C. WALKER.

DRAINAGE SYSTEM.

APPLICATION FILED FEB. 13, 1911.

1,003,307.

Patented Sept. 12, 1911.

2 SHEETS—SHEET 1.

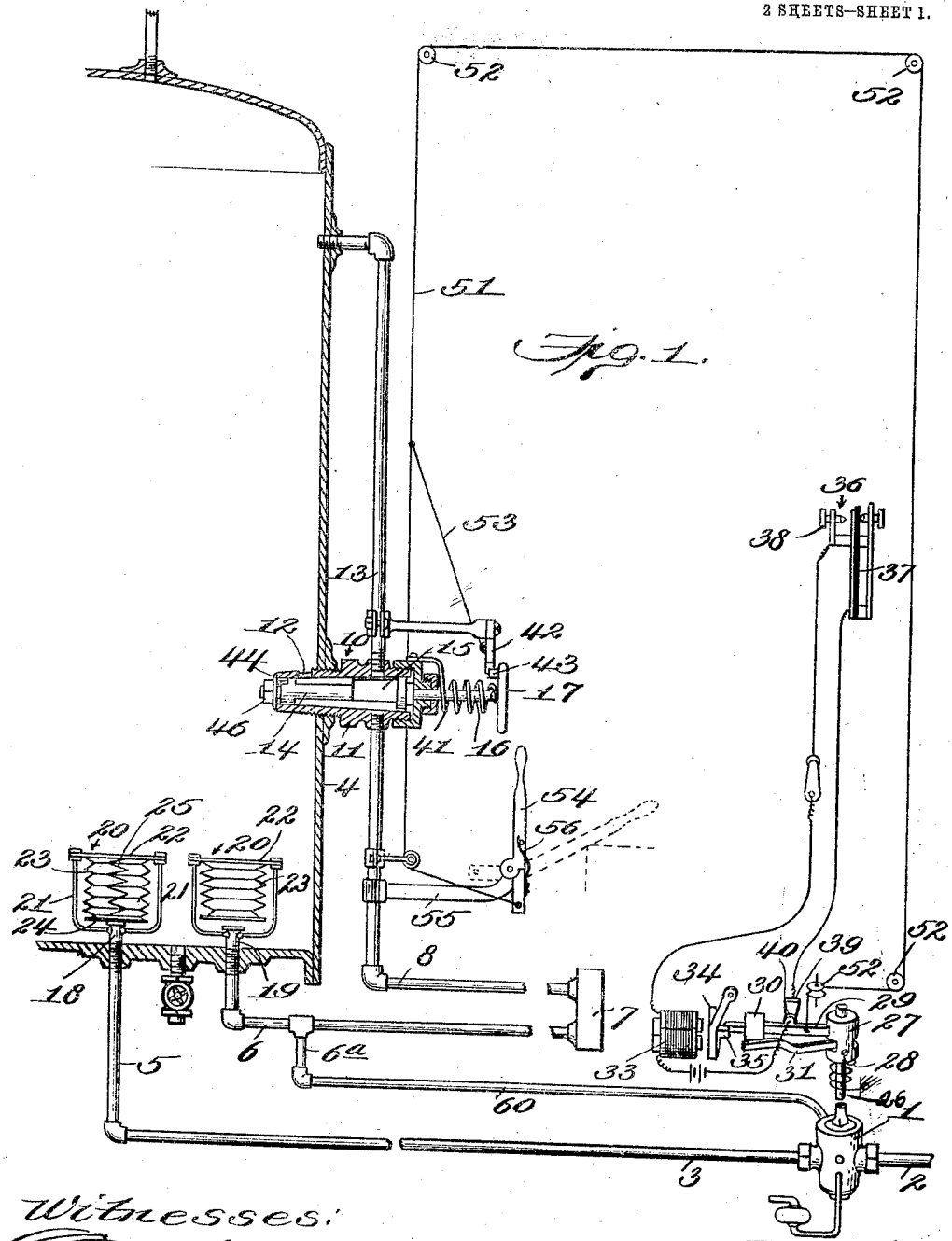

Fig. 1.

Witnesses:

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2 SHEETS—SHEET 2.

Fig. 2.

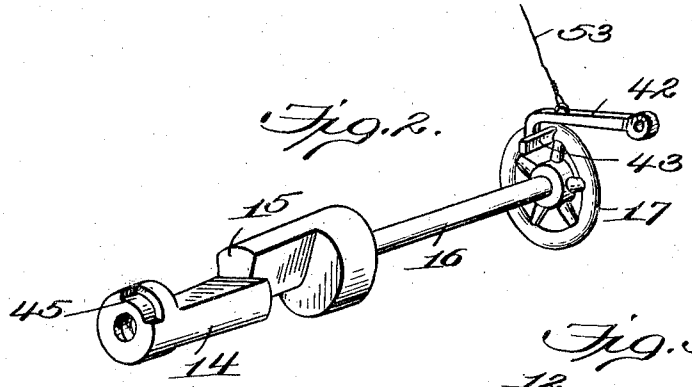


Fig. 3.

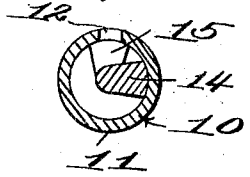


Fig. 4.

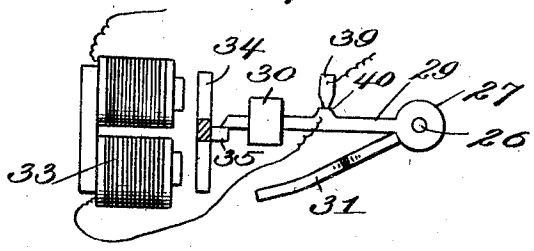


Fig. 5.

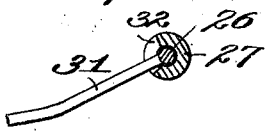
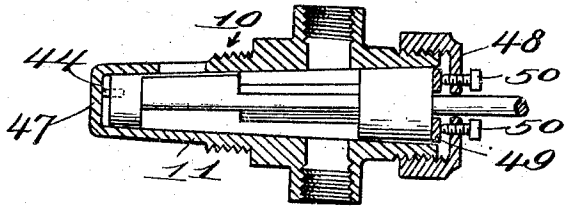


Fig. 6.



Witnesses:

Inventor

Charles Walker

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Atty

UNITED STATES PATENT OFFICE.

CHARLES WALKER, OF KNOXVILLE, TENNESSEE.

DRAINAGE SYSTEM.

1,003,307. Specification of Letters Patent. **Patented Sept. 12, 1911.**

Application filed February 13, 1911. Serial No. 608,434.

To all whom it may concern:

Be it known that I, CHARLES WALKER, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented new and useful Improvements in Drainage Systems, of which the following is a specification.

This invention relates to improvements in drainage systems for water service pipes and it proposes a system of the general nature disclosed in my U. S. Patent, No. 995,930 of June 20, 1911, and wherein the operation of the drain valve is affected automatically and automatically controls the operation of other parts to be particularly set forth.

The primary object of the invention is to improve a drainage system of the general type referred to by providing for an interdependent relation between the main drain valve and a valve which, *inter alia*, has the function of an auxiliary drain valve and immediately controls the drainage of the stand boiler and its appurtenant piping.

A further object of the invention is to provide improved means for operating the drain valve toward the end of certainty and quickness of action.

A further object of the invention is to provide as an adjunct of a system of the general character referred to, a device which is interdependently related to the main drain valve and is in the nature of a signal to indicate the condition of the water back, *i. e.*, whether the latter contains water or has been drained.

Other objects will appear as the description proceeds.

An embodiment of the invention is shown in the accompanying drawings wherein—

Figure 1 is a sectional diagram of the improved drainage system; Fig. 2 is a perspective view of the plug of the valve which is associated with the boiler and controls the drainage thereof; Fig. 3 is a cross sectional view of the valve shown in Fig. 2; Fig. 4 is a plan view showing the drain valve and its controlling adjuncts; Fig. 5 is a sectional view of a detail of the drain valve operating means; and Fig. 6 is a longitudinal sectional view of a modified or alternative construction of valve for controlling the drainage of the boiler.

Similar characters of reference designate corresponding parts throughout the several views.

The drain valve, as 1, may be of any form desired, the drawings containing a conventional view of the drain valve which forms the subject of my prior Patent No. 965,772. The service pipe is shown at 2 and the main distributing pipe is shown at 3. The cold water section of the house system (not shown) is of course connected to the pipe 3 at any suitably located point, *e. g.* in the manner shown in my Patent No. 995,930 aforesaid The boiler is designated by the numeral 4 and its connections comprise a pipe 5 which is interposed between the pipe 3 and the lower head of the boiler, a pipe 6 which leads from the lower head of the boiler to the water back 7, and a pipe 8 which leads from the water back and through which hot water is returned to the boiler. The connection 6^a connects the pipe 6 with a pipe 60 which leads to the drain valve in the same manner as the pipe 32 shown in my copending application referred to. The pipe 8 does not connect directly with the boiler but with a valve designated generally by the numeral 10 and including a casing 11 into which the pipe 8 is threaded. The casing 11 is threaded into the side of the boiler and projects laterally therefrom. Said casing is constructed to provide for the delivery of hot water, as may be desired, either into the lower portion of the boiler through an opening 12 formed at the inner end of the casing, or into the upper portion of the boiler through a pipe 13 which is interposed between the casing 11 and the boiler, and is arranged exteriorly of the latter. The valve 10 includes also a valve plug of the type shown in Fig. 2 and having its body portion fashioned to provide conterminous valve sectors 14 and 15 which are arranged at right angles to one another, the sector 14 controlling the communication of the casing 11 and the opening 12, and the sector 15 controlling the communication of said casing and the pipe 13. The valve body thus constructed is provided with a stem 16 which projects through the outer head of the casing 11 and is suitably packed and which carries a hand wheel 17. The pipes 5 and 6 are threaded into the lower head of the boiler and are alined with nipples, as 18 and 19, with each of which a valve designated generally by the numeral 20 is associated. The valve 20 comprises a skeleton cage 21 which is fixed to a nipple, a plate 22

provided at the upper end of said cage, a flexible, accordion-like body 23 preferably of spun brass which is fixed to and depends from the plate 22, and a valve plate 24 which is fixed to the lower end of the body 23, closing the latter and immediately controlling the communication of the corresponding nipple with the boiler. The bodies 23 may contain a readily volatile fluid such as ethyl chlorid or an expansive coil spring 25 or both, the function of the fluid or the spring being to tension the valve body in such a manner as to assure of a reliable operation of the latter when certain pressure conditions exist. Normally the valve bodies 20 will be held open by the combined force of the hydrostatic pressure and the service pressure, but when the latter component of this force is removed, the remaining component is not sufficient to maintain the valve bodies 20 collapsed and they will therefore expand and, through the agency of the plates 24, shut off the communication of the boiler and the nipples 18 and 19. The purpose of this arrangement will hereinafter appear.

The drain valve, regardless of its form, includes a rotatable operating element, as 26, which, in the form shown, is the valve stem and upon which is mounted for rotation a collar 27. The rotation of the collar 27 is effected by means of a torsion spring 28 which surrounds the stem 26 and which has one end connected to said collar and the other end to any suitable stationary support. The collar 27 is provided with a laterally projecting arm, as 29, which carries near its outer end a hammer block 30. The stem 26 is provided with a laterally projecting arm 31 which passes through a slot 32 (Fig. 5) in the collar 27 and has its free end adjacent the hammer block 30. The automatic operation of the drain valve is effected by the spring 28 which causes initially a movement of the collar 27 relatively to the stem 26 and subsequently a movement of said collar with said stem. At the completion of the initial movement referred to, the block 30 strikes the arm 31 with considerable force, the blow thus produced being sufficient to start the turning movement of the drain valve even though there may be conditions of a nature to prevent said turning movement were the spring 28 directly connected to the stem 26. The arm 29 is normally held in a position wherein the block 30 is distant from the arm 31, the means for this purpose comprising an electromagnet 33 and its armature 34, the latter being provided with a lug 35 which normally engages against the arm 29 and holds the latter in the normal position aforesaid. The circuit in which the electromagnet is included, is normally open at a thermostatic switch 36 which includes a compound bar 37, one wire of the circuit being connected to a contact 38 and the other wire of said circuit being connected to said compound bar and leading from the latter to a contact piece 39 which normally engages a contact piece 40 provided on the arm 29. A wire extends from the latter to the magnet 33 and includes the battery or other source of electric energy. The degree of temperature at which the bar 37 is to close the circuit may be determined by the regulation of the distance through which said bar may move, this regulation obviously depending upon a relative adjustment of the bar and the contact 38. During the draining operation the boiler is drained to the point of communication therewith of the pipe 13, the water thus drained from the boiler flowing through said pipe, through the valve casing 11, the pipe 8, the water back 7 and the pipe 6[a] to the pipe 60 which passes it to the drain valve. If the plug of the valve 10 happens to be in a position wherein the sector 14 closes the opening 12, no movement of said plug is necessary to provide for the partial draining of the boiler and of the pipe 13 in the manner aforesaid, since said pipe 13 is then in communication with the pipe 8 through the valve casing. If, on the other hand the sector 15 closes the pipe 13, before the boiler can be drained a movement of the valve plug sufficient to cause the sector 15 to uncover the pipe 13, must be effected. Such movement is effected by means of a torsion spring 41 which surrounds the stem 16 and has one end connected to the casing 11 and its other end connected with the hand wheel 17. Assuming that it is desired to admit water into the boiler through the opening 12, in such a case the valve plug will be held in the position shown and against the tension of the spring 41 by a pivoted detent 42, the angular end of which engages a lug 43 which is provided on the hand wheel 17. Obviously when the detent 42 is moved so as to disengage the lug 43 the spring 41 becomes effective to move the valve plug so as to cause the sector 14 to close the opening 12 and to cause the sector 15 to uncover the pipe 13. Such movement of the valve plug is limited by a lug 44 which projects inwardly from the casing 11 and works in a slot 45 formed in the inner end of the valve plug.

In Fig. 6 a modified or alternative construction of valve 10 is provided. Whereas in the construction shown in Fig. 2 the valve plug is held at a proper position in the casing 11 by the conventional screw and nut device 46 ordinarily employed on turning plugs, in the construction shown in Fig. 6 this device is not employed. Instead, the inner end of the casing 11 is permanently closed as at 47 and the outer end of said

casing is closed by a cap 48 between which and the valve plug a packing ring 49 is interposed. The ring 49 is held against the valve plug by screws 50 which are threaded through the cap 48 and which may be employed to regulate the tension of the valve plug so that its movement may be, on the one hand, without binding, and on the other hand, without undue looseness. The actuation of the valve 10 in the manner explained is preferably dependent on the operation of the drain valve and the connections by which this relation is established include a cable preferably of wire, as 51, which is trained over suitable pulleys 52 and is connected to the arm 29, the cable 51 having a branch 53 which is connected to the detent 42.

As an adjunct of the system a device for indicating the condition of the water back, *i. e.*, whether it contains or has been drained of water, may be employed and such device preferably comprises an arm which, by its position, gives the proper indication. This arm designated by the numeral 54, is preferably to be positioned over the range and is pivoted between its ends on a suitable support 55. As shown, the cable 51 is connected to the lower end of the arm 54. The latter is preferably made in pivoted sections, the pivot of which may also be the connection with the standard 55, and which are normally held in extended relation by a spring, as 56. The object of thus making the arm 54 in sections is to enable the longer section of said arm to yield in case an obstruction, such as a utensil on the range, is encountered, and thus not to interfere with the full movement of the shorter and heavier section of said arm which is necessary, in the arrangement shown in order to permit the full movement of the drain valve.

It is thought that the operation will be readily apparent from the foregoing description. The thermostatic switch 37 is regulated to close the circuit described when the temperature has fallen to some determined low degree. In such a case, the compound bar 37, by virtue of its contracting action, moves through an extent sufficient for its engagement with the contact 38, at which time the circuit is completely closed and the magnet 33 is energized. Thereupon the armature 34 is moved toward the magnet and in such movement the lug 35 disengages the arm 29. Thereupon the spring 28, acting on the collar 27, causes an initial movement of said arm at the inception of which the circuit referred to is broken at the connections 39 and 40 and at the completion of which the arm 31 is given a violent blow by the hammer block 30, which blow is sufficient to start the turning movement of the plug of the valve 1. Such movement being started, it is readily continued throughout the necessary extent by the spring 28, the collar 27 and its adjuncts, in such a case, constituting a positive connection between said spring and the arm 31 which is rigid on the valve stem 26. When the plug of the valve 1 has been turned to a position to interrupt the communication of the pipes 2 and 3 and to provide for the drainage of the building, such drainage will be effected in the general manner described in my co-pending application referred to, that is to say, the pipes of the system which are connected by suitable branches or leaders to the pipe 3 will pass their contents into the latter and from thence the water in the system will be passed to the drain valve. Simultaneously with the operation of the drain valve in the manner set forth, those devices which are interdependently related to said drain valve through the intermediary of the cable 51, will be operated. Therefore, when the drain valve is operated, the valve 10 will also be operated in the manner described if the previous position of said valve happens to be such as to make an operation thereof necessary and at the same time the arm 54 will be moved from a vertical position to a horizontal or substantially horizontal position, the vertical position of said arm indicating the normal circulation of water from the water back and the horizontal position of said arm indicating the drainage of the water back. When the valve 1 is operated obviously the service pressure component of the force which is normally effective to collapse the bodies 23 is removed and thereupon said bodies are distended so as to engage the valve plates 24 with the nipples 18 and 19 and thus interrupt the communication of said nipples and boiler and prevent the complete drainage of the boiler or, to be more exact, the drainage of the boiler beyond the point of communication therewith of the pipe 13. Obviously when the valve 1 is restored to its normal position, admitting water from the service main into the system, the bodies 23 will be collapsed in accordance with the explanation of their action which has been already given.

Having fully described my invention, I claim:

1. In a drainage system, in combination, a drain valve, a boiler, a valve providing for the admission of heated water to either the lower or the upper portion of the boiler, a pipe extending between the second named valve and the upper portion of the boiler to supply the latter, said pipe being connected to the drain valve through the second named valve, the latter being operative to provide for the drainage of the upper portion of the boiler through said pipe, thermostatically controlled means providing for the automatic operation of the drain valve, and op-

erative connections between the drain valve and the second named valve.

2. In a drainage system, in combination, a drain valve, a boiler, a valve providing for the admission of heated water to either the lower or the upper portion of the boiler, a pipe extending between the second named valve and the upper portion of the boiler to supply the latter, said pipe being connected to the drain valve through said second named valve, the latter being operative to provide for the drainage of the upper portion of the boiler through said pipe, and operative connections between the drain valve and the second named valve whereby the latter may be automatically actuated in its draining operation consequent to an operation of the drain valve.

3. In a drainage system, in combination, a drain valve, a boiler, a valve providing for the admission of water to either the lower or the upper portion of the boiler, a pipe extending between the second named valve and the upper portion of the boiler to supply the latter, said pipe being connected to the drain valve through said second named valve, the latter being operative to provide for the drainage of the upper portion of the boiler through said pipe, a spring for causing the draining operation of said second named valve, a detent to hold the second named valve against the tension of said spring and a connection between the drain valve and said detent to cause the disengagement of the latter from said second named valve consequent to an operation of the drain valve.

4. In a drainage system, in combination, a drain valve, a boiler and its water back, the latter being connected to the drain valve, a device for indicating whether the water back contains or is drained of water, and an operative connection between the device and the drain valve.

5. In a drainage system, in combination, a drain valve, a boiler and its water back, the latter being connected to the drain valve, an arm which by its position indicates whether the water back contains or is drained of water, and a cable operatively connecting the arm to a movable part of the drain valve.

6. In a drainage system, a drain valve including a rotatable operating part, a hammer block arranged to have an initial movement relative to the operating part and a subsequent movement with said part, a spring for causing the movement of the hammer block, and releasable means normally holding the hammer block against the tension of the spring.

7. In a drainage system, a drain valve including a rotatable operating part, a hammer block arranged to have an initial movement relative to the operating part and a subsequent movement with said part, a spring for causing the movement of the hammer block, and thermostatically controlled means for normally holding the hammer block against the tension of the spring and for releasing the hammer block when a certain temperature exists.

8. In a drainage system, a drain valve including a rotatable stem, a collar mounted for rotation on the stem, the collar having an arm rigid therewith and having also a slot, a hammer block provided on the arm, the valve stem having an arm rigid therewith and which projects through the slot, a torsion spring surrounding the stem and connected to the collar and also to a stationary support, and means normally operative to hold the first named arm with its hammer block distant from the second named arm.

9. In a drainage system, a drain valve including a rotatable stem, a collar mounted for rotation on the stem, the collar having an arm rigid therewith and having also a slot, a hammer block provided on the arm, the valve stem having an arm rigid therewith and which projects through the slot, a torsion spring surrounding the stem and connected to the collar and also to a stationary support, an electromagnet, the armature of which normally engages the first named arm to hold the latter with its hammer block distant from the second named arm, a circuit for the electromagnet, a wire of the circuit being connected to the first named arm, a contact normally engaged by said first named arm and included in the circuit, and a normally open thermostatic circuit closer.

10. In a drainage system, a boiler, a pipe leading to the upper end thereof and through which the upper portion of the boiler may be drained, a valve controlling said pipe, a pipe leading into the lower portion of the boiler and adapted to be drained, and a valve automatically operable to close said last named pipe and prevent drainage of the boiler therethrough when the service pressure is cut off incident to the draining operation.

11. In a drainage system, house supply pipes and a boiler with which one of the house supply pipes is in communication, a drain valve whereby all the house supply pipes may be drained, and a valve operable automatically when the service pressure is cut off incident to the draining operation to close the pipe which communicates with the boiler.

12. In a drainage system, house supply pipes and a boiler with which one of the house supply pipes is in communication, a drain valve whereby all the house supply pipes may be drained, and a valve operable automatically when the service pressure is

cut off incident to the draining operation to close the pipe which communicates with the boiler, the valve comprising a cage fixed adjacent the end of said pipe, a flexible accordion-like body capable of contraction and distention and having an end fixed to the cage and a movable end, and a valve plate associated with the movable end and arranged to close said pipe when the accordion-like body is distended.

13. In a drainage system, in combination, a boiler, a water back, a supply pipe leading into the lower end of the boiler, a second pipe extending from the lower end of the boiler to the water back, a return pipe from the water back, a valve interposed between the return pipe and the boiler, a pipe extending from the valve to the upper end of the boiler, a drain valve with which the supply pipe and the return pipe are adapted to be connected, the first named valve being constructed to admit water directly into the boiler therefrom, or to the upper end of the boiler through the last-named pipe and also to provide for the drainage of the upper portion of the boiler and said last named pipe through said return pipe, and a pair of valves within the boiler for closing the pipes which communicate with the lower end of the boiler, the valves last named being automatically operable when the service pressure is cut off incident to the drainage operation.

14. In a drainage system, in combination, a boiler, a water back, a supply pipe leading into the lower end of the boiler, a second pipe extending from the lower end of the boiler to the water back, a return pipe from the water back, a valve interposed between the return pipe and the boiler, a pipe extending from the valve to the upper end of the boiler, a drain valve with which the supply pipe and the return pipe are adapted to be connected, the first named valve being constructed to admit water directly into the boiler therefrom, or to the upper end of the boiler through the last named pipe and also to provide for the drainage of the upper portion of the boiler and said last named pipe through said return pipe, and a pair of valves within the boiler for closing the pipes which communicate with the lower end of the boiler, the valves last named being automatically operable when the service pressure is cut off incident to the drainage operation, and each comprising a cage fixed adjacent the end of a corresponding pipe, a flexible accordion-like body capable of contraction and distention having an end fixed to the cage, and a movable end, and a valve plate associated with the movable end and arranged to close said corresponding pipe when the accordion-like body is distended.

15. In a drainage system, a boiler, a water back, a return pipe from the water back, a drain valve, the return pipe being adapted for connection with the drain valve, a valve casing fitted in the boiler and projecting laterally therefrom, the return pipe being connected to the valve casing and the latter having an opening within the boiler, a second pipe exterior of the boiler and connecting the valve casing and the upper part of the boiler and a turning plug in the valve casing, the turning plug being fashioned to provide a pair of conterminous valve sectors arranged at right angles to one another, one of the sectors controlling the opening and the other sector controlling the communication of the return pipe and the second pipe, the latter being drained through the return pipe.

16. In a drainage system, a boiler, a water back, a return pipe from the water back, a drain valve, the return pipe being adapted for connection with the drain valve, a valve casing fitted in the boiler and projecting laterally therefrom, the return pipe being connected to the valve casing and the latter having an opening within the boiler, a second pipe exterior of the boiler and connecting the valve casing and the upper part of the boiler, a turning plug in the valve casing, the turning plug being fashioned to provide a pair of conterminous valve sectors arranged at right angles to one another, one of the sectors controlling the opening and the other sector controlling the communication of the return pipe and the second pipe, the latter being drained through the return pipe, a packing washer interposed between the turning plug and the outer end of the valve casing, and means for regulating the pressure of the washer against the turning plug.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES WALKER.

Witnesses:
MARCUS A. PARKER,
PARIS A. HAYNES.