No. 631,209. Patented Aug. 15, 1899.

H. L. FREEMAN.

STEAM GENERATOR.

(Application filed Aug. 24, 1898.)

(No Model.)

FIG. 1.

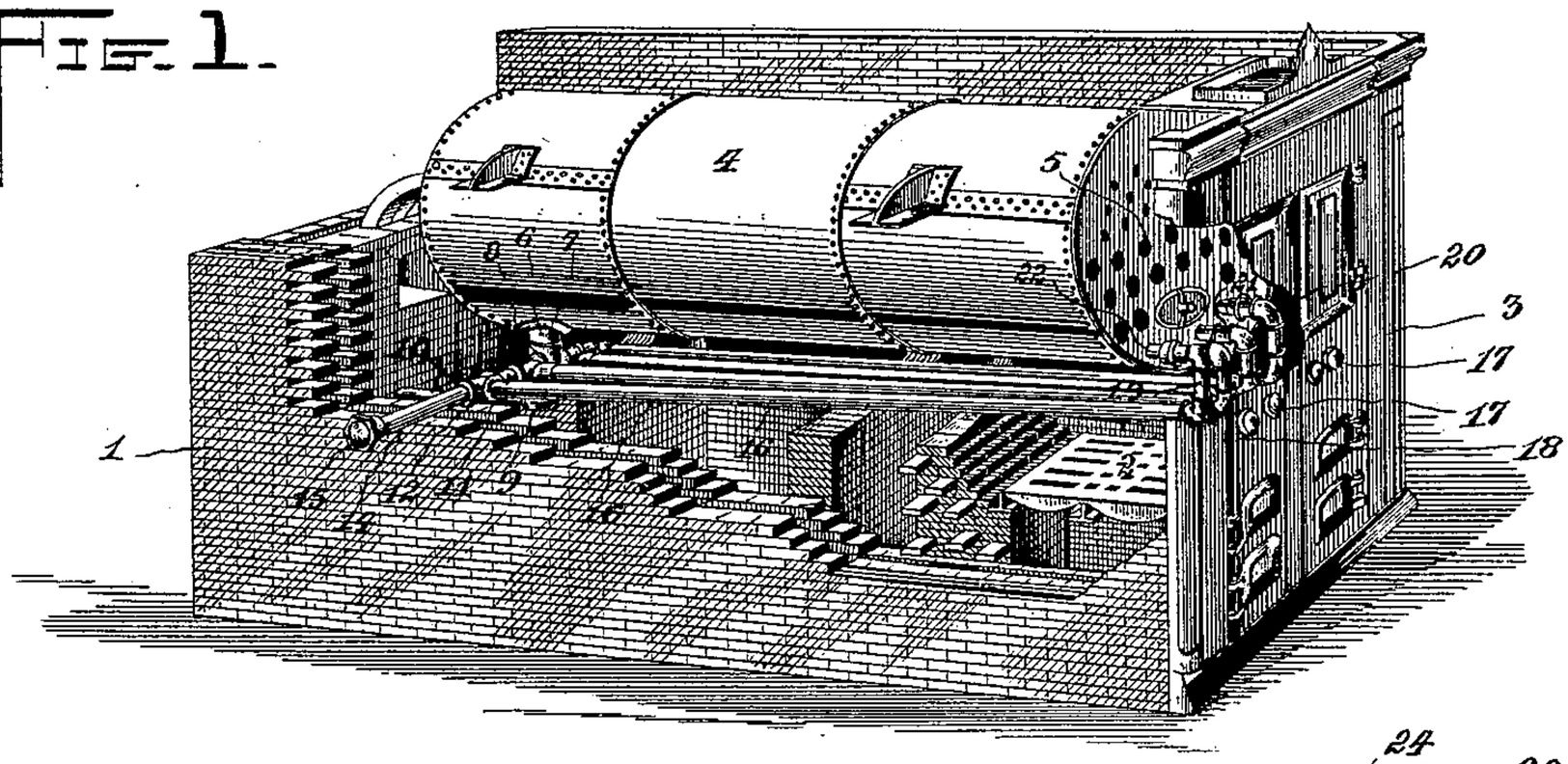

FIG. 2.

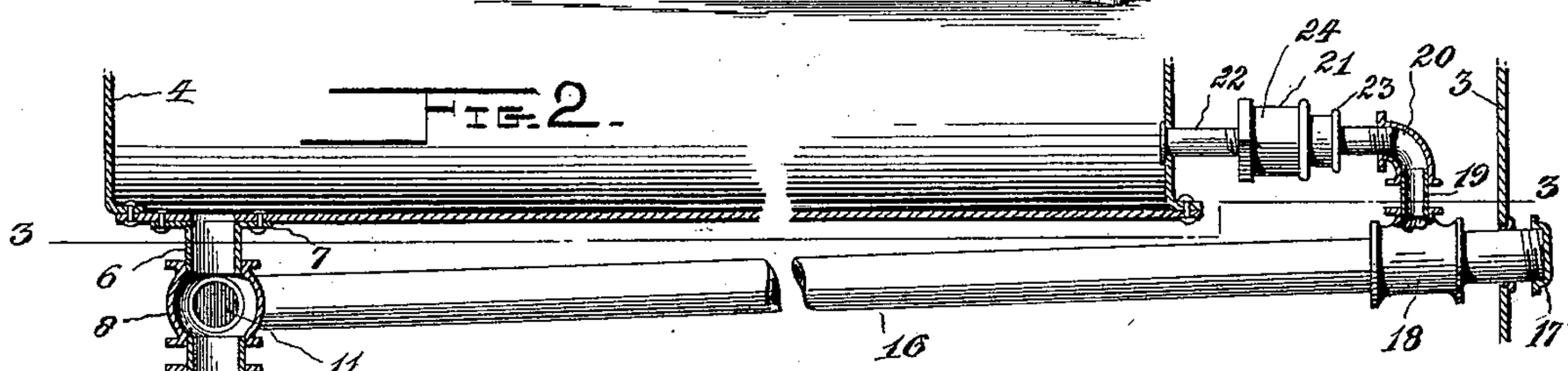

FIG. 3.

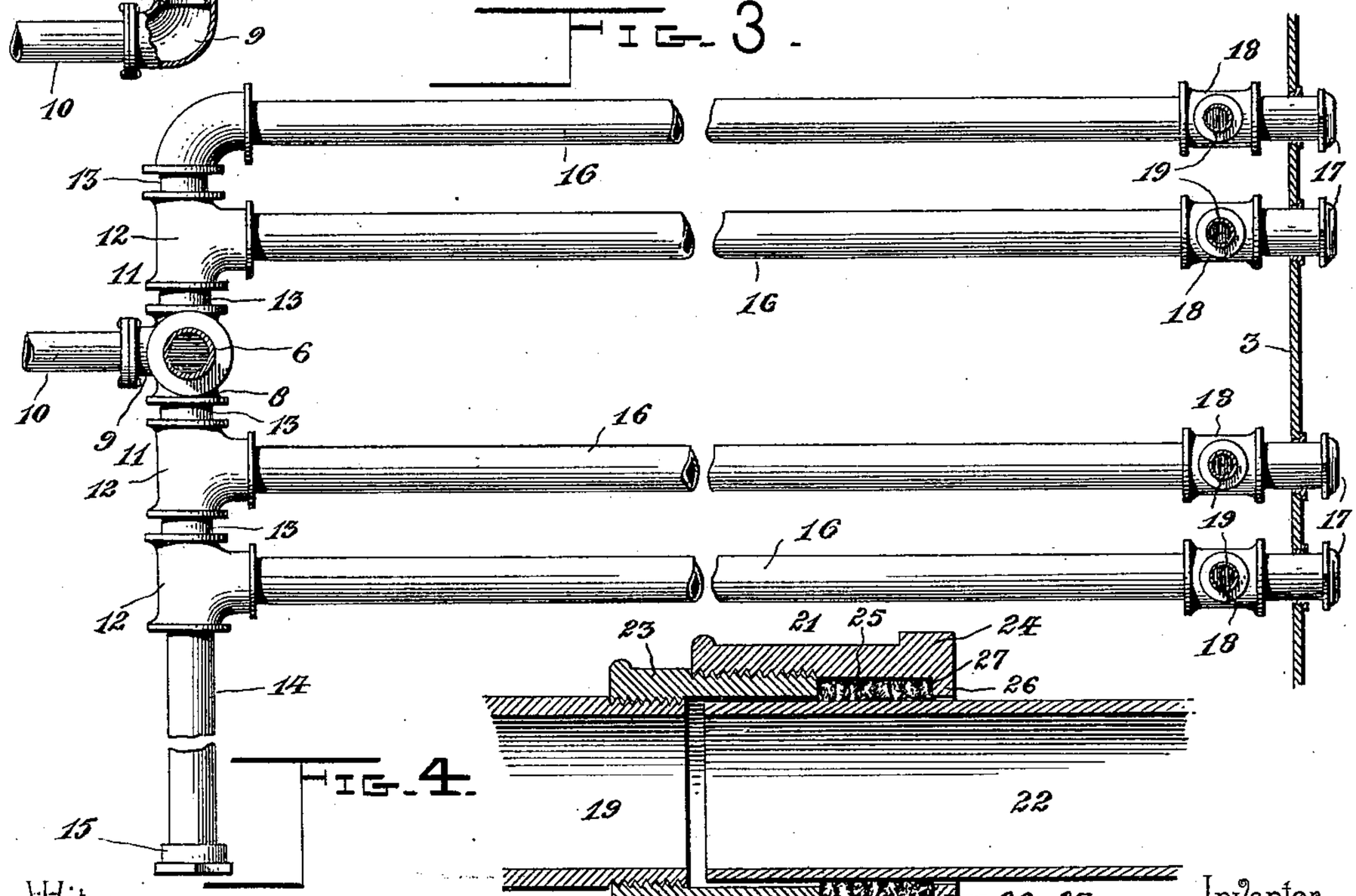

FIG. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

HORACE LIZZELLE FREEMAN, OF LEXINGTON, NORTH CAROLINA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 631,209, dated August 15, 1899.

Application filed August 24, 1898. Serial No. 689,412. (No model.)

To all whom it may concern:

Be it known that I, HORACE LIZZELLE FREEMAN, a citizen of the United States, residing at Lexington, in the county of Davidson and State of North Carolina, have invented a new and useful Steam-Generator, of which the following is a specification.

This invention relates to steam-generators, and more especially to that class of generators in which a separate water heating and circulating attachment is used in connection with the boiler and is arranged below the boiler within the furnace-casing above the fixe-box, so as to receive the direct effect of the heat from the fire and provide for heating and continuously circulating the water within the boiler.

To this end the invention primarily contemplates a novel arrangement of water heating and circulating pipes arranged below the boiler and entirely within the furnace-casing and above the fire-box and so connected with the boiler as to establish a continuous circulation, whereby all of the water in the boiler will pass through said pipes, and thereby be maintained at an even temperature.

The invention also contemplates a novel manner of mounting the heating and circulating pipes, whereby each of such pipes is capable of independent contraction and expansion, while at the same time being so arranged as to provide for a circulation which is sufficiently strong to wash all precipitated matter to the blow-off-pipe connection.

A further object of the invention is to provide novel and efficient means whereby all of the pipes constituting the heating and circulating attachment for the boiler can be readily cleaned from the outside of the furnace, and thereby maintain the efficiency of the generator.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a perspective view of a steam-generator embodying the improvements contemplated by the present invention, one side wall of the furnace-casing being broken away to expose the mounting of the series of heating and circulating pipes. Fig. 2 is a vertical longitudinal sectional view of a portion of the steam-boiler and the heating and circulating attachment fitted thereto. Fig. 3 is a plan view of the attachment, the line of section being taken immediately beneath the boiler, as indicated by the line 3 3 on Fig. 2. Fig. 4 is an enlarged sectional view of the expansion-coupling for the front connection of each heating and circulating pipe.

Referring to the accompanying drawings, the numeral 1 designates an ordinary furnace-casing having the usual fire-box 2 and the front plate 3, and supported within the furnace-casing is an ordinary type of tubular boiler 4. The tubular boiler 4 is of a horizontal type and is provided therein with the usual fire-tubes 5, which communicate with the interior of the furnace-casing in the usual way to allow the entire products of combustion in the fire-box to be returned through the boiler before escaping to the stack or chimney. These features of construction are well known in the art and form no part of the present invention, which is adapted for use in connection with steam-boilers of the type described, but specific reference is made thereto in order that the improvements claimed herein may be fully understood.

To provide for properly connecting the water heating and circulating attachment with the boiler 4 at the under side thereof, a pendent distributing-nipple 6 is employed. This distributing-nipple 6 is preferably provided at its upper end with a flange 7, securely riveted to the shell of the boiler at the under side, near the rear end thereof; but it will of course be understood that the said nipple may be fitted to the boiler in any other suitable manner, so as to communicate with the interior thereof and at its lowest point, whereby all the water within the interior water-space of the boiler will be compelled to pass through the nipple 6 and thence through the other pipes forming a part of the attachment. The pendent distributing-nipple 6 has fitted thereto a cross-coupling 8, to the lower side of which is coupled, by means of the elbow 9,

the blow-off pipe 10, which preferably extends through the rear wall of the furnace-casing, as illustrated in Fig. 1 of the drawings, and has fitted thereto an ordinary blow-off cock, which can be opened from time to time when it is desired to blow off accumulations of sediment from the boiler and the water heating and circulating attachment thereof. The opposite side portions of the cross-coupling 8 support the oppositely-extending portions of the header-pipe 11, arranged transversely beneath the rear end portion of the boiler, and said transverse horizontally-arranged header-pipe 11 extends from opposite sides of the nipple 6, or at least the coupling 8 thereof, and essentially consists of a plurality of couplings 12 and short intermediate nipples 13, joined together in the same manner as the ordinary pipe-couplings; but it will of course be understood that the couplings 12 and nipples 13 form a complete header-pipe having uninterrupted communication between all of its parts from end to end.

The transverse horizontally-arranged header-pipe 11 is preferably provided with an extension 14 at one end, which projects through one side of the furnace-casing and has fitted to its outer open end a closure plug or cap 15, which when removed admits of ready access to the header-pipe from end to end thereof, so that the same may be readily cleaned throughout its entire length. The couplings 12, forming a part of the header-pipe 11, provide for the connection with such pipe of the series of longitudinal water heating and circulating pipes 16. The longitudinal heating and circulating pipes 16 are arranged in any desired number side by side in the same transverse plane beneath the boiler 4, so as to extend longitudinally of the latter from end to end thereof. By reason of this arrangement the said pipes are necessarily disposed within the main fire-flue beneath the boiler and directly over the fire-box 2, thereby receiving the direct action of the fire.

The rear ends of the pipes 16 are fitted in the coupling 12, and from this point the said pipes extend forward at a slight upward inclination and have their front ends extended through the furnace-front 3 and fitted with the closure caps or plugs 17, which admit of the ready cleaning of the individual pipes 16 independently of each other. Adjacent to their front ends and at the inner side of the furnace-front 3 each of the pipes 16 has fitted thereto a T-coupling 18, to which is connected one end of a branch circulating-pipe 19, having an elbow-joint 20, and also having an expansion-coupling connection 21 with a front coupling-nipple 22, fitted in the front end or head of the boiler beneath the line of the fire flues or tubes 5, thereby providing an independent-coupling connection between the forward end of each water heating and circulating pipe 16 and the front end of the boiler. The expansion-coupling connection 21 for the forward end of each pipe 16 compensates for unequal expansion between the boiler and said pipe, while at the same time each pipe is free to expand and contract independently of the other, thereby greatly increasing the durability and efficiency of the water heating and circulating attachment.

Each expansion-coupling connection 21 essentially comprises an inner sleeve 23 and an outer adjustable packing-gland 24, confining therein asbestos packing 25. The inner sleeve 23 of the coupling is interiorly and exteriorly threaded, the interior threads thereof engaging with the upper threaded end of the branch circulating-pipe 19, so as to be rigidly carried thereby, while the exterior threads of said sleeve 23 are adjustably engaged by the interior threads of the outer packing-gland 24. Each packing-gland is provided at the end opposite its connection with the sleeve 23 with an inwardly-disposed flange 26, forming an interior shoulder 27, against which abuts the packing 25, so that when the gland 24 is tightened up the said packing will be firmly compressed on the unthreaded portion of the nipple 22, which is received within the coupling. The nipple 22 has no positive connection with the coupling, so that any unequal expansion of the parts will permit a relative movement thereof without impairment of the same.

In the operation of the water heating and circulating attachment it will be understood that the forward ends of the pipe 16 immediately above the fire-box will be necessarily heated to a higher temperature than at their rear ends, so that the heated water necessarily arises through the branch pipes 19 and into the front end of the boiler. The water within the rear portion of the boiler passes down through the distributing-nipple 6 and is distributed from the header-pipe 11 through all of the heating and circulating pipes and thence again into the front end of the boiler, thereby establishing a continuous circulation of all the water in the boiler, which necessarily produces an even temperature and an easy and quick heating of the water, and thereby economizes the fuel. The circulation which is thus maintained is strong enough to wash all precipitated matter down to the blow-off-pipe connection, through which it can be ejected whenever necessary.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described steam-generator will be readily apparent to those skilled in the art without further description, and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a steam-generator, the combination with the boiler, of a pendent distributing-nipple fitted to the under side of the boiler near its rear end and carrying a transversely-arranged header-pipe extending from opposite sides thereof, and a plurality of heating and circulating pipes arranged longitudinally beneath the boiler at an inclination and coupled at their rear ends to the header-pipe, each of said heating and circulating pipes having an independent coupling connection at its front end with the front end of the boiler, substantially as set forth.

2. In a steam-generator, the combination with the boiler, of a header-pipe arranged beneath the boiler and having a nipple connection therewith, and a plurality of heating and circulating pipes coupled to the header-pipe and each having an independent connection with the front end of the boiler, each of said heating and circulating pipes being provided, contiguous to its connection with the boiler, with an expansion-coupling, substantially as set forth.

3. In a steam-generator, the combination with the furnace-casing and the steam-boiler therein, of a header-pipe arranged transversely beneath the rear end portion of the boiler and having a single nipple connection therewith, said header-pipe being extended at one end through one side of the furnace-casing and fitted with a closure cap or plug, and a plurality of heating and circulating pipes coupled at their rear ends to the header-pipe and having their front ends extended through the furnace-front and fitted with a closure cap or plug, each of said heating and circulating pipes having an independent branch-pipe connection with the front end of the boiler below the line of the fire-tubes therein, substantially as set forth.

4. In a steam-generator, the combination with the boiler, of a header-pipe arranged beneath the boiler and having a nipple connection therewith, a plurality of heating and circulating pipes coupled to the header-pipe and each having an independent branch-pipe connection with the front end of the boiler, and an expansion-coupling fitted to each branch-pipe connection and comprising an inner sleeve fitted to one of the pipe-sections, and the outer packing-gland adjustably fitted to said sleeve and provided at one end with an interior shoulder, and packing arranged within the gland against the shoulder thereof and adapted to be compressed on the other pipe-section, substantially as set forth.

5. In a steam-generator, the combination with the boiler, of a header-pipe arranged beneath the boiler and having a nipple connection therewith, and a plurality of heating and circulating pipes coupled at their rear ends to the header-pipe and having their front ends extended through the furnace-front and fitted with a closure cap or plug, each of said heating and circulating pipes having an independent branch-pipe connection with the front end of the boiler, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HORACE LIZZELIE FREEMAN.

Witnesses:
M. C. BIGGERS,
M. W. CONRAD.