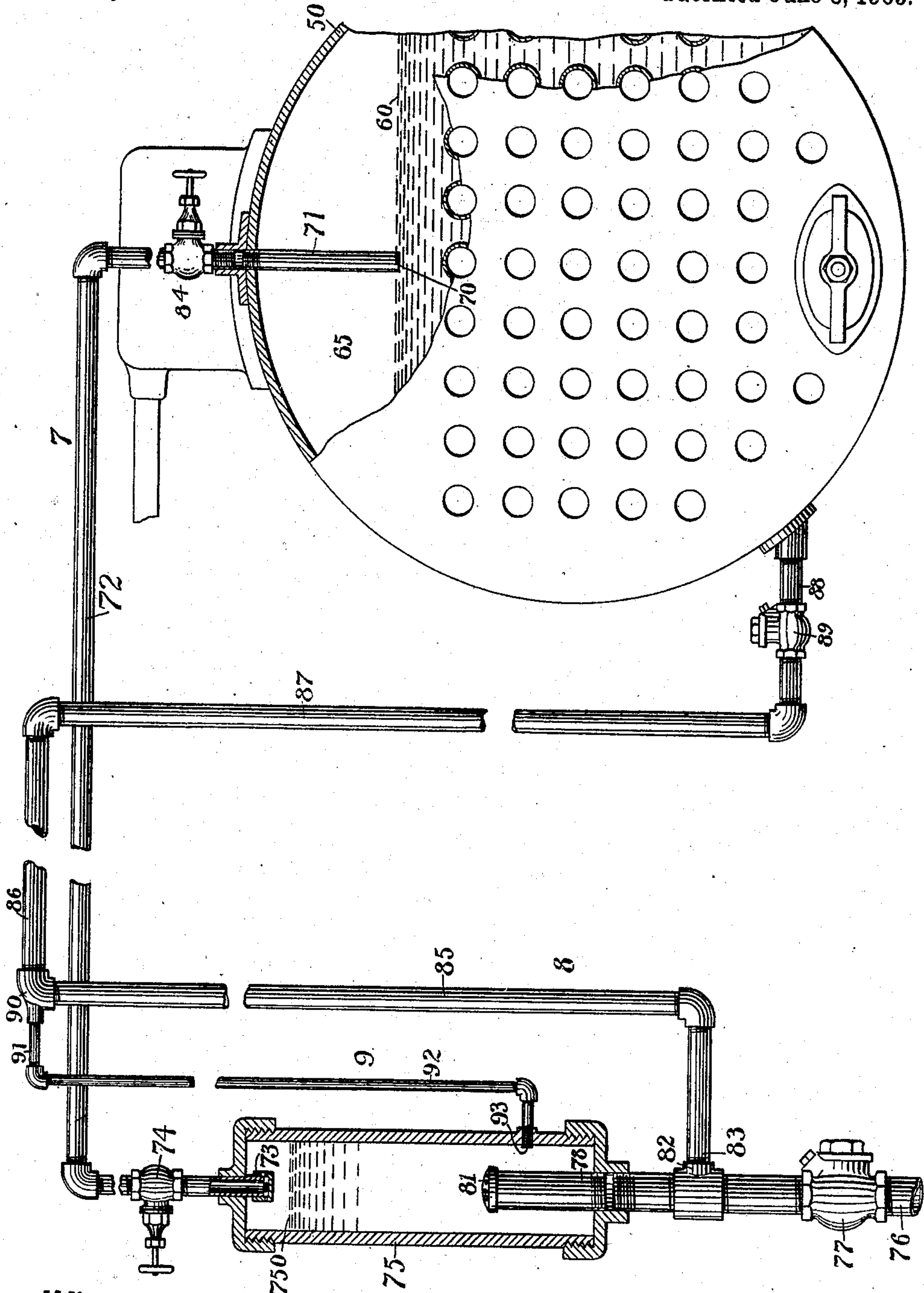


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STEAM PUMP.

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STEAM-PUMP.

No. 924,140.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, THOMAS R. BROWN, a citizen of the United States, residing in Milton, in the county of Northumberland and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Pumps, of which the following is a specification.

This invention relates to steam pumps and is particularly adapted for use in a system of boiler feed and having for an object to provide means for supplying feed water to a boiler and is automatically controlled by the steam from the boiler when the surface of the water falls below or rises above the normal water level.

In my improved apparatus a steam pump is employed in which a working chamber is provided which is connected with the water supply and with the boiler at a point normally below the surface of the water, and with the boiler at about the water line. Steam will be admitted into such chamber when the water in the boiler falls below a predetermined level, and will be the means of passing a charge of feed water into the boiler, after which, the steam in the chamber will then be condensed, forming a vacuum in the chamber, which vacuum will be the cause of drawing water from the supply into the chamber. The quantity of steam passing over from the generator to this chamber will be small as compared with the chamber, and the vacuum producing condensation will be so rapid that the oncoming steam will be largely condensed. After the initial condensation of steam which forms the vacuum if a small amount of steam should enter the chamber it will not be sufficient, even if not immediately condensed which it will be in most instances, to impair the efficiency of the vacuum. Steam from the boiler will be utilized for passing the water from said chamber into the boiler by overbalancing a column of water in the pipe leading into the boiler, so that the static force of such column together with the steam pressure will open a back pressure valve and the water will pass into the boiler.

The drawing accompanying and forming a part of this specification illustrates a form of device for carrying out my invention; a boiler being shown in end view partly broken away in cross section, and a device for supplying feed water partly in elevation and partly in vertical section. The various pipes

are shown as broken to indicate that the lengths of these are not necessarily of the proportions illustrated.

A steam generator is here illustrated as a boiler 50 which has the normal or high water level represented therein by 60, which high water level at times will be at or adjacent to an opening 70 for permitting passage of steam to the controlling device; illustrated at the left hand side of the boiler. For the efficient working of the device, which for convenience will be termed a steam pump, a certain amount of steam, preferably dry, must be passed from the boiler into the chamber 75. The surface of the water in the boiler is always more or less agitated when giving off steam, and the steam which is nearest the surface of the water contains at times a considerable percentage of moisture. This condition will vary, doubtless, in different types of boilers, and in the same type of boiler when being forced at one time and being worked below capacity at another. In practice I have found that at times it is necessary to have the opening 70 somewhat above the level at which it is desired to maintain the water line.

A condensing and water storage chamber will be employed. This condensing chamber in the present illustration is shown at 75. The bottom of the chamber may be placed at about the water level of the boiler which in certain installations will give the most satisfactory results; but the device will also work successfully with the chamber at other positions relative to the boiler level.

The opening 70 from the boiler is here illustrated as the working open end of a line of pipe 7, comprising a pipe 71 connecting with a pipe 72, which by means of a restricted nozzle 73 finds entrance into the chamber 75. The pipe 71 is shown as provided with a hand valve 84 for controlling the amount of steam which passes out of the boiler. The pipe 72 where this enters the chamber 75 is also shown as provided with a hand valve 74 for controlling the passage of steam into such chamber.

The feed water is supplied from some suitable source of supply, not shown, by means of a pipe 76. This pipe is shown with a back pressure valve 77 closing against the flow of the supply water. The supply pipe by means of a continuation 78 enters the chamber 75 and has an open end at an appreciable distance above the bottom of the chamber

75, and is shown at provided with a sprinkler in the form of a rose 81. A line of pipe 8 will run from chamber 75 to the boiler at a point below its normal portion of the supply water stored level for supplying the feed water, and comprises in the present illustration pipe 78, a reducer 82 from which extends a pipe 83, and from this extends a riser pipe 85 having an upper run 86 above the water level 750 in the chamber 75, and also above the water level 60 in the boiler 50, and a drop leg 87 which connects with a pipe 88 entering the boiler at some convenient point below the water level. The back pressure to such pipe from the boiler is controlled by a valve 89 opening toward the boiler. A line of smaller pipe 9 is shown extending from the chamber 75 to the line of pipe 8 and is shown connected to the juncture of the pipes 85 and 86 by a reducer elbow 90, such pipe comprising a portion 91, an upright portion 92 and an end 93 entering the chamber 75 below the open end of pipe 78.

The operation of the system may be briefly summed up as follows: Assuming the parts to be connected up substantially as illustrated herein, and that water is in the chamber 75 to the level 750 there indicated, upon the water level in the boiler sinking sufficiently to permit steam to pass through the opening 70 and exert its influence within the chamber 75 water will be forced out of such chamber. The boiler pressure against the boiler end of the line of pipe 8 will be balanced by the steam passing into the chamber 75 and the difference between the heights of the columns in the pipes 85 and 87 forms a static column having sufficient pressure to overcome the valve 89 and open this. The water, after its level is below the open end of pipe 78, will continue to flow from the chamber by pipe 9 until it has uncovered the pipe end 93, when steam will pass to the pipe 86 through the line of pipe 9, which will break the balance in the line of pipe 8 and permit a portion of the water in the downward pipe 87 to continue its passage into the boiler, and the water in the pipe 85 to flow backwardly and through the rose 81 into the chamber 75 and condense the steam therein. But before such condensation is effected steam will have passed up the line of pipe 9, carrying with it a certain amount of moisture or water and inducing this water which is entrained with it to pass into the downward pipe 87, the steam in the line of pipe 8 being cut off from the supply of steam will in the meantime condense and draw in other water to fill the vacuum thus created so that solid water or a column of solid water will be in the pipe 87. By means of valves as 74 and 84 the admission of steam in the chamber may be so controlled that it will not interfere with the formation of a working vacuum. Upon the condensation

of steam within the chamber 75 and the formation of a vacuum in such chamber, water will be drawn from the supply into the chamber 75, where it will remain until sufficient steam again passes over from the boiler to permit the static column of water to enter the boiler.

It will be noticed that this mechanism operates substantially without valves or movable parts so far as the emptying of the storage of the supply is concerned and so far as indications are communicated to this from the boiler that the water level has been lowered.

By arranging the line of pipe 8 somewhat in the manner here illustrated there is not only provided a static column in pipe 87 to overcome the resistance of the valve at the boiler, but also a supply of water is stored in pipe 85 for condensing the steam in the chamber 75.

Having described my invention I claim:

1. The combination with a steam pump having a working chamber, an open connection for steam and connections for liquid supply and liquid discharge, of means for retaining a portion of the supply, a connecting passage between said means and the working chamber constructed and adapted for automatically causing a release of the supply so retained and from said means at periods corresponding to the condition of each discharge for effecting condensation and causing a vacuum in the said working chamber.

2. A steam pump having a supply and a discharge connection and embodying a chamber having an open steam supply connection, means connected with the chamber for storing liquid, and a steam connection between the lower portion of the chamber and the storing means.

3. In a boiler, the combination with a source of steam supply, of a chamber having an open steam connection, a connection for feed liquid supply, a discharge, and means for automatically discharging a portion of the liquid contained in said chamber or its said connections for discharge and supply into said chamber for condensing the steam and causing a vacuum.

4. The combination of a chamber having an open steam connection a liquid supply connection, a liquid discharge connection, and means for automatically discharging a portion of the liquid contained in said discharge connection into said chamber for condensing the steam and causing a vacuum in such chamber.

5. The combination with a steam generator, of a feeder, there being a communication from the feeder to the generator at a point below the low water level in the generator, a continuously open communication from the generator at about its normal water level to the feeder, means in communication with the

feeder for storing water, a connection from the feeder located and timed for passing steam from the feeder to the storing means for releasing the contents thereof and permitting the water therein to enter the feeder at the end of the feeding stroke.

6. The combination with a steam generator, of a condensation chamber located above the generator, a line of pipe extending from within the generator adjacent the normal water level therein to the upper portion of the condensation chamber, a line of pipe extending from the condensation chamber above its lower portion to within the generator below the water level therein, means in communication with the chamber for storing a static body of water, and a steam connection between the lower portion of the said chamber and the upper portion of the storing means for releasing the water therein.

7. The combination with a steam generator, of a condensation chamber, a steam connection between the generator and the condensation chamber, the condensation chamber having a supply and discharge opening at a point above its lower portion, a water supply and a water connection with the lower portion of the generator in communication with said supply and discharge opening, and means for effecting rapid condensation in the chamber, and a connection between the lower portion of the chamber and the water connection with the generator for releasing a portion of the water in such connection and returning this to the chamber for condensing the steam in the chamber.

8. The combination with a steam generator, of a condensation chamber, a steam connection between the generator and the condensation chamber, the condensation chamber having a supply and discharge opening at a point above its lower portion, a water supply and a water connection with the lower portion of the generator in communication with said opening, and means for effecting rapid condensation in said chamber.

9. The combination with a steam generator, of a line of pipe extending from within the generator adjacent the normal water level, away from the generator and back within the same below the water level, the line of pipe having in its return portion a riser portion extending above the said water level, the line of pipe between its water level end and the riser portion embodying a condensation chamber, a water supply entrance to the chamber above its lower portion, and a connection between the lower portion of said chamber and the riser portion of the line of pipe.

10. The combination with a steam generator, of a line of pipe extending from within the generator adjacent the normal water level, away from the generator and back

within the same below the water level, the line of pipe having in its return portion a riser portion extending above the said water level, the line of pipe between its water level end and the riser portion embodying an enlarged chamber, a water supply entrance to the chamber above its lower portion, and a connection between the lower portion of said chamber and the upper part of the riser portion of the line of pipe.

11. The combination with a steam generator, of a condensation chamber located above the bottom of the generator, a line of pipe extending from within the generator adjacent the normal water level to the condensation chamber, a line of pipe extending from the condensation chamber above its lower portion to within the generator below the water level, the line of pipe having a riser portion extending above the said water level, and a connection between the lower portion of said chamber and the riser portion of the line of pipe.

12. The combination with a steam generator, of a condensation chamber, a steam connection between the generator adjacent the normal water level and the upper portion of the condensation chamber, the condensation chamber having a supply and discharge opening at a point above its lower portion, a water supply and a connection with the lower portion of the generator in communication with said opening, said connection having a riser portion extending above the water level in the generator, and a connection between the condensation chamber below said opening and the upper part of the riser portion of the connection.

13. The combination with a steam generator, of a condensation chamber located above the bottom of the generator, a line of pipe extending from within the generator adjacent the normal water level to the upper part of the condensation chamber, means for restricting the flow of steam from said pipe into the condensation chamber, a pipe entering the condensation chamber and provided with an opening at a distance above the bottom thereof, a water supply in communication with the said pipe entering the condensation chamber, a line of pipe in communication with the lower portion of the generator and the said pipe entering the condensation chamber, said line of pipe having a riser portion extending above the water level in the generator, and a pipe between the condensation chamber below the said pipe entering the same and the upper part of the said riser portion.

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Witnesses:

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