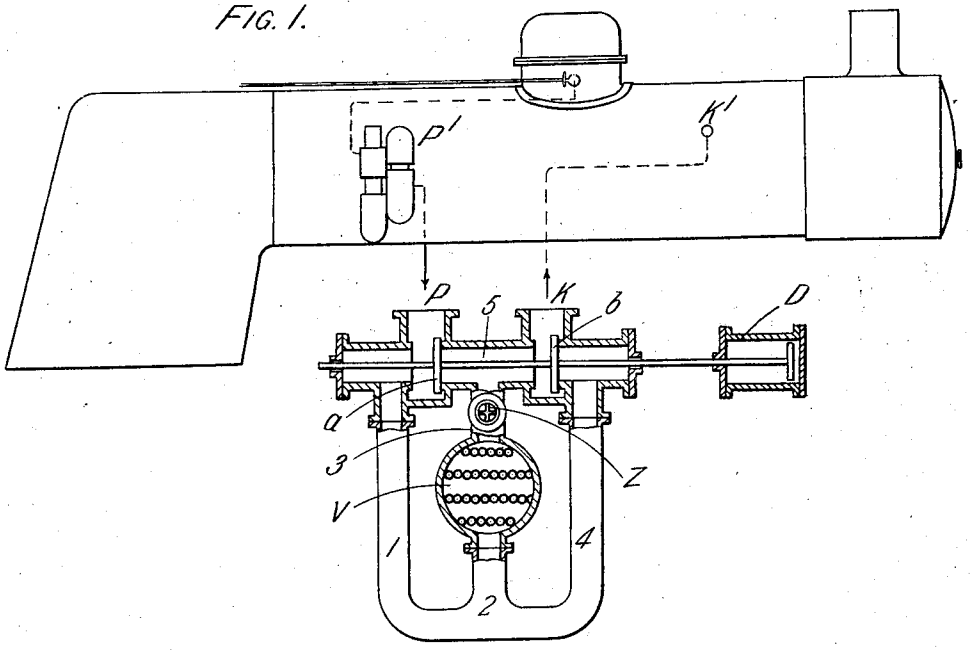
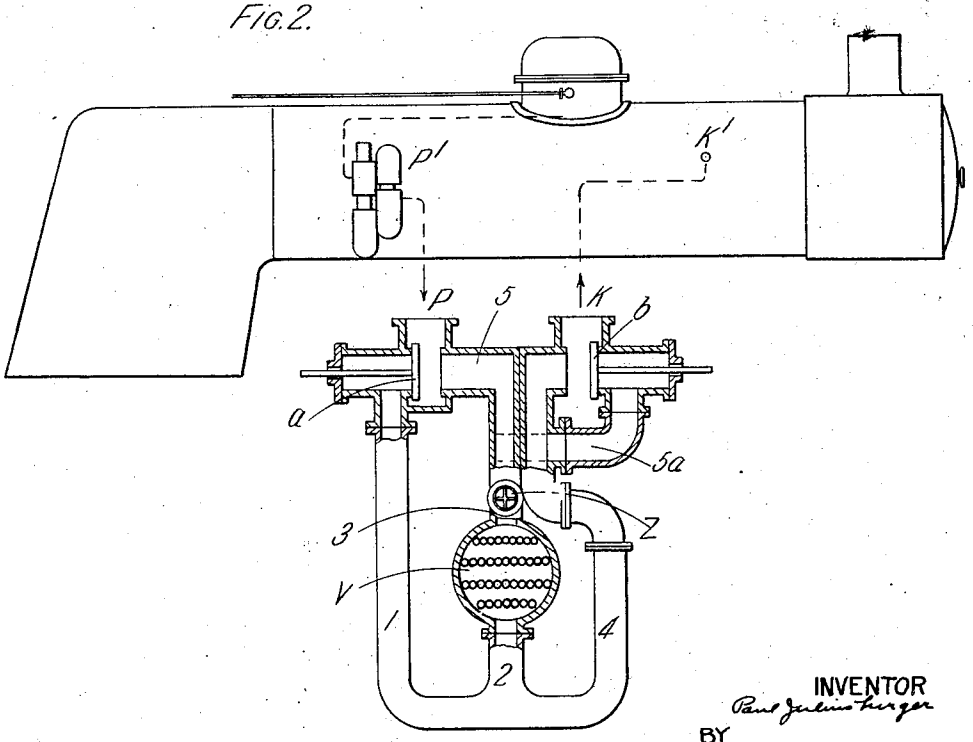


FIG. 2.



INVENTOR
Paul Juliusburger
BY
Dennie Davis Warren & Edmonds
ATTORNEYS

May 27, 1930. P. JULIUSBURGER 1,759,986

CHANGE-OVER DEVICE FOR BOILER FEED WATER HEATERS AND SIMILAR APPARATUS, ESPECIALLY APPLICABLE FOR LOCOMOTIVES

Filed Dec. 8, 1925 2 Sheets-Sheet 2

FIG. 3.

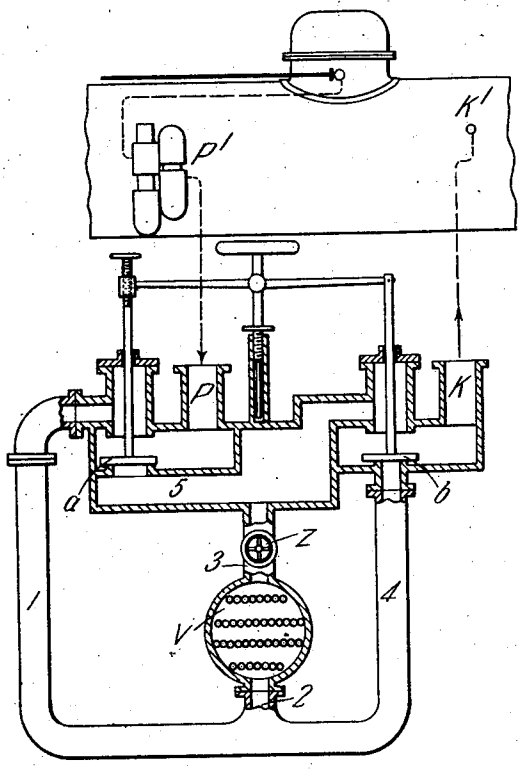
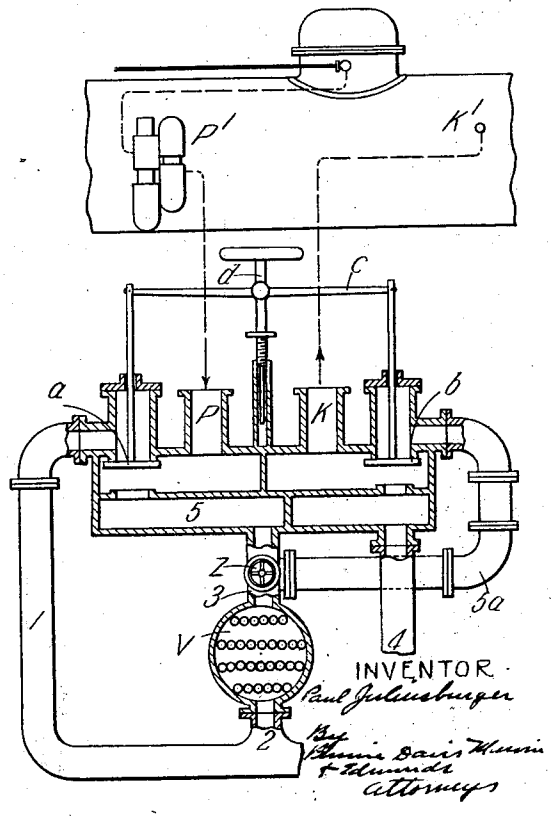


FIG. 4.



INVENTOR
Paul Juliusburger
By Munn Davis Munn & Edmunds
Attorneys

Patented May 27, 1930 1,759,986

UNITED STATES PATENT OFFICE

PAUL JULIUSBURGER, OF CHARLOTTENBURG, BERLIN, GERMANY

CHANGE-OVER DEVICE FOR BOILER-FEED-WATER HEATERS AND SIMILAR APPARATUS, ESPECIALLY APPLICABLE FOR LOCOMOTIVES

Application filed December 8, 1925, Serial No. 74,211, and in Germany December 22, 1924.

This invention relates to change-over devices for boiler feed water heaters and similar apparatus, more especially applicable for locomotives.

Change-over devices are used in locomotive working, on the one hand, for ensuring a uniform distribution of the boiler scale deposits, and on the other hand, for increasing the scavenging action when the feed water heater is to be freed from such deposits of the precipitated boiler scale by the said scavenging action. Hitherto the change-over member comprised a cock or valve provided with several passage ways. Such cock or valve in its original simple form has the disadvantage that it is very difficult to operate, as the cock or valve plug has to be pressed with considerable force into the casing in order to form tight joints between the several chambers involved and exposed to different pressures and the atmosphere, so that opposing frictional resistance to the rotation to the plug has to be overcome and this can only be effected with considerable difficulty. In an endeavour to eliminate these drawbacks either the plug is made of a cylindrical shape, which renders it impossible to obtain a perfectly tight joint on all sides, or separate devices have to be used for lifting the cock plug before rotating it, and for firmly forcing it back again into its joint tight position in the casing after the rotation has been effected. These lifting devices are also difficult to operate as it is necessary to overcome considerable frictional resistances due to the screw lifting means, as the screw threads are of fairly large diameter, and therefore they have to be provided with large hand wheels or levers for rotating them. The capacity of a change-over cock or valve however is narrowly limited. for technical and economic reasons, as according to the quantities of water that can be handled by the cock or valve in a unit of time, so is the cross sectional areas of passages in the cock or valve plug, and the total dimensions and weight of the cock or valve, the latter increasing in such a manner that in the larger sizes, the operation is practically impossible by hand while the fitting thereof is rendered extremely difficult. Under these circumstances the use of comparatively large change-over devices is of doubtful value.

According to this invention, these disadvantages are eliminated by replacing the frictionally fitted cocks or valves by a set of valves which are capable of being moved without the use of abnormal pressure or force, since there is but little, if any, friction to be overcome. By this means the cross sectional areas of passages can be increased within wide limits, and apparatus of any desired capacity can be used without materially increasing the dimensions and weights, the change-over device to this end comprising two double-seated valves mounted in the feed pipe leading, on the one hand, from the pump to the feed water heater, and on the other hand, from the feed water heater to the boiler, the two double-seated valves being so arranged in relation to each other that one of the two shut off positions of the one valve always corresponds on each occasion to a definite closing position of the other valve it being immaterial, whether the co-ordinated positions are attained simultaneously or successively. The valves are capable of being arranged independent of each other or may be coupled to each other, and they may be operated by hand or by power or may be controlled by a pressure medium.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be fully described with reference to the accompanying drawings, in which several constructions of the change-over device are diagrammatically illustrated by way of example. In these drawings:—

Figure 1 shows in part sectional elevation a construction of a change-over device connected to a locomotive boiler and pump, by connections diagrammatically illustrated, the device having two valves which are in axial alignment and are movable in the same axial direction and capable of being collectively operated.

Figure 2 shows a modification of the construction shown in Figure 1, with axially

aligned valves adapted to be moved in opposite directions.

Figure 3 shows a further modification of the construction illustrated in Figure 1, the two valve axes being disposed parallel to each other and capable of being controlled, through the medium of one and the same spindle, and only a part of the boiler being shown.

Figure 4 shows a modification of the construction shown in Figure 3.

Throughout the drawings, the feed water heater is marked V, the change-over valves *a* and *b*, while P designates the connection or branch for the pipe connecting the pump p^1 to the change over device, while a conduit 1 or 3 of the latter leads to the feed water heater V, and K the connection or branch of the change over device for the pipe connecting the boiler k^1 to the device, the latter being connected by a conduit 3 or 4 to the feed water heater V.

In the construction of the device shown in Figure 1, where the valves are in the positions shown therein, the feed water delivered by the pump through the connection P, passes through the conduit 1 and the feed water heater connection branch 2 into the heater V, traverses the latter in the upward direction, is given during that time the desired increase of temperature and escapes from it through the branch 3, to the valve *b*, which is set for the delivery of the water to the outlet branch K of the pipe leading to the boiler. If, for the purpose of scavenging the feed water heater, the direction of flow is to be reversed, the valves *a* and *b* are moved collectively to the left, either by hand or by means of the pressure medium cylinder D. The feed water coming through the branch P from the pump then passes through the branch 3 into the heater, traverses it in the direction opposite to that previously mentioned, that is to say, in the downward direction, and escapes from it through the branch 2 to the conduit 4 and the valve *b*, at this moment opened for this direction of flow, into the boiler.

In the construction of change-over device shown in Figure 2, the valves *a* and *b* are capable of being moved in opposite directions. As shown, the valve *a* closes the conduit 1, and the valve *b* is clear of the conduit 4, which is thus open and permits the feed water to pass through the same from the branch 3, the heater V and the branch 2 to the branch K. If the valve *a* is moved to the right, and the valve *b* to the left, the latter closes the conduit 4, and the former closes the conduit 5, while the feed water then passes through the conduit 1, through the branch 2 into the heater and escapes from the latter through the branch 3 to the boiler through a branch conduit 5^a specially provided for this position.

In the construction shown in Figure 3, the valves *a* and *b* are operated by hand. The valve spindles are suspended from a balance or equalizing lever *c* which is pivoted to the hand operated screw spindle *d*, in order to ensure a uniform closing of the valves. In the valve position shown, the feed water passes through the conduit 1, branch 2, into the heater, traverses the latter and escapes from it to the branch 3 whence it passes to the conduit 5 and the adjoining chambers to the branch K, and then to the boiler. When the two valves are screwed upwards, the water will pass from the branch P through the conduit 5 and the connection 3 into the heater, which it traverses now in the opposite direction, to and through the conduit 4 into the connection K leading to the boiler.

The construction in Figure 4 is similar to that of Figure 3, with the exception that the position of the conduits is slightly different and somewhat similar to that shown in Figure 2, and the branch conduit 5^a is provided and commences at the conduit 5, to enable the feed water escaping from the heater through the branch 3 to pass the valve *b* and into the conduit K leading to the boiler. In the position of the valves shown in Figure 4, the water passes from the branch P through the conduit 5, connection 3, into the heater, escapes from the same into the branch 2 from which it passes to and through the conduit 4 and is diverted by the lifted valve *b* into the branch or connection K. When the valves are screwed down, the water coming from the branch P is delivered through the conduit 1 and branch 2 to the heater, which it traverses in the reverse direction and escapes therefrom through the branch 3 and passes to the branch or connection K by way of the branch conduit 5^a and valve *b*.

The change-over cocks mentioned in the opening portion hereof, the drawbacks of which are eliminated by the invention hereinbefore described, have as a rule, in addition to the two change-over positions in which the water is conveyed in different or opposite directions through the heater, also a switched out or inoperative position in which the water is delivered from the pump directly to the boiler, the heater being completely shut-off from the delivery pipe. The change-over devices according to this invention, in as far as they have been hereinbefore described, do not provide this possibility of shutting-off or switching out the heater. However the improved change-over valve shown in Figure 2 is adapted for switching out the heater by moving the valve *b* to the left from the position shown in Figure 2. This will have the effect of placing the conduit 5^a into communication with the outlet K thereby permitting the inlet P to communicate with the latter through the conduit 5 arranged in connection with the conduit 5^a. In a similar manner the change-over valves shown in the other figures of the drawings can be converted into

combined change-over and switching out devices by so arranging the mechanisms connecting the double seated valves as to render them independent instead of inter-dependent of each other and thereby enable the movement of one valve to be effected independently of the other valve. If, for instance, the valves *a* and *b* shown in Figure 1 are adapted to be operated independently and the valves *b* remain in the right hand position as shown in Figure 1, and the valve *a* is moved to the left hand position such as is shown in Figure 2, then the inlet connection P would be in communication with the outlet connection K by the conduit 5 and the feed water heater connection 2 would be shut off from the inlet branch P as well as from the outlet branch K, and the water will flow from the pump through the inlet branch P and the conduit 5 to the boiler or outlet connection or branch K. The feed water connection 3 however will, on the contrary, be open, that is to say, the heater will only be switched out of the water circuit, there being no need for the water to pass through the heater in its passage to the boiler or outlet connection or branch K. If the heater is to be completely shut off from the delivery pipe, it will be sufficient to insert into the connection 3 a closing member Z. In the working positions of the change-over device, this closing member Z remains open, while when the heater V is out of use the member Z is closed. Figure 3 shows the arrangement of the switching out device for valves mounted with their axes parallel. In this case, it is necessary to make one valve, or both, vertically adjustable independently of the other or of each other, for instance, by means of a screw threaded nut and spindle, relatively to the point of suspension of the balance lever, and to lock the balance lever in its position before moving the valve spindle. The valve which does not take part in the axial or vertical movement must remain pressed against its lower seat, and the oscillatory movement of the balance lever during the axial adjustment of the other valve must be prevented, otherwise the operative mechanism becomes an inoperative structure for effecting the movement of one valve and not the other. To this end the valve *a* in Figure 3 is lifted whilst the valve *b* remains on its bottom seat in order to shut off the feed water heater connection 2 from the branches or connections P and K. By thus arranging the valves the water will pass from the branch or connection P through the conduit 5 to the branch or connection K. By closing the member Z in the heater connection 3, the heater will be switched off completely from the conduit 5 exactly as in Figures 1 and 2. In a similar manner to that described with reference to Figure 3, the valves *a* and *b* shewn in Figure 4 can be independently operated and therefore further description thereof as regards Figure 4 is considered unnecessary.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In combination, a boiler feed water heater and a change-over device, the latter comprising a valve controlled inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, a valve controlled outlet conduit capable of delivering water to a boiler, and piping connecting the outlet conduit to the opposite ends of the heater, the piping and valves being arranged for the alternate delivery of water to the opposite ends of the heater and from the said opposite ends to the outlet and for the alternate flow of water in opposite directions through the heater.

2. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet capable of receiving water from a feed pump, piping connected to the inlet and having branches communicating with opposite ends of the heater, an inlet valve controlling the branches for the alternate passage of water from the piping connected to the inlet to the opposite ends of the heater, an outlet connected to a boiler for delivering water thereto from the heater, piping connected to the outlet and having branches connected to the opposite ends of the heater and an outlet valve controlling the outlet, the inlet and outlet valves being associated for the alternate flow of water in opposite directions through the heater and the alternate passage of water from the opposite ends of the heater to the outlet.

3. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, and an outlet valve controlling the alternate flow of water from the opposite ends of the heater, to the outlet conduit, the inlet and outlet valves also controlling the alternate flow of water through the heater in opposite directions.

4. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the

alternate flow of water from the opposite ends of the heater to the outlet conduit, and means for simultaneously and collectively operating the inlet and outlet valves for controlling the alternate flow of water through the heater in opposite directions.

5. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the alternate flow of water from the opposite ends of the heater to the outlet conduit, and means for simultaneously and collectively operating the inlet and outlet valves in the same direction for controlling the alternate flow of water through the heater in opposite directions.

6. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the alternate flow of water from the opposite ends of the heater to the outlet conduit, means for simultaneously and collectively operating the inlet and outlet valves for controlling the alternate flow of water through the heater in opposite directions, a branch conduit connecting the heater to the piping, and a closing member in the said branch for preventing the flow of water through the heater.

7. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the alternate flow of water from the opposite ends of the heater to the outlet conduit, spindles attached to the valves, a balance lever to which the spindles are pivotally attached and means for moving the lever.

8. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the alternate flow of water from the opposite ends of the heater to the outlet conduit, spindles attached to the valves, a balance lever to which the spindles are pivotally attached, means for moving the lever, a branch conduit connecting the heater to the piping, and a closing member in the said branch for preventing the flow of water through the heater.

9. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the alternate flow of water from the opposite ends of the heater to the outlet conduit, spindles attached to the valves, a balance lever to which the spindles are pivotally attached, means for moving the lever, and mechanism on at least one of the spindles for adjusting the position of the valve connected therewith relatively to the balance lever.

10. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit capable of receiving water from a feed pump, piping connected to the inlet conduit and to the opposite ends of the heater, an inlet valve controlling the alternate flow of water to the opposite ends of the heater, an outlet conduit capable of delivering water to a boiler, piping connected to the outlet conduit and to the opposite ends of the heater, an outlet valve controlling the alternate flow of water from the opposite ends of the heater to the outlet conduit, spindles attached to the valves, a balance lever to which the spindles are pivotally attached, means for moving the lever, a branch conduit connecting the heater to the piping, a closing member in the said branch for preventing the flow of water through the heater, and mechanism on at least one of the spindles for adjusting the position of the valve connected therewith relatively to the balance lever.

11. In combination, a feed water heater and a change-over device, the latter comprising an inlet conduit, an outlet conduit, arrangements of piping connecting each end of the heater to both conduits, and valves in the conduits controlling the alternate passage

of water to the respective ends of the heater and the alternate passage of water from the opposite ends of the heater to the outlet conduit.

12. In combination, a boiler feed water heater and a change-over device, the latter comprising an inlet conduit, an outlet conduit, piping for transmitting water from the inlet conduit to both ends of the heater and for transmitting the water from both ends of the heater to the outlet conduit, and valves in the inlet and outlet conduits controlling the alternate flow of the water to both ends of the heater, the alternate flow of water through the heater in opposite directions and the alternate flow of water from the opposite ends of the heater to the outlet conduit.

PAUL JULIUSBURGER.