

**No. 669,212.**

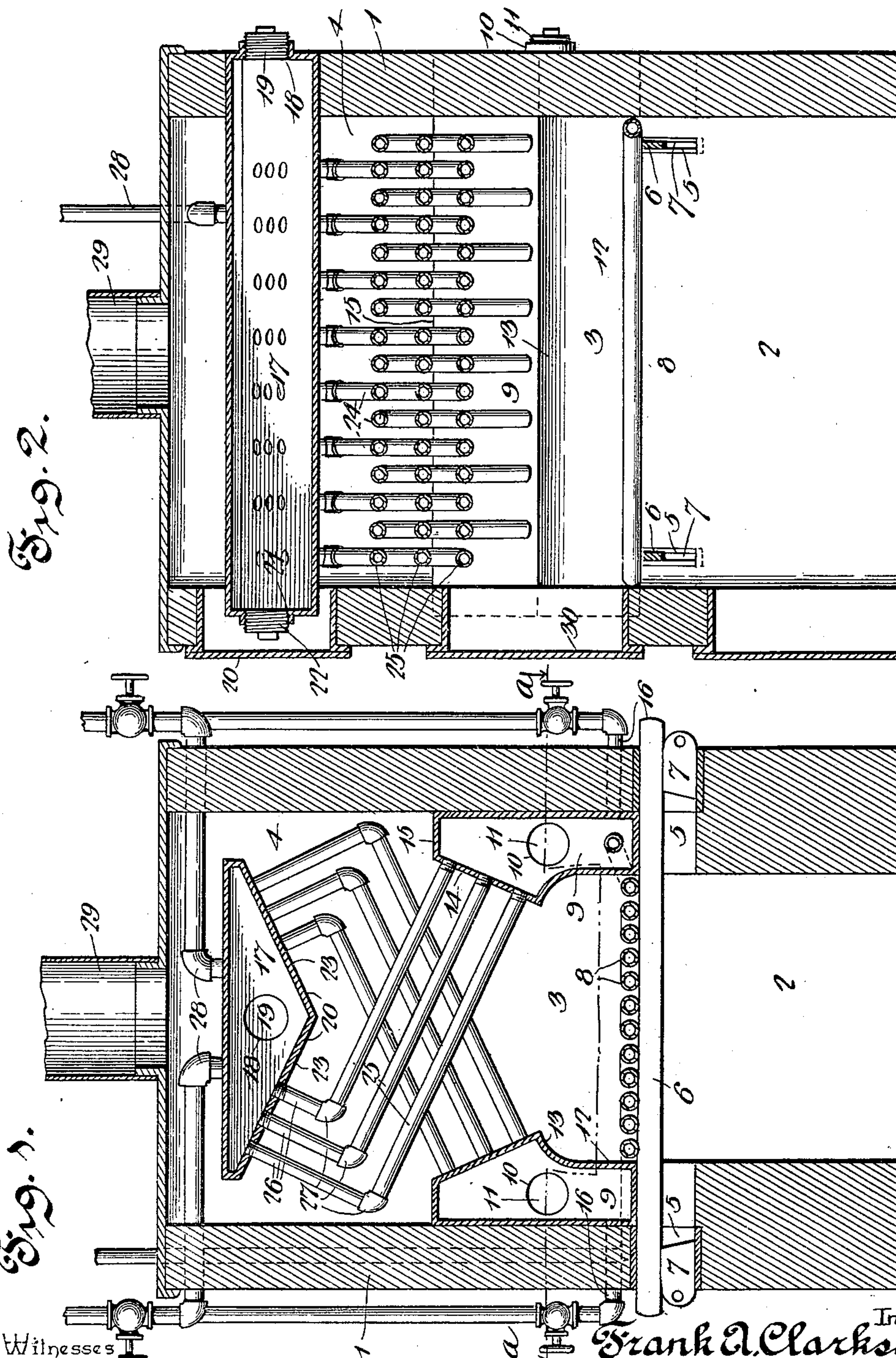
**Patented Mar. 5, 1901.**

**F. A. CLARKSON.**  
**HOT WATER HEATER.**

(Application filed Dec. 7, 1900.)


(No Model.)

**2 Sheets—Sheet 1.**



Witnesses

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Fig. 4.

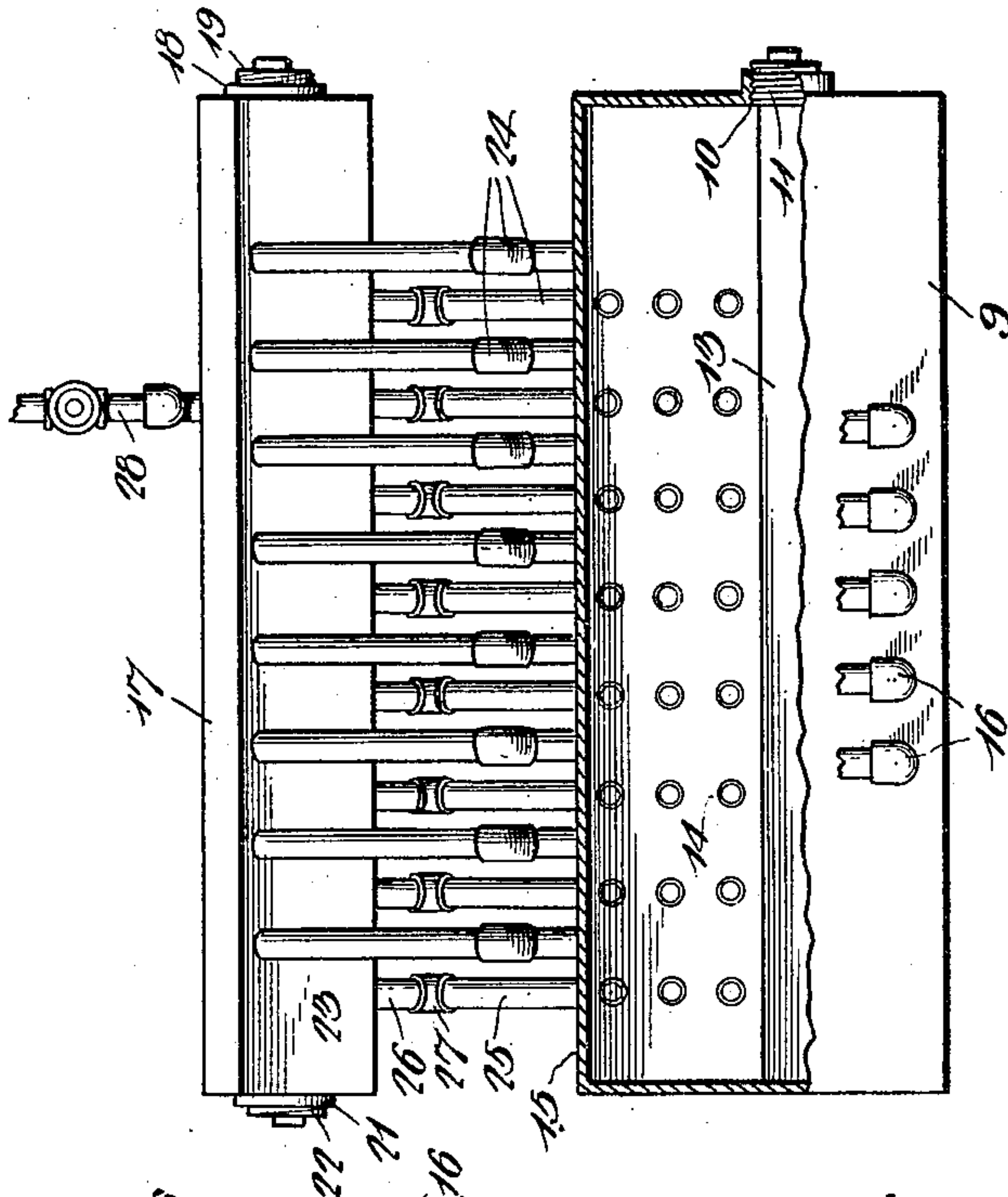
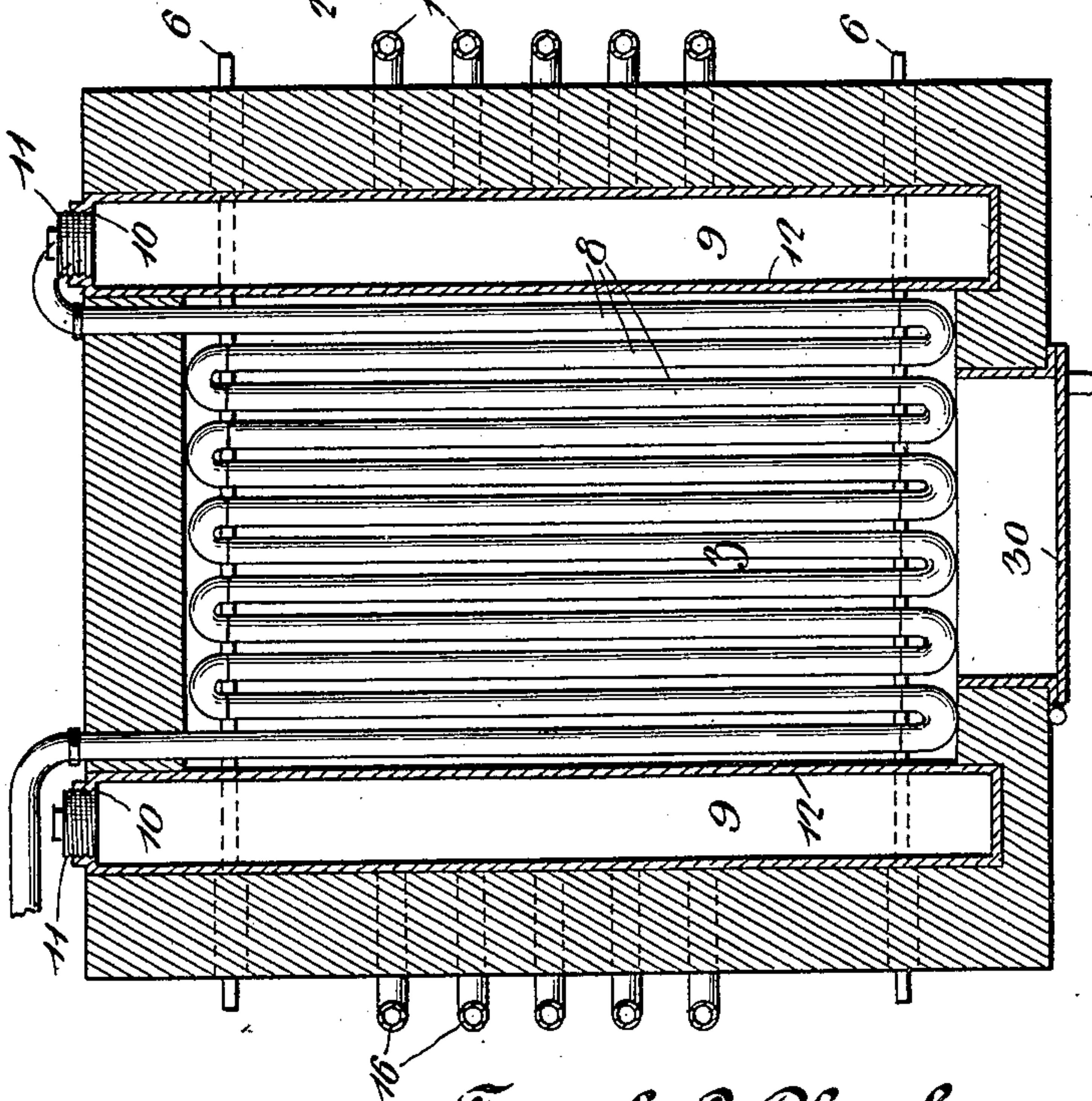


Fig. 3.



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# UNITED STATES PATENT OFFICE.

FRANK A. CLARKSON, OF DULUTH, MINNESOTA.

## HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 669,212, dated March 5, 1901.

Application filed December 7, 1900. Serial No. 39,083. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK A. CLARKSON, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented a new and useful Hot-Water Heater, of which the following is a specification.

This invention relates to hot-water heaters of that class having supply and return pipes extending to and from different parts of a building for heating the latter; and the primary object of the same is to provide simple and effective means whereby the fuel heat will be utilized to its maximum extent with a minimum consumption and a greater water-heating surface obtained by the employment of lower water-legs with extended surfaces adjacent the fire-bed and an upper angular drum presenting an enlarged surface and spreading laterally a greater distance and vertically a less distance than the ordinary cylindrical heating-drums to thereby more quickly heat the volume of water contained in the drum without reduction in the capacity of the same, but, on the contrary, increasing the capacity of the containing-distributor at the upper portion of the heater without requiring the use of a greater amount of fuel for maintaining the temperature of the water therein at the proper degree.

A further object of the invention is to so dispose the surfaces of the lower legs and the lower opposite portions of an upper distributor or drum that the tubular conveyers connecting said surfaces and members and crossed above the fire-bed may be made up in each instance of two pipe-sections exclusively and differing in length and meeting said surfaces at an angle of about ninety degrees, the pipe-sections being connected to each other by a single approximately right-angular union.

A further object of the invention is to provide simple and durable means for rendering the operation of a hot-water heater more effective generally and facilitate the assembly of the several parts as well as to introduce certain adjustable features therein in relation to the grate, which is composed of tubular bends connected to a portion of the returns and to one of the legs and horizon-

tally disposed to serve as the sole grate means.

With these and other objects and advantages in view the invention consists in the construction and arrangement of the several parts, which will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a transverse vertical section of a hot-water heater embodying the features of the invention. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a horizontal section taken in the plane of the line *a a*, Fig. 1. Fig. 4 is a sectional side elevation of a portion of the heater shown broken away.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a surrounding jacket or casing of either brickwork or metal and including in its arrangement the usual ash-pit 2, a fire-space 3 above the latter, and an upper heating-space 4, containing the distributing-drum or water-containing device. In the opposite sides of the jacket or casing, near the front and rear ends, vertical slots 5 are formed and adjustably receive grate-supporting bars 6, extending transversely of the heater and held immovable by plugs 7, inserted between either the upper and lower edges of the said bars and the upper and lower end walls of the slots, the plugs and bars being of such width as to entirely fill the slots and avoid the formation of openings at points that might interfere with the draft of the heater. The grate-bars 8 are rested at opposite extremities on the said bars 6, and in this instance said grate-bars are formed of tubular lengths with terminal bends and are preferably twelve in number, made up of six couples. When the supporting-bars 6 are at their highest elevation, the grate-bars are disposed in their maximum vertical position and in line with the lower ends of legs 9 on opposite sides of the interior of the heater and running almost full length of the latter, with their rear ends exposed through the back of the casing or jacket and provided with hand-holes 10, fitted with closing screw-plugs 11, so that said legs can be easily cleaned when necessary. The inner lower walls 12 of the legs



are in the main vertical and form the opposite lower side walls of what may be termed the "fire-box," the upper portions 13 of said walls being upwardly and inwardly curved to provide overhanging heating-surfaces and cause the flame and heated particles of combustion to be centralized and prevented from having too sudden lateral deflection and also thereby materially increase the length of the said portions of the legs at a point nearest the greatest heat center and more quickly raise the temperature of the water in the legs. The actual size of the fire-box may be said to extend from the plane of the grate-bars to the upper inner terminals of the portions 13 of the lower side walls of the legs, and the capacity of the said fire-box may be increased by lowering the supporting-bars 6 to the lower ends of the slots 5, or this depression of the grate-bars may be required at different times to allow the heater to be thoroughly cleaned or repaired by the substitution of new grate-bars in the event that the old ones burn out. The uppermost inner portions 14 of the side walls of the legs extend upwardly and outwardly at an angle of inclination to flat tops 15, and over which the particles of combustion slip off in a laterally-expanded condition for heating the elements above, and which will be more fully hereinafter described. The terminals of the grate-bars are respectively connected to one of the legs and to a return-pipe 15 at the rear of the furnace, and for the purpose of changing the position of the grate-bars, as heretofore set forth, or disconnect the same for the substitution of new ones suitable connecting-joints will be provided in relation to the connected terminals of the said bars. Entering the opposite side portions of the jacket or casing and communicating with the lower portions of the legs are a plurality of valved return-pipes 16, which, with the pipe 15, will be equal in number to the number of compartments heated in a building in which the heater is located, it being obvious that one of these pipes may serve as an initial feeding means from a primary source of supply. It will also be understood that only a portion of the said pipes may be used, if desired, without impairing the circulation of the heater by shutting the valve attachments thereof to avoid the waste of heat in compartments that may be unoccupied, for instance, or in portions of a building where heat is not at all times desired.

In the upper portion of the heating-space 4 a drum or distributing-receptacle 17 is mounted and has the rear end exposed through the rear portion of the jacket or casing and supplied with a hand-hole 18, fitted with a screw-plug 19, and the front accessible by means of an upper front door 20, the said front end being also supplied with a hand-hole 21, fitted with a screw-plug 22. This drum or receptacle is in the form of an inverted flattened triangular pyramid, with the downwardly-extending apex directly in vertical alinement

with the central longitudinal line of the grate-bars below, and the lower upwardly and outwardly inclined sides 23 provide an extended heating-surface, with which the water contacts, and by reason of the lateral spread of the water in this drum or receptacle and the reduction of the vertical extent of the column as compared to the ordinary drum constructions it will require less time and the consumption of less fuel to heat the water in this drum or receptacle to the necessary high degree of temperature, and, furthermore, by the greater expanse of this improved distributing device the particles of combustion in their highly-heated condition will have a longer contact and heating influence with relation to the said lower sides of the same. Between the upper portions 14 of the inner walls of the legs and the lower inclined sides 23 of the drum or receptacle series of conveyers 24 are interposed, comprising a series of three longer pipes 25, attached to the said portions 14 of the legs and having an upward angle of inclination. Depending from the said sides 23 of the drum or receptacle are shorter pipes 26, which have an outward inclination and are connected to the upper ends of the longer pipes 25 by approximately right-angular unions 27, the entire series alternately crossing each other or the series starting from the leg on one side having a direction toward the side of the heater on which the opposite leg is located and those from the latter leg reversely extending toward the side of the heater against which the first-named leg is disposed, whereby a greater number of conveyers can be interposed between the legs and the drum or receptacle within a given extent and in the best circulatory position possible. The advantage of the angular construction of the portions 14 of the inner walls of the legs and the lower sides 23 of the drum or receptacle is that the ingress of the water from the legs into the lower terminals of the conveyers connecting therewith and the egress from said conveyers into the drum or receptacle can be carried on without impediment or obstruction, because the ends of the longer and shorter pipes connecting directly with the said legs and drum sides 23 as set forth have a straight run without the resistance of interposed elbows or curves, and the inclination of the longer pipes 25 being comparatively gradual and not abrupt will allow the water as heated to more quickly ascend therethrough and permit a greater quantity to be exposed in each pipe length over the fire-bed below. Another very important advantage obtained by the assemblage of the parts of each conveyer as set forth is that only two lengths of pipes are necessary to complete the connection between the legs and the drum or receptacle, and the connected ends of the pipes 25 and 26 are disposed at about an angle of ninety degrees to the portions 14 of the legs and the sides 23 of the drum, and as the pipes extend away in straight lines from said portions and



sides at the same angle a single union only is required to attach the pipes to each other.

The upper end of the drum or receptacle is flat, and therefrom extend a plurality of delivery or feed pipes 28, which have valves to control the passage of water therethrough, the number of these pipes corresponding to the number of the return-pipes heretofore set forth, and, as before stated in connection with the latter, the said delivery or feed pipes can be shut off at will and their use decimated as desired when not required for use. Rising from the top of the jacket or casing is a smoke-pipe 29, and it will be observed that direct passage to the same of the particles of combustion and smoke from the fire chamber or bed below is obstructed by the position and form of the drum or receptacle 17 and that the said particles of combustion and smoke must first pass around the sides of the drum and completely envelop the latter before reaching said pipe 29 and also thoroughly pass through and around the conveyers, and thereby utilize the full caloric effect of the fuel. The fire-bed is also made accessible by means of a door 30, and by opening the same and the door above, heretofore set forth, the heater can be cooled, if desired, and cleaned.

The preferred form and arrangement of the improved heater have been shown and described; but it is obviously apparent that changes in the form, size, proportions, and minor details may be resorted to without in the least departing from the principle of the invention.

Having thus described the invention, what is claimed as new is—

1. In a hot-water heater, the combination of a grate, interiorly-disposed longitudinally-extending water-legs on opposite sides of the grate and having the upper portions of the inner sides arranged at an outward angle of inclination, an upper drum or receptacle having lower angular sides, a plurality of series of conveyers connecting the said upper angular portions of the inner sides of the legs and the lower angular sides of the drum or receptacle, the conveyers extending from the legs alternately in reverse directions and crossing each other and each conveyer comprising a short and a longer pipe length respectively connecting with the drum sides and the upper inner portions of the legs in planes at right angles thereto and attached to each other by a single approximately right-angular union, and distributing and return devices.

2. In a hot-water heater, the combination of legs, an upper drum or receptacle, the legs having inner and the drum lower angular sides, and series of conveyers connecting the said angular sides of the legs and drum, each conveyer comprising a short pipe length arranged in a plane at a right angle to the one angular side of the drum or receptacle and a longer length of pipe at a similar angle to the

inner side of the leg, the pipes being straight and attached to each other by a single approximately right-angular union.

3. In a hot-water heater, the combination of legs having the upper portions of the inner sides arranged at an outward angle of inclination, a drum having lower angular sides, and conveyers in the form of separate pipe-sections connecting the said angular side portions of the legs and drum, the angle of the said side portions of the legs being in such relation to the angular sides of the drum that each pipe-section can be made up of two pipe lengths exclusively having a different extent and both straight and in planes at right angles to the parts with which they connect, the pipe lengths being connected to each other by an approximately right-angular union.

4. In a hot-water heater, the combination of a grate, interiorly-disposed longitudinally-extending water-legs on opposite sides of the grate and provided with inner lower side portions vertically disposed and terminating in upper inwardly-curved members with which upper outwardly-inclined portions connect, an upper inverted triangular pyramidal-shaped drum centrally disposed and projecting laterally in opposite transverse directions, conveyers connecting the upper inner portions of the legs and the lower angular sides of the drum arranged in series and alternately crossing each other in reverse directions, and distributing and return devices.

5. In a hot-water heater, the combination of a grate made up of a horizontally-disposed series of pipe lengths in continuous communication, longitudinally-extending legs arranged on opposite sides of the grate and having a portion of the inner sides thereof extending inwardly over and above the grate and also having the upper portions of the said inner sides inclined outwardly, an upper drum or receptacle having lower downwardly and inwardly inclined sides, a plurality of series of conveyers connecting the upper inner inclined portions of the legs and the inclined sides of the drum or receptacle and alternately extending in opposite directions and crossing each other, return-pipes connecting with the legs and with one terminal of the grate, the remaining terminal of the grate being attached to one of the legs, and distributing or feeding pipes extending away from the drum or receptacle.

6. In a hot-water heater, the combination of a casing having slots in opposite sides thereof near the ends of the same, supporting-bars vertically adjustable in the said slots, a grate held by the said supporting-bars, and water-holding devices adjacent to and above the grate.

7. A water-heater comprising opposite legs, an elevated drum located over the space between the legs, and a series of pipes or conveyers connecting each leg with the drum, the pipes or conveyers in the two series being crossed between the horizontal planes of the



legs and the drum, and each pipe or conveyer consisting of straight pipe-sections connected by an angle-coupling or elbow.

8. A water-heater comprising opposite legs, 5 an elevated drum located above the space between the legs, and a series of pipes or conveyers connecting each leg with the drum, each pipe or conveyer consisting of a major pipe-section and a minor pipe-section arranged in angular relation and connected by 10 a single coupling or elbow, corresponding pipe-sections of each series being arranged in a common plane, and the planes of the corresponding sections of the two series being arranged to intersect between the horizontal 15 planes of the legs and the drum.

9. A water-heater comprising opposite legs and a superjacent drum, and a series of conveyers connecting each leg with the drum, 20 each conveyer consisting of upper and lower pipe-sections connected by a single coupling or elbow, the lower pipe-sections of each series being arranged in a common inclined plane extending upward and inward over the inter-

val between the legs to a point beyond the 25 plane of the corresponding pipe-sections of the other series.

10. A water-heater comprising opposite legs and a superjacent drum, and a series of conveyers connecting each leg with the drum, 30 each conveyer consisting of upper and lower pipe-sections connected by a single coupling or elbow, the lower pipe-sections of each series being arranged in a common inclined plane extending upward and inward over the 35 interval between the legs to a point beyond the plane of the corresponding pipe-sections of the other series, and said lower pipe-sections of the two series alternately disposed on the line of intersection. 40

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

FRANK A. CLARKSON.

Witnesses:

JOHN COVENTRY,

THERON G. BARTHOLOMEW.