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FUEL FEEDING SYSTEM FOR STEAM BOILER FURNACES.

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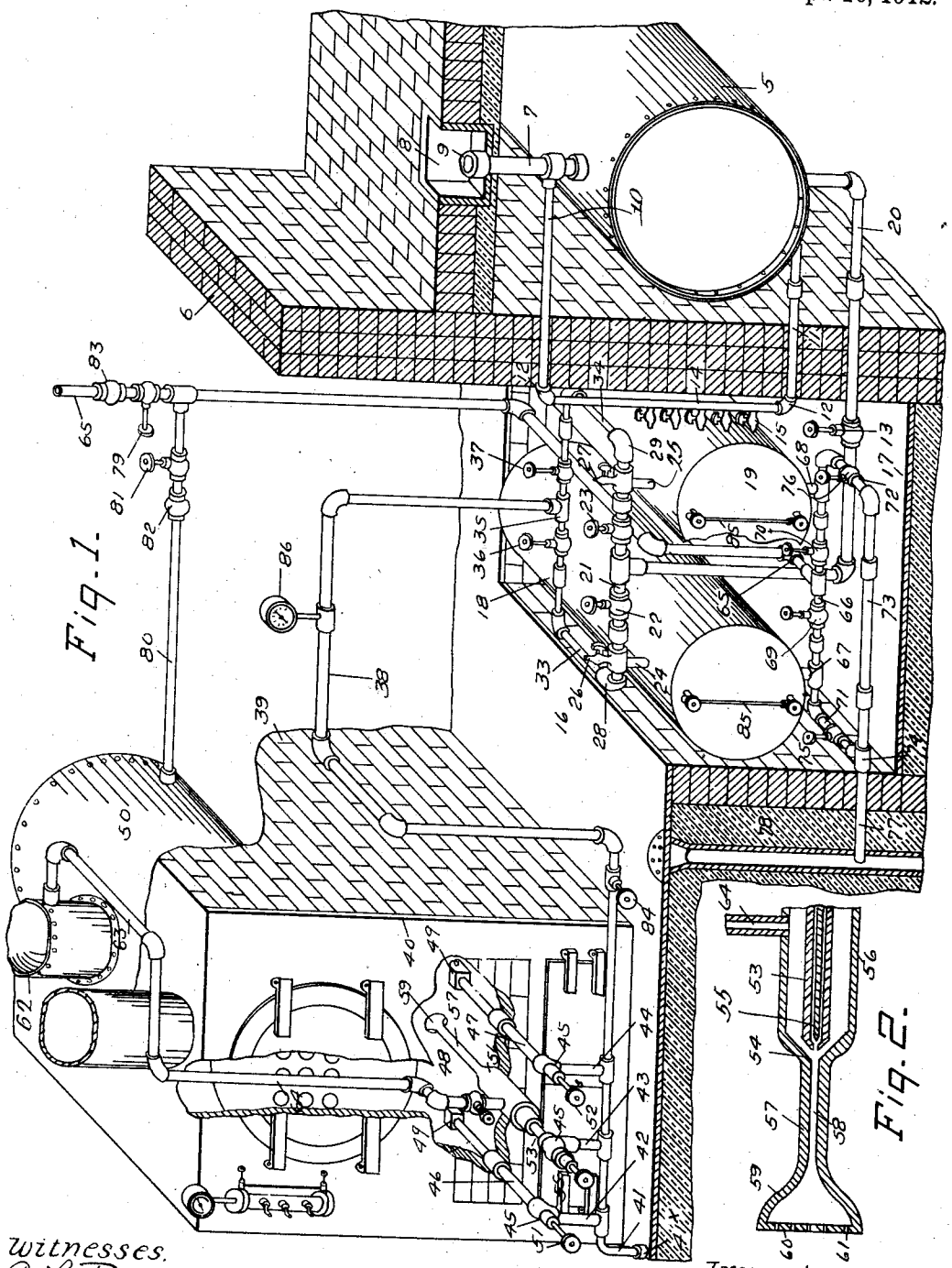

Fig. 1.

Fig. 2.

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FUEL-FEEDING SYSTEM FOR STEAM-BOILER FURNACES.

1,038,069. Specification of Letters Patent. Patented Sept. 10, 1912.

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To all whom it may concern:

Be it known that I, THOMAS T. BATHURST, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Fuel-Feeding Systems for Steam-Boiler Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawing, forming a part of this specification.

The invention relates to a system of feeding hydro-carbons under fluid pressure, to feed the hydro-carbons to the burner for combustion within the combustion chamber of a furnace or heater; and it has for its object, first, in a steam boiler furnace, to automatically control different fluid pressures upon the body of the oil.

The invention consists in the novel assemblage of parts, which will be first fully described and then specifically pointed out in the claims.

In the drawings, Figure 1 is an isometric view of a steam boiler furnace and high pressure steam boiler, also showing the main supply and storage tank for the hydro-carbons, and the hermetical fluid pressure tanks below the level of the furnace, also showing the pressure tanks for the fuel oil, the burners, the water pipe connections with the steam boiler and the water pressure and supply pipes and the novel means for controlling the fluid pressures. Fig. 2 is a sectional view of the combined atomizer injector and spray-producer for admixture of the steam and hydro-carbon.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

Referring to the drawings, 5 indicates a storage tank for the hydro-carbon, which, as shown, is located outside of the wall 6, of the furnace room and beneath the surface of the ground. With the upper portion of the tank is connected one end of a supply pipe 7, the upper end of said pipe extending upwardly within an open box 8, and provided with a screw cap 9.

10 and 11 indicate pipes extending through the wall 6, of the furnace room and connected at their ends in one direction with the respective upper and lower side portions of the horizontal tank 5. The ends of the pipes 10 and 11 extending in the other direction are provided with elbow joints 12, with which are connected the vertical pipe 14. With the pipe 14 are connected the pet-cocks 15, arranged in vertical series for indicating the height of the oil in the tank 5.

Within the wall 6, of the furnace room, as shown, beneath the floor 16, is a pit 17, in which are arranged horizontally in position the parallel hermetical pressure tanks 18 and 19, the upper surface of these tanks being below a horizontal plane extending diametrically through the supply tank 5.

20 indicates a supply pipe connected with the lower portion or side of the supply tank 5 at one end, the other end being extended downwardly a short distance, thence bent at right angles and extended through the wall 6, into the pit 17, beneath the pressure tank 19; thence bent at right angles and extended upwardly between said tanks 18 and 19, and to a point a short distance above the horizontal plane of the upper surfaces of said tanks and connected with a pipe 21, extending transversely to the said tanks. In pipe 20, is a cut-off valve 13. In the pipe 21, on each side of the point of connection of pipe 20 therewith, are the cut-off valves 22 and 23. With the outer end portions of pipe 21, are connected the short branch pipes 24 and 25, which extend downwardly and are connected with the upper side portions of the respective pressure tanks 18 and 19. With the upper surface of pipe 21, above the openings to the branch pipes 24 and 25, are connected the pet-cocks 26 and 27, respectively. With the extreme outer ends of pipe 21, are connected the elbow joints 28 and 29, and with said joints are connected the inner ends of the pipes 33 and 34, the outer ends of which pipes extend rearwardly a considerable distance, and thence bent at right angles and extended inwardly toward each other and connected with a three-way pipe joint 35. In the pipes 33 and 34, upon the opposite sides of pipe joint 35, are the cut-off valves

36 and 37. With the three-way joint 35, is connected the lower end of a feed pipe 38, the upper end of which pipe extends upwardly a short distance, thence in the direction of the side wall 39, of a steam boiler furnace, thence extended downwardly in the direction of and to a point a short distance above the floor 16, supporting the furnace, thence horizontally past the lower portion of the furnace front 40 and a short portion, bent at right angles and extended downwardly and provided with a screw threaded closure or cap 41ˣ, this portion 41, of the pipe forming a sediment holder for the heavy hydro-carbons. From the lower horizontal portion of the feed pipe 38, extend upwardly the separate branch pipes 42, 43 and 44, these pipes being spaced apart and provided with elbows 45, at their upper ends. With the elbows connected with the outer pipes 42 and 44 are connected the ends of the pipes 46 and 47 respectively, the other ends of said pipes being extended horizontally through the furnace front 40 into the combustion chamber 48 of the furnace. Upon the said ends of the pipes 46 and 47 are atomizing spray producers 49, of the form shown in my previous applications for Letters Patent, Serial No. 589,629, Oct. 28, 1910, and Nos. 627,627—627,628 of May 16, 1911.

The intermediate device between the atomizing spray producers consist of a combined atomizer and injector and spray producer, for the admixture of dry steam and atomized oil, and oxygen as further described. The feeding of the oil to the spray producers 49 is controlled by the cut-off valves 51 and 52, in the pipe joints 45 connected with the branch pipes 42 and 44. With the pipe joint 45 on the branch pipe 43, is connected the inner end of a pipe 53, the outer end of which pipe extends through the furnace front, plate 40, and a like distance within the combustion chamber described, of the spray producers 49. The outer end of the pipe 53 is provided with a valve seat 54. In said pipe 53 is a needle valve 55, the inner end of which valve seat is cone shaped and likewise the inner end of the needle valve, which valve extends through pipe joint 45, within the pipe 53, to the valve seat 54. Extending around the outer end portion of pipe 53 is a casing 56, larger in circumference than said pipe. The forward end of said casing is reduced in circumference adjacent to the outer end of pipe 53, and from said point extends a neck 57, in which neck is a restricted opening 58. The outer end of said neck is enlarged in circumference to form a spraying chamber 59, the outer end 60, of said chamber being provided with small spraying perforations 61. With the steam dome 62, on the boiler 50, is connected one end of the steam conducting pipe 63, the other end of which pipe extends to a point a short distance from the furnace front, plate 40, thence extended downwardly through the smoke jacket 64, to a point directly above the neck 57, of the casing 56, thence bent at an angle and extended through the furnace front, plate 40, and bent downwardly and connected with the outer end portion of casing 56.

65 indicates a water service and supply pipe leading from the usual water service system in the street. As shown, the pipe 65 extends downwardly into the furnace inclosure or room and at the rear of the pressure tanks 18 and 19, thence extended into the pit 17, and thence bent at right angles and extended forwardly between said pressure tanks and connected with a fluid pipe 66 extending transversely to and beneath the forward ends of the pressure tanks 18 and 19. From points near the ends of pipe 66, are connected branch pipes 67 and 68, leading into the lower portion or bottom of the pressure tanks 18 and 19, respectively.

In pipe 66 are cut-off valves 69 and 70, located upon opposite side of the point of connection of pipe 65 with the pipe 66. With the ends of pipe 66 are connected the pipes 71 and 72, extending at right angles to said pipe and forwardly a short distance. With the forward end of pipe 72 is connected one end of pipe 73, the other end of which pipe extends in a parallel line with pipe 66, to a three-way pipe joint 74, with which joint is connected the forward end of pipe 71. In pipes 71 and 72 are cut-off valves 75 and 76, respectively. From the three-way pipe joint 74, is extended a short pipe 77, which is connected with the side of a vertical drainpipe leading from the floor 16, to the sewer.

In the water service and supply pipe 65, is a cut-off valve 79. With the side of the boiler 50, at a point in the direction of the bottom and below the water line, is connected one end of a water-conducting pipe 80, the other end of which pipe is connected with the water service pipe 65, below the valve 79. In the pipe 80, adjacent the point of connection with pipe 65, is a cut-off valve 81. In the pipe 80 between the boiler 50, and valve 81 is a check valve 82 and in the water service pipe 65, above the cut off valve 79 is a check valve 83 and in feed pipe 38 is a cut off valve 84. Upon the forward ends of the pressure tanks 18 and 19 are oil and water sight gages 85, of the usual and well known description, for indicating the height of the oil and water, and upon the feed pipe 38, is a pressure gage 86, for indicating the fluid pressures in the feed pipe.

In the preparatory stages for the utilization of the hydro-carbon for the generation of steam in the steam boiler furnaces, the valves 22 and 23 in pipe 21 above the pres-

sure tanks 18 and 19, and the valve 13 in pipe 20, leading from the storage tank 5 to said pipe 21, are first opened, supplying the oil by gravity pressure, to said pipe 21 and through branch pipes 24 and 25 to the pressure tanks 18 and 19, until these tanks are completely filled, when said valves 22, 23 and 13 are closed.

The cold water is supplied to the steam boiler 50 in the usual manner, and maintained at the proper level for the generation of steam. Valves 69 and 70 in pipe 66, connected with the bottom of the pressure tanks 18 and 19 and with which the water service pipe is connected, are now opened and also valve 79 in said pipe, and a water pressure of twenty pounds, approximately, is forced within the pressure tanks upon the body of oil at the bottom of the tanks, this pressure being sufficient to compress the hydro-carbon within the pressure tanks. The valves 36 and 37 in the pipes 33 and 34, and also valve 84 in the feed pipe 38, being opened, the water pressure now upon the oil forces the oil through the feed pipe 38 to the valve joints 45, leading to the spray producers 49. The valves 51 and 52 are first opened and the oil is atomized and sprayed through the spray producers into the combustion chamber, and ignited, and from the combustion of oil beneath the boiler the temperature of the water is gradually increased and steam is quickly generated. Upon the generation of live steam the pressure of the steam is equally upon the body of water in the boiler 50, increasing in force as the water is converted into steam. The valve 81 in pipe 80 being opened, the hot water under pressure of from fifty to one hundred pounds, passes through pipe 80, past the check valve 82, and into the water service pipe 65 overcoming the lesser force of the cold water which it displaces, closing check valve 83, and passing into the pressure tanks 18 and 19 and replacing the pressure of the cold water by water of high temperature, which tends to lessen the viscosity of the oil and render the feeding with greater force from heat compression as the hot water displaces the cold.

Steam being generated by the burners 49 in the steam boiler 50, the valves 51 and 52 controlling the flow of the oil to said burners, are closed and the needle valve 55 in pipe 53 is then opened, admitting the oil to the said pipe and past the valve seat 54, at which point the oil is atomized. The steam from the upper portion of the boiler or dome passes through pipe 63 and into the casing 56, surrounding pipe 53, and past the orifice in pipe 53, and mixes with the atomized oil, which oil now passes through the restricted opening 58 in the neck 57, which forms the mixing chamber of oil and steam, into the spreading nozzle 59 for the admixed steam and oil, which is now sprayed through the openings 61 into the combustion chamber beneath the boiler, at the same time drawing the air within the casing 56 to admix with the admixture of oil and steam, and increase combustion.

The diminution in the amount of steam pressure from the consumption of the water in the boiler, will be followed obviously with a diminution of the hot water pressure in the boiler, particularly in refilling the boiler, in which case the needle valve 55 is closed and the water pressure from the water service pipe overcomes the pressure of the hot water, and is forced past the check valve 83 and obtains the pressure required to feed the oil through the feed pipe and to the burners 49, the valves 51 and 52 leading to which are then opened and steam generation resumed. The variance in pressures is as seen controlled by the valves automatically. For the purpose of removing sediment or deposits from the oil in the pressure tanks 18 and 19 when the oil has been fully consumed, the valves 75 and 76 in pipes 71 and 72 which are for the purpose of removing water from the tanks 18 and 19 respectively are opened. The valve 79 in pipe 65 being closed, the water remaining in the said tanks 18 and 19 is discharged into the sewer. The pet-cocks 26 and 27 are employed to permit of the escape of the air when the tanks 18 and 19 are being filled.

I have shown the invention applied to a steam boiler furnace; its application may, however, be made to all hot water heating systems, and other devices or the ordinary burners may be employed in lieu of the spray producer, and such modifications employed as are within the scope of the appended claims.

Having fully described my invention, what I now claim as new, and desire to secure by Letters Patent, is:

1. In a fuel feeding system the combination with a steam generator of a liquid fuel burner, a liquid fuel holding pressure tank, a feed pipe connected with said tank and said burner, a water service and supply pipe connected with said tank, a hot water supply pipe leading from the steam generator to the water service and supply pipe, and automatic means for admitting the fluid of greatest pressure from either the water service pipe or the hot water supply pipe through the water service pipe to the fuel holding pressure tank to displace the liquid fuel therein.

2. In a fuel feeding system the combination with a steam generator of a liquid fuel atomizing spray producer, a liquid fuel holding pressure tank, a feed pipe for the liquid fuel connected with said tank and said liquid fuel atomizing spray producer, a

water service and supply pipe connected with said pressure tank supplying water to displace the liquid fuel at a low pressure, a check valve in said water service and supply pipe, and a hot water supply pipe connected with said steam generator and said water service pipe between said check valve in said water service pipe and said pressure tank.

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Witnesses:
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