M. CONNOR.

STEAM GENERATOR.

APPLICATION FILED MAY 20, 1908.

943,916.

Patented Dec. 21, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

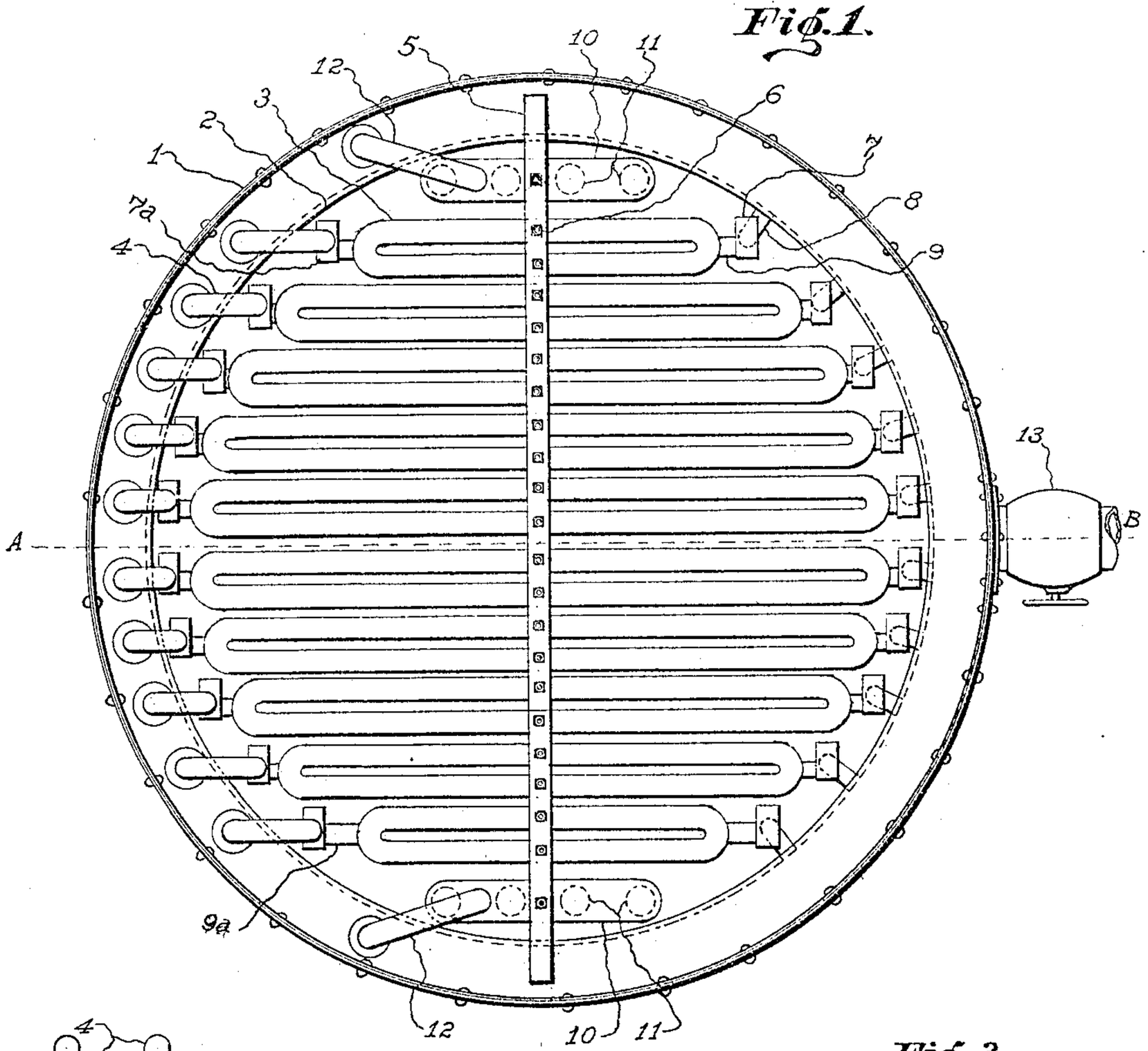


Fig. 2.

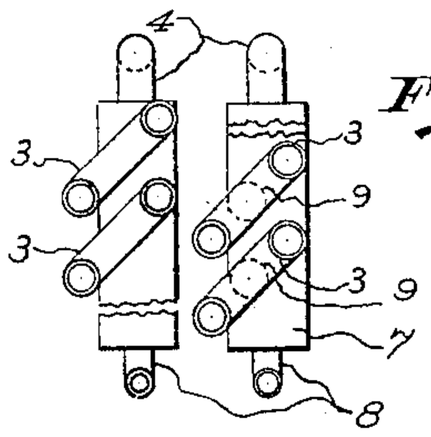
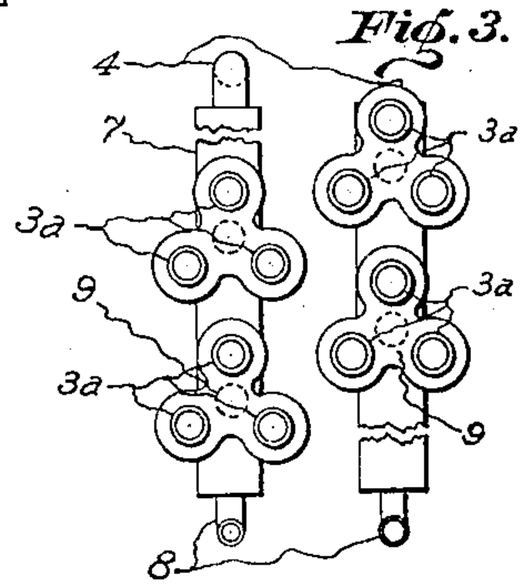


Fig. 3.



Witnesses.

C. W. Walker

Frank Dayton.

Inventor.

Miles Connor

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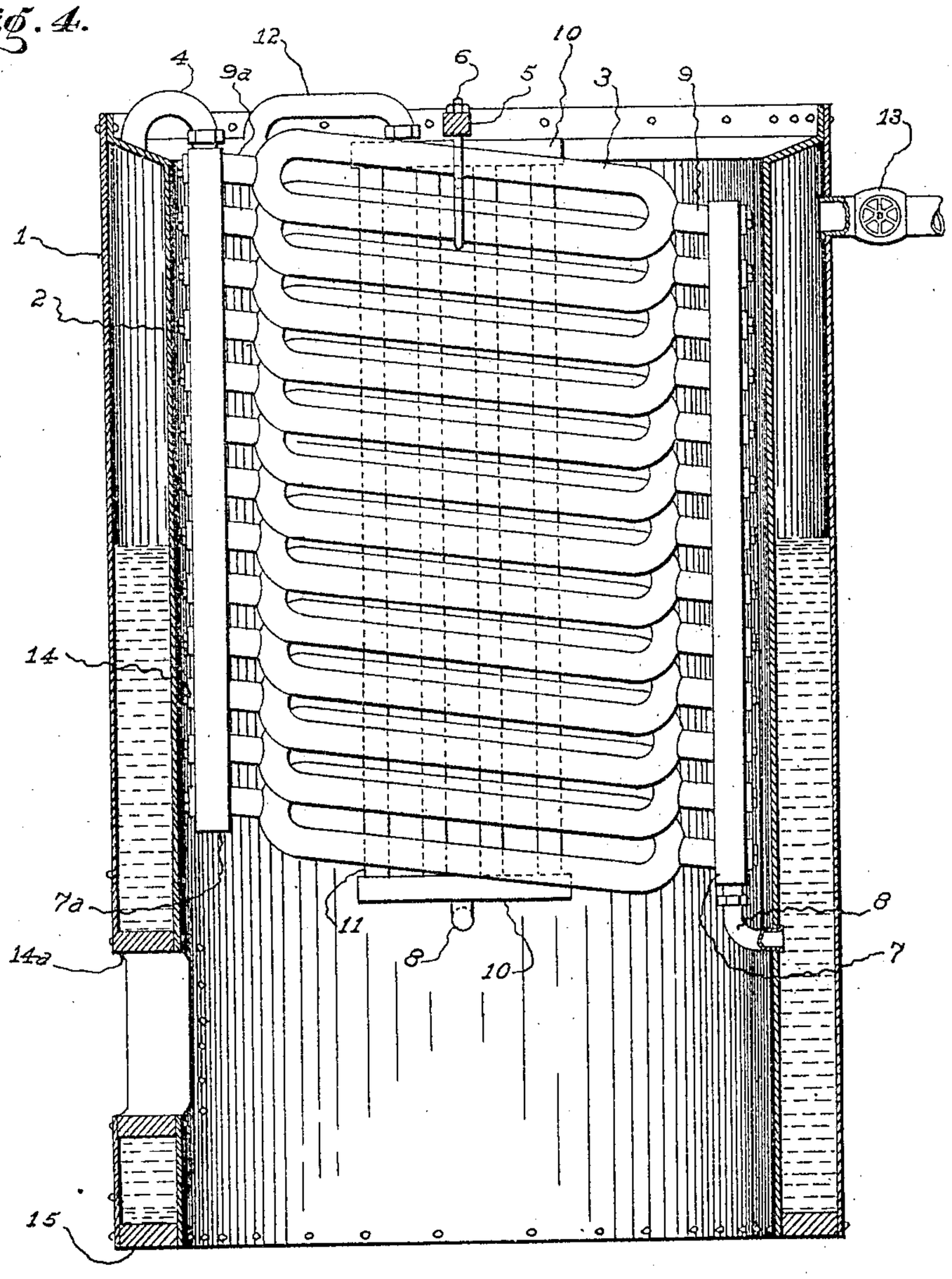
2 SHEETS—SHEET 2.

Fig. 4.



Witnesses.

C. M. Walker

Frank Dayton

Inventor:

Miles Connor

UNITED STATES PATENT OFFICE.

MILES CONNOR, OF PUEBLO, COLORADO.

STEAM-GENERATOR.

943,916. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed May 20, 1908. Serial No. 433,860.

To all whom it may concern:

Be it known that I, MILES CONNOR, a citizen of the United States, and resident of Pueblo, in the county of Pueblo and State of Colorado, have invented a new and useful Improvement in Steam-Generators, of which the following is a specification.

My improvement relates to the type of steam generators known as "vertical sectional water-tube boilers" adaptable for fire engines and other purposes.

The object of this improvement is to provide horizontally inclined tubes that are connected to vertically disposed headers, or manifolds, that may be arranged so the tubes may be in a staggered relation to each other, or in clusters, so that a current of heated gases will be thoroughly broken up and be brought into contact with a number of tubes before escaping to the draft stack; all in such manner as to procure a maximum heating surface on the tubes and manifolds, in proportion to the grate area; to provide for maintaining a constant circulation, within the boiler, in the same direction, and to provide, by means of the arrangement of said tubes and manifolds, for ready removal for repairs thereof and for easy inspection; and to further provide for accumulating the generated steam in the upper portion of the shell of the boiler, above the water therein, from which dry steam for use in engines, or other uses, is taken without the need of any special arrangement of construction inside of shell; all of which are attained by the mechanisms illustrated in the accompanying drawings, in which,—

Figure 1 is a plan view of my invention with the draft stack removed; Fig. 2, is a front elevation of two of the manifolds in broken section, showing the staggered relation to each other; Fig. 3 is a similar view of two of the manifolds showing the staggered relation of the tubes that are arranged in clusters; and Fig. 4 is a cross-sectional elevation, on the line A. B., Fig. 1, showing the tube and manifold arrangement, shown in Fig. 2, in place.

Similar reference numerals refer to similar parts throughout the several views.

A steam generator of concentric construction, forming a steam and water space, the same inclosing the fire box and combustion chamber is shown in the drawings and is formed by an outer shell 1 and an inner shell 2 that are attached at their tops and joined to spacer 15 at their bottoms, in such manner as to form a space between them for both water and generated steam. The fuel door or other openings, are formed in the two shells by spacers 14ª that surround the openings.

Within the inner shell 2 are mounted feed manifolds 7 that are connected by tubes 8 to the lower, or water space portion, formed by the opening between the shell plates of the boiler. These manifolds are joined by tubes 9 to tubes 3 that are joined by tubes 9ª to discharge manifolds 7ª, the latter being connected to the upper, or steam space of the boiler, by tubes 4. The interior of the boiler above the grate and fire space is thus filled with tubes carried by the feed and discharge manifolds, except two segmental portions at each side of the tubes, which spaces are filled by tubes 11 that are joined at their ends by small manifolds, or headers, 10, the lower ones of which are connected to the water space of the boiler by a tube 8, and the top manifolds are connected to the steam space of the boiler by tubes 12.

To facilitate holding the tubes and manifolds in proper position, a beam 5 is provided which extends from side to side of the top of the boiler, resting on the boiler at its ends, and carrying hook-bolts 6 that are arranged to encircle the upper tubes 3 and hold them in proper position. The manifolds are supplied with plugs 14, opposite tubes 9 and 9ª, that may be removed while the said tubes are swaged or expanded in the manifolds, or are being repaired. The steam is taken from the boiler through valve 13 which serves as the usual take off or throttle connection.

While I show a cylindrical type of boiler shell in which tubes of different length are made to conform to the inner curved surface thereof, and in which small segmental sides are filled by vertical tubes joined by horizontal manifolds, the construction of the boiler shell may be rectangular instead of cylindrical so the tubes and manifolds may be alike, and no segmental openings will exist at the sides of the tubes.

It is a well known fact that vertical tubes in a boiler have the best circulation but poor steam generating qualities, while the horizontal tubes have the best steam generating qualities but poor circulation that must be forced. My invention differs from horizontal and vertical tube boilers in that the

tubes are horizontally inclined and that the water enters feed manifolds from the space between the boiler shell plates by connection 8 and is carried up in said manifolds by the action of the heat and is distributed through the horizontally inclined tubes by reason of their inclined position which induces a natural circulation.

The combined steam and water is discharged into discharge manifolds which, owing to their vertical position, and the superheated condition of the water, produces a free discharge of water and entrained steam into the steam space of the shell, through connection 4, from which it may be taken for use through valve 13.

The double tube arrangement shown in the drawings may be supplemented by the cluster arrangement illustrated in Fig. 3, where three tubes 3^a are used instead of two tubes 3 that form a loop; and a great number of pipes, arranged in clusters, may be used, if desired, to facilitate in staggering the tubes and creating greater heating area.

The manifolds and tubes are placed close to each other, within the boiler shell, but with sufficient clearance to permit of removal of any column of tubes with their attaching manifolds, for repairs or inspection; to do so it being only necessary to disconnect tubes 8 and 4 from their manifolds and remove beam 6 to permit of raising them out of the boiler without disturbing the remaining manifolds and tubes. It is preferred to swage or expand the tubes in the manifolds, but ordinary unions, in pipes 9 and 9^a, may be used to join them which would preclude the need of plugs 14.

Without departing from the spirit of my invention I may place the manifolds and tubes in alternating position in such manner that the tubes will incline alternately across the boiler.

Having thus described my invention, what I claim as new is—

1. In a boiler of the character described, the combination with an outer and an inner shell of two series of vertical manifold headers within said inner shell, one series connected at the bottom with the space between said shells through said inner shell and the other series connected at the top with the space between said shells through said inner shell, and a multiplicity of horizontally disposed pipes in clusters, each cluster connected at each end by a common pipe to the respective vertical manifold, all substantially as set forth.

2. In a circular upright boiler of the character described, the combination with an outer and an inner shell of two series of vertical manifold headers within said inner shell, one series connected at the bottom with the space between said shells through said inner shell and the other series connected at the top with the space between said shells through said inner shell, a multiplicity of horizontally disposed pipes in clusters, each cluster connected at each end by a common pipe to the respective vertical manifold, and separate vertical tubes connected by manifolds with the bottom and top space between said shells filling space on interior of inner shell on each side of horizontally disposed pipes; all substantially as set forth.

3. In a vertical sectional water tube boiler of the character described, the combination with vertically disposed manifolds carrying horizontally inclined tubes, a beam across the top of the boiler and hook hold means attached to said beam supporting said inclined tubes, all substantially as set forth.

4. In a circular upright boiler of the character described having an outer and an inner shell with space between same, the combination of two series of vertical manifold headers within said inner shell, one series connected at the bottom with the space between said shells through said inner shell and the other series connected at the top with the space between said shells through said inner shell, a multiplicity of horizontally disposed pipes in clusters, each cluster connected at each end by a common pipe to the respective vertical manifold, and a threaded plug in every vertical manifold on the opposite side thereof to the position of said pipe forming connections with one end of said clusters of horizontally disposed pipes; all substantially as set forth.

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

MILES CONNOR.

Witnesses:
C. M. WALKER,
FRANK DAYTON.