

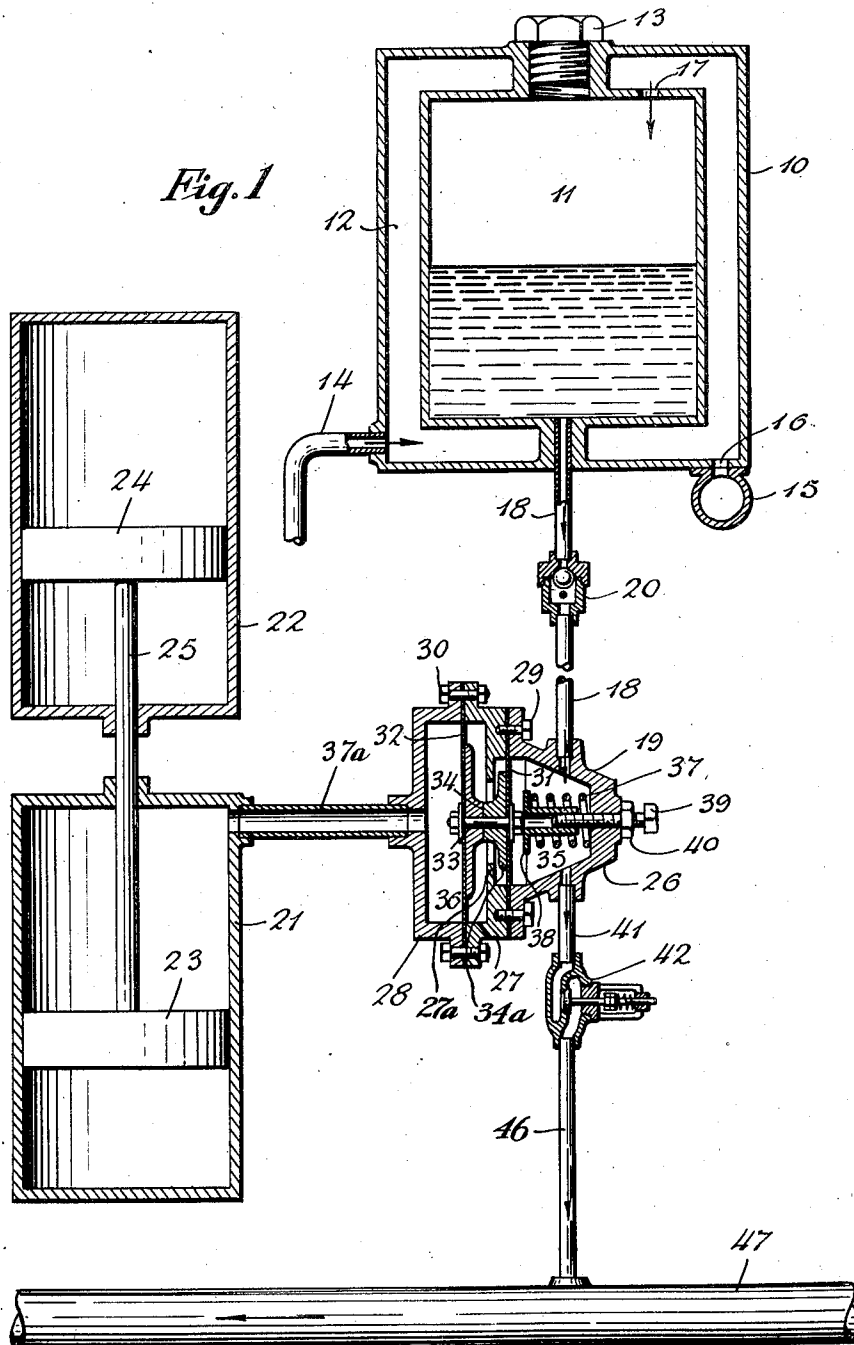
Feb. 12, 1935.

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1,991,235

FEEDING APPARATUS

Filed April 26, 1930



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1,991,235

FEEDING APPARATUS

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Application April 26, 1930, Serial No. 447,567

2 Claims. (Cl. 210—40)

This invention relates to apparatus for feeding treating liquids to boiler feed water and has for its principal objects to provide a new and improved method and apparatus by means of which the amount of liquid introduced into the feed line of a boiler will be automatically proportioned within predetermined limits to the amount of feed water supplied and to prevent objectionable oxidation of the boiler compound.

Another object is to combine with the automatic proportioning of the treating liquid to feed water, suitable means for preheating or otherwise conditioning such liquid before its addition to the feed water, and for securing a thorough mixing of said compound with the feed water.

A further object is to provide a new and improved construction for a container or vessel in which the conditioning of the treating liquid is carried out, prior to its addition to the feed water.

Another object is to provide a new and improved construction of an automatic feeding device.

The above and other objects of the invention will appear more fully from the following more detailed description and by reference to the accompanying drawing forming a part hereof wherein Fig. 1 of the drawing is a sectional plan view showing constructional details of suitable examples of the principal component members of one embodiment of the system or apparatus in accordance with the invention, and more or less diagrammatically the connections and relationships between said components. In the drawing, the numeral 10 indicates a container in which a supply of treating liquid is carried for feeding of the same to the feed water in proportion to the amount of the latter fed through the usual feed water supply line. This container includes an inner compartment 11 spaced from the outer walls of the container to provide a steam jacket 12. A filling plug 13 is provided to permit the compartment 11 to be filled with treating liquid from time to time. Steam is supplied to the steam space 12 through a pipe 14 connected to any suitable supply of steam of substantially constant pressure suitably secured to the casing 10 at any desirable point. Along the bottom thereof is a trap 15 which communicates through the aperture 16 with the interior of the steam space 12 and serves to collect condensate formed in said steam space. Communication is established between the inner compartment 11 and the steam space 12 by means of an

aperture 17 formed in the top wall of the compartment 11.

While this communication has been shown as an aperture in the top wall of the compartment, such showing is merely illustrative; if desired a pipe may be connected to said aperture with its lower end terminating some distance below the top. The purpose of connecting the compartment 11 with the steam space 12 is first, to exclude air from said compartment, and second, to furnish the desired pressure within the compartment 11 to cause the liquid contained therein to feed readily out of said compartment, and, third, to maintain the treating liquid at a substantially constant temperature.

The treating liquid passes from the compartment 11 through a conduit 18 which is connected with an automatic feeding device 19, a check valve 20 being interposed between the container 10 and said feeding device 19.

In order that the amount of liquid fed will be proportional to the supply of feed water, the feeding device 19 is preferably so constructed that it will be actuated in synchronism with the feed water pump. The latter has been indicated diagrammatically as consisting of a water cylinder 21 and a steam cylinder 22. The water cylinder has mounted therein a piston 23, while the steam cylinder has mounted therein a piston 24 and these two pistons are connected together by a common piston rod 25. As the constructional details of the pump form no part of the present invention and furthermore, as the construction of such pumps is well known in the art, the steam and water inlets and outlets and other constructional details of the pump have not been shown in the drawing.

The automatic feeding device comprises a plurality of casing members 26, 27 and 28 secured together in any suitable way as for example, by means of the bolts 29, 30. Secured between the casing members 26 and 27 is a diaphragm 31. A second diaphragm 32 is secured between the casing members 27 and 28. These two diaphragms are secured together in fixed relationship by means of a bolt 33 which passes through suitable apertures provided in the middle of said diaphragms and through a pair of spacing blocks 34.

The conduit 18 communicates with a compartment 35 defined by the casing member 26 and the diaphragm 31. A second compartment 36 is defined by the casing member 28 and diaphragm 32 and this compartment is in communication with the water cylinder 21 of the pump by means of the conduit 37a.

It will be noted that the effective area of the diaphragm 32 is much larger than the effective area of the diaphragm 31 and that the two diaphragms are so connected together by means of the bolt 33 as to be moved in unison to perform the functions of a differential diaphragm or piston. The differential diaphragm is normally forced toward the left in the drawing by means of a compression spring 37 one end of which abuts against an inner wall of the casing member 26 and the other end of which abuts against a sliding thimble or sleeve 38. The sleeve 38 is held by means of the spring 37 against the head of the bolt 33. It will be obvious from the above and an inspection of the drawing, that when the piston 23 is moving towards the conduit 37a the pressure of the water within the cylinder 21 will be communicated through the conduit 37a to the compartment 36; that such pressure will be exerted upon the larger diaphragm 32 thus moving the compound or differential diaphragm consisting of the members 32, 31 towards the right against the action of the spring 37.

In order to limit the amount of movement of the differential diaphragm and thereby regulate the quantity of treating liquid pumped upon each working stroke of the feeding device 19, a bolt or screw 39 is screwed into the end of the casing member 26, a lock nut 40 being provided for holding said screw 39 in operative position. The thimble 38 is mounted slidably upon the inner end of said screw 39 so as to permit relative movement between the thimble and screw, but is of such a length that it limits the stroke of the diaphragms 31 and 32 toward the right, the screw 39 being short enough so that it does not affect the stroke of the diaphragm. The stroke of the diaphragms toward the left is limited by contact between flange 34a on the right hand spacing member 34 and flange 27a on casing member 27. The stroke of the diaphragms and the rate of feed of the treating liquid cannot therefore be changed without disassembling the feeding device, so that the rate of feed cannot be changed by the engineer when in use, although it can be changed by changing member 38 when the device has been disassembled. The compartment 35 of the feeding device is in communication with a conduit 41 which leads through a check valve 42 to an outlet pipe 46 the lower end of which is connected with the main feed water line 47. The line 47 may be either the suction or pressure line of the feed water pump.

The manner in which the above described apparatus operates is as follows: Let it be assumed that a suitable supply of treating liquid has been placed in the compartment 11 of the compound container 10 and that the feed water pump is operated, steam is supplied from any suitable source to the steam space 12 of said container thereby heating the container and the contents of the compartment 11. A portion of this steam passes through the aperture 17 thus creating pressure within such compartment sufficient to insure the ready feeding of the treating liquid from such compartment. When the water piston 23 of the pump is moving away from the conduit 37a, the suction induced above the piston will be communicated through the conduit 37a to the compartment 36 of the automatic feeding device thus tending to move the differential diaphragm 32, 31 towards the left thereby inducing suction within the compartment 35, and operating the check valve 20 to draw from the compartment 11 a small quantity of the treating liquid. This

movement of the differential diaphragm towards the left will, of course, be assisted by the pressure of the compression spring 37. When the piston 23 is moving towards the conduit 37a, the pressure within the cylinder 21 will be communicated through said conduit to the compartment 36 thus causing the differential diaphragm to be moved towards the right. The contents of the compartment 35 will therefore be expelled through the conduit 41, the check valve 42 being opened and the check valve 20 closed by the pressure. Due to the difference in area of the diaphragms 32, 31, the pressure of the fluid pumped out of the compartment 35 will, of course, be greater than the pressure in the feed water line 47. As the treating liquid and water pass to the pipe 47, they will be thoroughly mixed with the feed water in the supply line.

It will be noted that the compartment 11 in which the supply of treating liquid is maintained is closed to the atmosphere, the pressure for feeding such liquid from said compartment being provided by the steam supplied through the pipe 14 to the steam jacket 12 and aperture 17 to the compartment 11 above the level of its contents. In its flow from the compartment 11 through the feeding device 19 to the boiler, the treating liquid passes through hermetically sealed conduits and chambers, consequently oxidation of the treating liquid is effectively prevented, and as oxidation of the treating liquid has caused considerable trouble with treating liquid feeders in the past, the present invention obviates such trouble.

It will be seen from the above that the apparatus disclosed will carry out a method of supplying treating liquid to feed water which consists of the following steps: Subjecting the treating liquid to a preheating or conditioning by subjecting such liquid directly to the action of steam supplied to the compartment 11 through the aperture 17 and also to the heating action of the steam in the steam jacket 12; withdrawing, by the action of the automatic feeding device 19, a measured quantity of liquid, as determined by the length of the bushing 38, from the compartment 11, and as such measured quantity is withdrawn and delivered on each upward stroke of the piston 23, the rate of feed of the treating liquid will be accurately proportioned to the rate of feed of the feed water; and delivering such measured quantity of treating liquid to the boiler feed water at predetermined temperature.

While the system or apparatus disclosed forms a satisfactory example of means for carrying out the method above described, it will of course be understood that the invention is not limited to the constructional details or the arrangement of the component parts illustrated and described but that many changes, variations and modifications may be resorted to without departing from the principles of the invention. In particular, it is obvious that, if pipe 47 is a suction pipe, diaphragm 31 may be omitted or diaphragms 31 and 32 combined into one on account of the low pressure against which the automatic feeding device needs to deliver, or a piston having ends of equal areas be substituted for the diaphragms.

We claim:

1. In an apparatus for supplying a treating liquid to a boiler, a sealed container for said liquid arranged normally to prevent ingress of air and having partition means for dividing it into an inner treating liquid containing compartment and a steam jacket surrounding said compartment, and means for connecting said

steam jacket with a source of steam, said partition being provided with an aperture for the passage of steam to said inner compartment above the level of the contents thereof.

5 2. The combination in a feed water heating system of a chamber for fluid boiler compound, a steam jacket for said chamber, a passage for introducing compound into the top of said chamber

and leading through said jacket, said chamber having a communication with said jacket at the top of the chamber, removable means for closing said passage, means for conducting steam to said jacket, and means for leading condensate there- 5 from.

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