

No. 726,394.

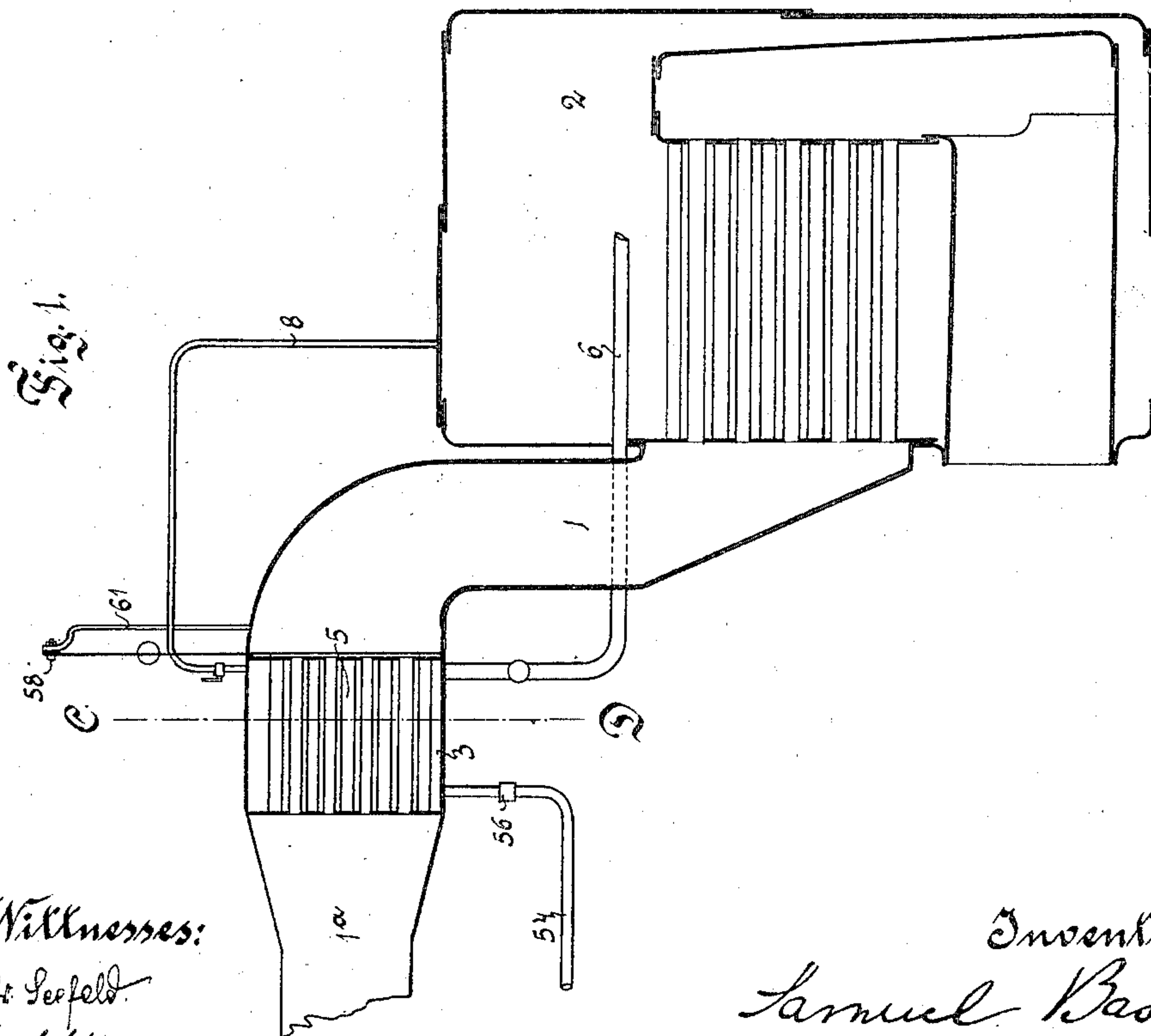
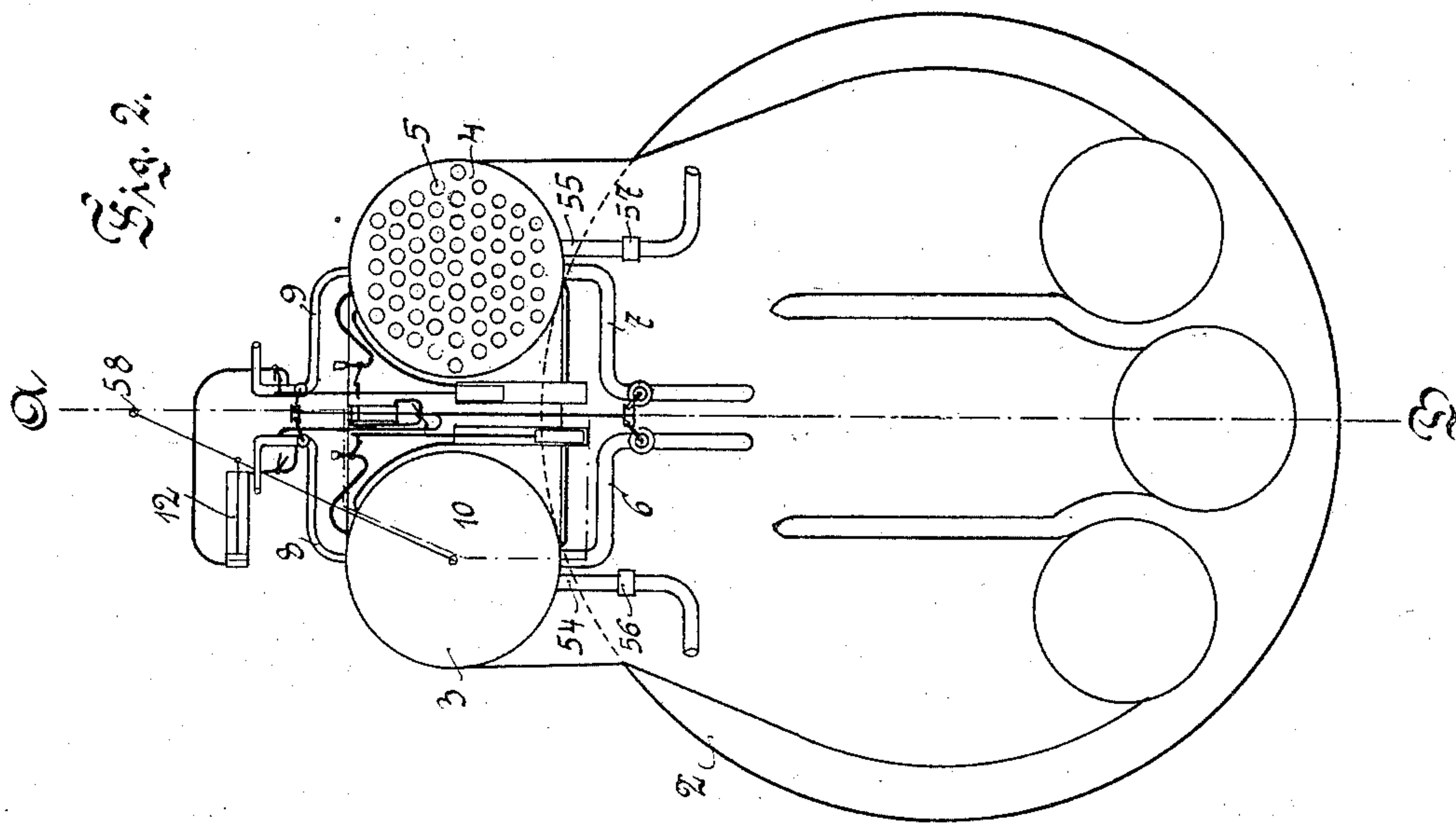
PATENTED APR. 28, 1903.

S. BASCH.  
AUTOMATIC BOILER FEEDER.

APPLICATION FILED JAN. 24, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:  
 Ouf. Seefeld.  
 Carl W. W.

Inventor:  
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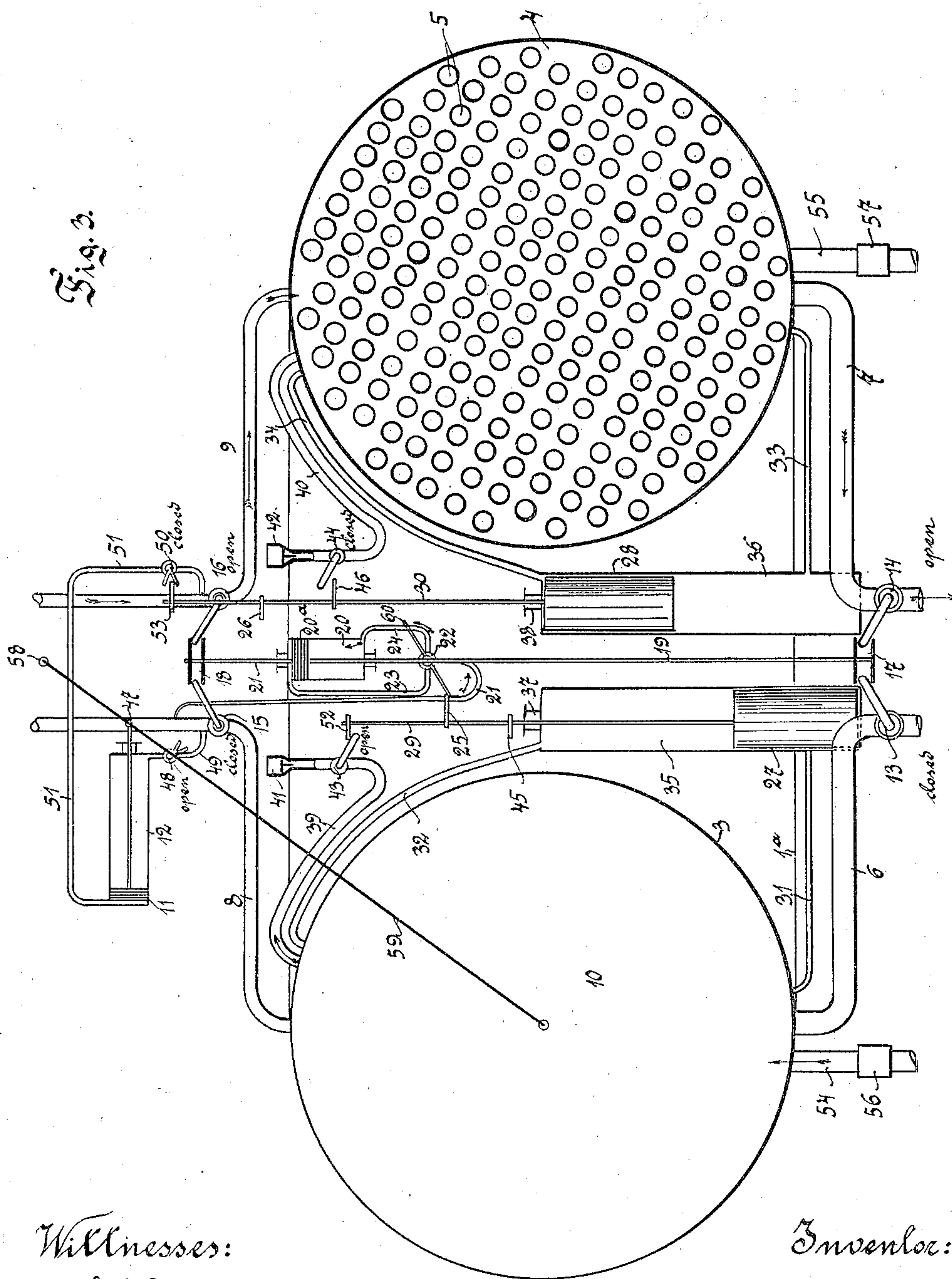
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Carl Olte

Inventor:

Samuel Basch



# UNITED STATES PATENT OFFICE.

SAMUEL BASCH, OF LONDON, ENGLAND.

## AUTOMATIC BOILER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 726,394, dated April 28, 1903.

Application filed January 24, 1903. Serial No. 140,408. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL BASCH, a subject of the Emperor of Germany, residing at London, in the United Kingdom of Great Britain and Ireland, have invented a new and useful Automatic Boiler-Feeder, of which the following is a specification.

My invention relates to an automatic boiler-feeder arranged for sucking the water, heating it with the heat of spent fire-gases of a steam-boiler or the heat of exhaust-steam of a steam-engine or from other source, and for feeding the so-heated water under pressure into a steam-boiler and at a temperature more or less approaching to that of the latter; and the objects of my invention are, first, to provide two tubed feed-water heaters placed side by side and at a certain height above the steam-boiler within a channel, through which the spent fire-gases are passed or the exhaust-steam is conducted; second, to provide each tubed feed-water heater with a float and a space for the same, which is connected by pipes with the upper and lower parts of the feed-water heater; third, to connect the lower parts of the two feed-water heaters separately with the steam-boiler beneath its water-level and the upper parts of the former with the steam-boiler above its water-level by means of pipes having stop cocks or valves; fourth, to provide means controlled by the two floats for opening and closing the stop cocks or valves in the pipes attached to the two feed-water heaters; fifth, to provide means for alternately shutting the tubes of either of the two feed-water heaters, while the tubes of the other feed-water heater are opened to the spent fire-gases or the exhaust-steam; sixth, to provide means controlled by the floats for automatically shifting the said shutting means from the one feed-water heater to the other one, and vice versa; seventh, to connect the two feed-water heaters with the source of fresh water by pipes, and, eighth, to provide the two feed-water heaters with vent-pipes controlled by the floats. I attain these objects by the arrangement illustrated diagrammatically in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through the broken line A B in Fig. 2 and shows the automatic boiler-feeder as applied

to a marine boiler. Fig. 2 is a vertical section through the automatic boiler-feeder on the line C D in Fig. 1 and an elevation of the marine boiler, the left-hand tubed feed-water heater being removed to show a circular shutting-disk; and Fig. 3 shows, on an enlarged scale, the same vertical section through the automatic boiler-feeder as before, the right-hand feed-water heater being assumed to have more heating-tubes than are shown at Fig. 2.

Similar characters of reference refer to similar parts throughout the several views.

In the drawings the automatic boiler-feeder is assumed to be applied to a marine boiler 2. It essentially consists of two cylindrical feed-water heaters 3 and 4, having each a plurality of flue-tubes 5, reaching from the one bottom to the other bottom. The two feed-water heaters 3 4 are placed parallel to each other within a widened part of the horizontal flue 1<sup>a</sup>, adjoining to the smoke-chamber 1. The lower parts of the two feed-water heaters 3 4 are connected with the respective fresh-water source by pipes 54 55, having check-valves 56 57, and with the marine boiler 2 beneath its water-level by the two separate pipes 6 and 7, having stop cocks or valves 13 and 14. The upper parts of the two feed-water heaters 3 4 are provided with two vent-pipes 39 and 40 and connected with the marine boiler above its water-level by the two separate pipes 8 and 9, having stop cocks or valves 15 and 16. Between the two feed-water heaters 3 4 two float-cylinders 35 36 are arranged, which are connected with the former by the pipes 31 32 and 33 34, respectively. Within these cylinders 35 36 the piston-like floats 27 and 28, respectively, are arranged to move up and down, which are rigidly connected with the two vertical rods 29 and 30. These vertical rods are guided on their lower parts by the stuffing-boxes 37 and 38, and on their upper parts by any suitable guides conveniently secured on the top wall of the horizontal flue 1<sup>a</sup>. In the center line of the marine boiler a steam-cylinder 20 is conveniently secured, the piston of which is rigidly connected with a vertical rod 19. This piston-rod 19 is guided in any suitable manner and carries on the lower and upper ends two cross-heads 17 and 18, having slots or



spaces, into which the suitably-shaped ends of the keys of the stop-cocks 13 14 and 15 16 engage. The plugs of the latter are so arranged that in the positions of the keys 5 shown at Fig. 3 the stop-cocks 13 and 15 of the left tubed feed-water heater 3 are closed, but those 14 and 16 of the right feed-water heater 4 are open. The two ends of the cylinder 20 are connected by pipes 23 and 24 10 with a three-way cock 22, and the latter by a pipe 21 with the one connecting-pipe 8 above the stop-cock 15, so that always steam can be admitted to the cylinder 20. The plug of the three-way cock 22 is so arranged 15 that in its one extreme position (shown at Fig. 3) the steam coming from the boiler through the pipe 21 is admitted through the one way in the plug and through the pipe 24 to the cylinder 20 beneath its piston 20<sup>a</sup>, as 20 is indicated by the arrows, while the cylinder 20 above its piston 20<sup>a</sup> is put into open communication with the free atmosphere by means of the other pipe 23, the two other ways of the cock 22, and a pipe on the rear 25 of the latter. (Not shown.) Then the piston 20<sup>a</sup> will be secured in its uppermost position by the steam acting on its lower surface. When the plug of the three-way cock 22 is 30 turned through an angle of ninety degrees, then the steam from the boiler will be admitted through the pipe 23 to the cylinder 20 above its piston 20<sup>a</sup>, while the cylinder 20, beneath the piston 20<sup>a</sup>, will be put into open communication with the free atmosphere by means of 35 the pipe 24 and the said two other ways of the plug. In this case the steam will push the piston 20<sup>a</sup> downward and secure it in its lowermost position. The three-way cock 22 is provided with a two-armed key 60, against 40 which two tappets 25 and 26, secured on the two float-rods 29 and 30, can strike alternately. The two vent-pipes 39 and 40 are provided on their ends with two check-valves 41 and 42 and beneath these valves with two stop-cocks 45 43 and 44. Against the key of the one stop-cock 43 two tappets 45 and 52, arranged on the one float-rod 29, can strike in opposite directions for closing and opening the stop-cock 43, respectively. In a similar manner 50 two tappets 26 and 53 are arranged on the other float-rod 30 for striking against the key of the other stop-cock 44.

A circular shutting-disk 10, having about the same diameter as the two feed-water 55 heaters 3 4, serves for shutting the tubes of either feed-water heater and is fastened on a lever 59, which is mounted to turn on a pin 58. The latter is assumed to form a part of a suitable support 61, placed on the horizontal flue 1<sup>a</sup>; but it will be understood that the 60 pin 58 can also be secured in any convenient manner to a suitable wall of the ship. Of course the top wall of the horizontal flue 1<sup>a</sup> must be provided with a suitable slot to allow 65 of the lever 59 passing through. The disk 10 is counterbalanced in any known manner—for example, by means of a suitable counter-

weight fastened on an extension of the lever 59 beyond the fulcrum 58—so that the disk 10 will always occupy either of its two extreme 70 positions. A horizontal steam-cylinder 12 is secured to a suitable place of the ship and connected by pipes 49 and 51 with the two connecting-pipes 8 and 9 above their stop-cocks 15 and 16, so that always steam can be 75 admitted to the cylinder 12. The rod of its piston 11 is provided on the external end with a slot 47 at right angles thereto, in which a pin on the lever 59 engages. The said steam-pipes 49 and 51 are provided with 80 stop-cocks 48 and 50, having forked keys, into which the said two upper tappets 52 and 53 can engage to open and close these cocks. The plugs of the latter are so arranged that they can be turned through an angle of about 85 ninety degrees and that in the one extreme position, as shown for cock 48 at Fig. 3, the steam can be admitted from the boiler to the cylinder 12 and in the other extreme position, 90 as shown for cock 50, the cylinder 12 is disconnected from the steam-boiler and put into open communication with the atmosphere by means of a pipe. (Not shown.)

The parts between the two feed-water heaters 3 and 4 may be inclosed in a special cham- 95 ber formed by two partition-walls within the flue 1<sup>a</sup> and reaching from the peripheries of the one heater 3 to the peripheries of the other heater 4.

The automatic boiler-feeder operates in the 100 following manner: Assuming the left feed-water heater 3 to have entirely discharged its heated contents into the marine boiler 2, then the various parts will occupy their positions. (Shown at Fig. 3.) The circular disk 10 will 105 shut the tubes of the left feed-water heater 3, so that the spent fire-gases of the marine boiler can pass only through the tubes 5 of the right feed-water heater 4 to the chimney. The left float 27 will be in its lowest position, 110 and the two stop-cocks 13 and 15 are closed, so that the left feed-water heater 3 is disconnected from the marine boiler 2, while the one stop-cock 43 is open. Then the high pressure previously prevailing in the feed-water 115 heater 3 will have disappeared, owing to steam escaping through the vent-pipe 39, the open cock 43, and the check-valve 41. On the other hand steam is admitted from the pipe 8, through the pipe 49 and the open cock 120 48, to the cylinder 12, so that the piston 11 is kept in its extreme position on the left, and thereby the shutting-disk 10 is secured in its position shown. At the same time steam is admitted from the pipe 8 through the pipe 125 21, the three-way cock 22, and the pipe 24 to the steam-cylinder 20 in the direction of the arrows, so as to secure the piston 20<sup>a</sup>, with the rod 19 and the two cross-heads 17 and 18 in their uppermost positions. The left feed- 130 water heater 3 is now allowed to cool; so that the steam contained therein is gradually condensed, when a vacuum will be formed, where- by water is sucked from the fresh-water



source through the pipe 54 and the opened check-valve 56, so that it will gradually fill the heater 3. Of course the float 27 will follow the water-level within the feed-water heater 3 and rise. At last the upper tappet 52 on the rod 29 of the float 27 will strike against the forked key of the cock 48 and so turn the plug of the latter as to disconnect the cylinder 12 from the marine boiler 2 and to put it into open communication with the atmosphere. Then no steam at all will be in the cylinder 12. From an examination of Fig. 3 it will be evident that the float 27 will attain its uppermost position when the left feed-water heater 3 is about half-full. The condensation of the steam, however, will continue during the further cooling of the heater 3 until the latter is quite filled with water or nearly so. The right feed-water heater 4 had been previously filled in a similar manner with water and put into open communication with the marine boiler 2 by the opened stop-cocks 14 and 16, so that the same pressure prevails therein as in the marine boiler 2. The water contained in the heater 4 and heated by the spent fire-gases is allowed to gradually flow into the marine boiler 2. When the upper half of the water contents have been emptied into the boiler 2, the float 28 will commence to sink slowly and take along with it the rod 30, so that the upper tappet 53 will turn the forked key of the cock 50, and thereby put the cylinder 12 on the left side of the piston 11 into open communication with the steam-boiler 2, when steam will enter the cylinder 12 and push the piston 11 from left to right. This means that the shutting-disk 10 will be shifted from the left feed-water heater 3 to the right feed-water heater 4, so that the spent fire-gases will now pass through the tubes of the left heater 3 to the chimney and heat the water contained in the heater. Meanwhile hot water will continue to flow out of the right feed-water heater 4 into the steam-boiler 2 until the heater 4 is emptied. It will be seen that in general the two floats 27 and 28 are moving in opposite directions. When the left float 27 is about to attain its uppermost position, the lower tappet 45 on its rod 29 will strike against the key of the stop-cock 43 and turn the same, so as to close the latter. When the right float 28 is about to reach its lowermost position, the middle tappet 26 on its rod 30 will strike against the two-armed key of the three-way cock 22 and turn the same, so that the steam from the pipe 8 will be admitted through the pipe 23 to the upper end of the cylinder 20, when the piston 20<sup>a</sup> of the latter will be moved downward with the rod 19 and the two cross-heads 17 and 18. Thereby the two stop-cocks 13 and 15 will be opened to put the left feed-water heater 3 into open communication with the marine boiler, when of course the pressure of the latter will also prevail in the heater 3 to enable its water to flow into the boiler. At the same time the two stop-cocks 14 and 16 will be

closed to disconnect the right feed-water heater 4 from the marine boiler 2. Moreover, the upper tappet 53 on the float-rod 30 will have opened the stop-cock 44, and thereby also the vent-pipe 40 to the atmosphere, when steam will escape from the heater 4 and the high pressure in the latter will disappear. The right feed-water heater 4 will now cool and gradually suck water from the fresh-water source, after which all the occurrences described above with reference to the left feed-water heater 3 will take place in the right heater 4. Where it is so preferred, the pipes 6 and 7 within the marine boiler 2 may be provided with two stop-valves, and the latter may be connected in a known manner with two floats, so that they can be closed in case the water-level within the boiler should reach the highest limit to prevent an excess of water from being fed into the boiler.

The whole arrangement described so far renders it unnecessary that the automatic boiler-feeder should work most regularly, which would not be possible for various reasons. The engine may stop and will then require no steam. The feed-water may be sometimes colder and sometimes warmer than on the average, whereby the vacuum will be varied. Sometimes the two feed-water heaters 3 4 may be filled entirely and alternately; but sometimes they may be filled only partially, owing to the defective vacuum. In general, however, the two floats 27 and 28 will occupy their uppermost positions before the shutting-disk 10 is shifted from the one feed-water heater to the other one, or vice versa. In this case there will be no steam in the cylinder 12 on both sides of its piston 11, so that when the respective float commences to sink the upper tappet on its rod will open the respective cock 48 or 50 to admit steam to the cylinder 12 on the proper side for moving the shutting-disk 10 from the one feed-water heater to the other one. The cooling and filling of the one feed-water heater will on the average require less time than the emptying of the other heater filled with hot water.

The automatic boiler-feeder may be varied in its details without deviating from the spirit of my invention. The two feed-water heaters 3 4 may be placed vertically or otherwise instead of horizontally. The float-cylinders 35 36 and the steam-cylinder 20 may be inclined in case circumstances should render this necessary or desirable. The circular shutting-disk 10 may be replaced by other equivalent means.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a steam-boiler, of two tubed feed-water heaters located above said steam-boiler; two pipes connecting the lower parts of said tubed feed-water heaters with a water source and provided each with a check-valve, two lower pipes connecting the lower parts of said two tubed feed-water heaters with said steam-boiler beneath its



water-level, two upper pipes connecting the upper parts of said two tubed feed-water heaters with said steam-boiler above its water-level, two vent-pipes secured on the upper parts of said two tubed feed-water heaters and provided each with a check-valve, two vessels, pipes connecting the upper and lower parts of either of said two vessels with the upper and lower parts respectively of either of said two tubed feed-water heaters, two floats mounted in said two vessels to move up and down and each arranged to attain its lowest position when the respective tubed feed-water heater is emptied and to attain its highest position, when the water-level in the respective tubed feed-water heater is about in the middle of the latter, means controlled by said two floats for opening either of said two vent-pipes on the respective float attaining its lowest position and for closing same on the float attaining its highest position, means controlled by said two floats for opening said upper pipe and said lower pipe connecting either of said two tubed feed-water heaters with said steam-boiler on the float corresponding to the other tubed feed-water heater attaining its lowest position, while said controlled means are arranged for closing the upper and the lower pipe on the float corresponding to the respective tubed feed-water heater attaining its lowest position, means for conducting a heating fluid to the tubes of said two tubed feed-water heaters, means for shutting the tubes of either of said two tubed feed-water heaters, and means controlled by said two floats for shifting said tubes shutting means from either of said two tubed feed-water heaters to the other one on the float corresponding to the latter commencing to sink, substantially as set forth.

2. The combination with a steam-boiler, of two cylindrical feed-water heaters located above said steam-boiler and having each a plurality of tubes parallel to its longitudinal axis and reaching from the one bottom to the other bottom, the said two cylindrical feed-water heaters being placed parallel to each other or nearly so within a widened part of a channel through which the spent fire-gases from said steam-boiler are passed, two pipes connecting the lower parts of said two cylindrical feed-water heaters with a water source and provided each with a check-valve, two lower pipes connecting the lower parts of said two cylindrical feed-water heaters with said steam-boiler beneath its water-level, two upper pipes connecting the upper parts of said two cylindrical feed-water heaters with said steam-boiler above its water-level, the said two lower pipes and said two upper pipes being each provided with a stop-valve having a movable part, two vent-pipes secured on the upper parts of said two cylindrical feed-water heaters and provided each with a check-valve and beneath this with a stop-valve having a movable part, two parallel float-cylinders placed vertically or nearly so, pipes for

connecting the upper and lower parts of either of said two float-cylinders with the upper and lower parts respectively of either of said two cylindrical feed-water heaters, two cylindrical floats mounted in said two float-cylinders to move up and down and each arranged to attain its lowest position, when the respective cylindrical feed-water heater is emptied, and to attain its highest position, when the water-level in the respective cylindrical feed-water heater is about in the middle of the latter, two float-rods attached to said two cylindrical floats and guided in the longitudinal axes of said two float-cylinders, a tappet secured on each of said two float-rods and arranged for striking against said movable part of said stop-valve of the respective vent-pipe and thereby opening this stop-valve on the cylindrical float attaining its lowest position, a tappet secured on each of said two float-rods and arranged for striking against said movable part of said stop-valve of the respective vent-pipe and thereby closing this stop-valve on the cylindrical float attaining its highest position, a steam-cylinder parallel to said two float-cylinders, a three-way cock connected with said steam-boiler by suitable means and arranged for admitting in either extreme position of its plug steam to either end of said steam-cylinder while putting the other end of the latter into open communication with the atmosphere, a two-armed key secured on the plug of said three-way cock, a piston-rod attached to the piston of said steam-cylinder, a cross-head fastened on said piston-rod and arranged for so controlling said movable parts of said two stop-valves of said two lower pipes as to simultaneously open the one stop-valve and to close the other stop-valve and vice versa, a second cross-head fastened on said piston-rod and arranged for so controlling said movable parts of said two stop-valves of said two upper pipes as to simultaneously open the one stop-valve and to close the other stop-valve and vice versa, a tappet secured on each of said two float-rods and arranged for striking against the one arm of said two-armed key and thereby so turning the plug of said three-way cock as to admit steam to the respective end of said steam-cylinder for closing said two stop-valves in said upper pipe and said lower pipe of the respective cylindrical feed-water heater and for opening those stop-valves of the other feed-water heater on the respective cylindrical float attaining its lowest position, a circular disk arranged for shutting the tubes of either of said two cylindrical feed-water heaters, a lever mounted on a stationary pin to rock and carrying said circular shutting-disk, said lever being so arranged as to move said circular disk from the one feed-water heater to the other one and vice versa, means for counterbalancing said circular disk and said lever, a shifting steam-cylinder having a piston-rod the external end of which is pivotally connected with said le-



ver, two separate pipes connecting the two  
ends of said shifting steam-cylinder with said  
steam-boiler above its water-level and pro-  
vided each with a three-way cock, which is so  
5 arranged, that in the one extreme position of  
its plug steam is admitted to said shifting  
steam-cylinder and in the other extreme po-  
sition of its plug said shifting steam-cylinder  
is disconnected from the boiler and put into  
10 open communication with the atmosphere,  
and two forked keys secured on the plugs of  
these two three-way cocks, the one of said  
three tappets on either of said two float-rods

being arranged for engaging said forked key  
of the respective three-way cock and open- 15  
ing the latter on the cylindrical float attain-  
ing its highest position and again closing this  
three-way cock on the cylindrical float com-  
mencing to sink, substantially as set forth.

In testimony whereof I have signed my 20  
name to this specification in the presence of  
two subscribing witnesses.

SAMUEL BASCH.

Witnesses:

H. D. JAMESON,

A. NUTTING.