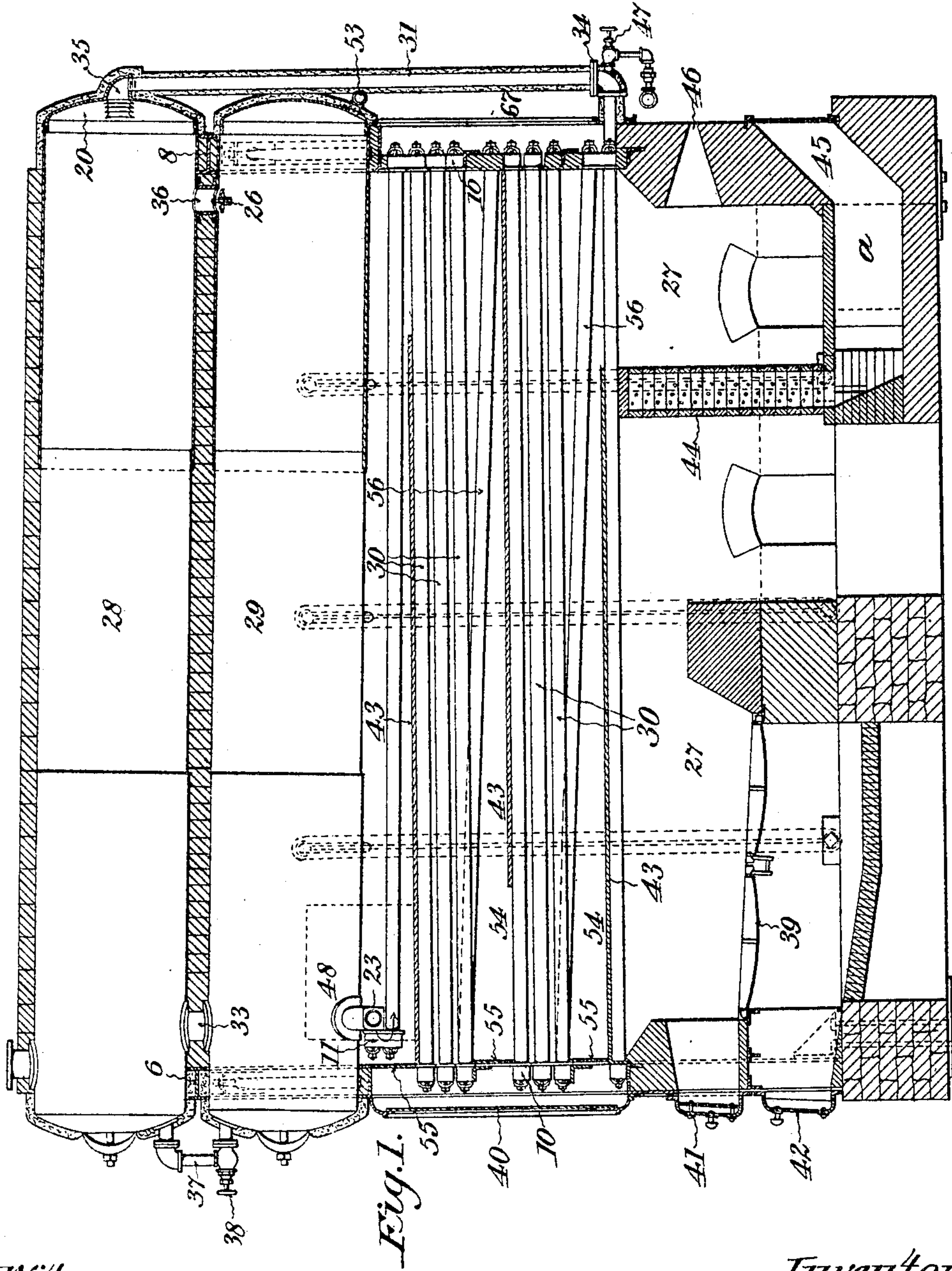


No. 799,083.

PATENTED SEPT. 12, 1905.

J. C. PARKER.  
STEAM GENERATOR.  
APPLICATION FILED JAN. 2, 1901.

6 SHEETS—SHEET 1.



Witnesses:

*A. M. Long.*

*M. J. Dixon*

Inventor:

*John C. Parker:*

*by Henry H. Bates,*  
*att'y.*

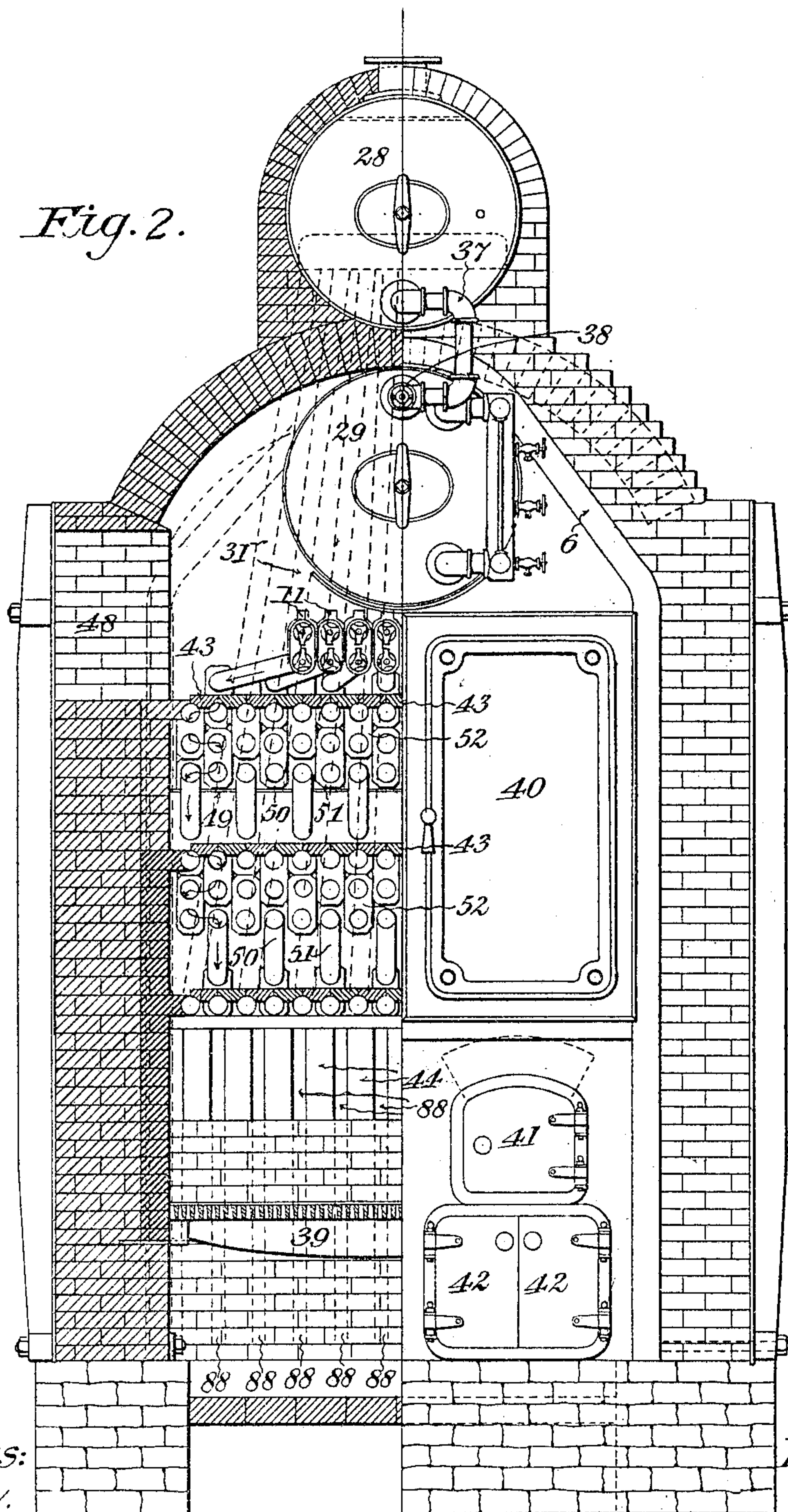
No. 799,083.

PATENTED SEPT. 12, 1905.

J. C. PARKER.  
STEAM GENERATOR.  
APPLICATION FILED JAN. 2, 1901.

6 SHEETS—SHEET 2.

*Fig. 2.*



Witnesses:

*M. J. Dixon*

*M. J. Dixon*

Inventor:

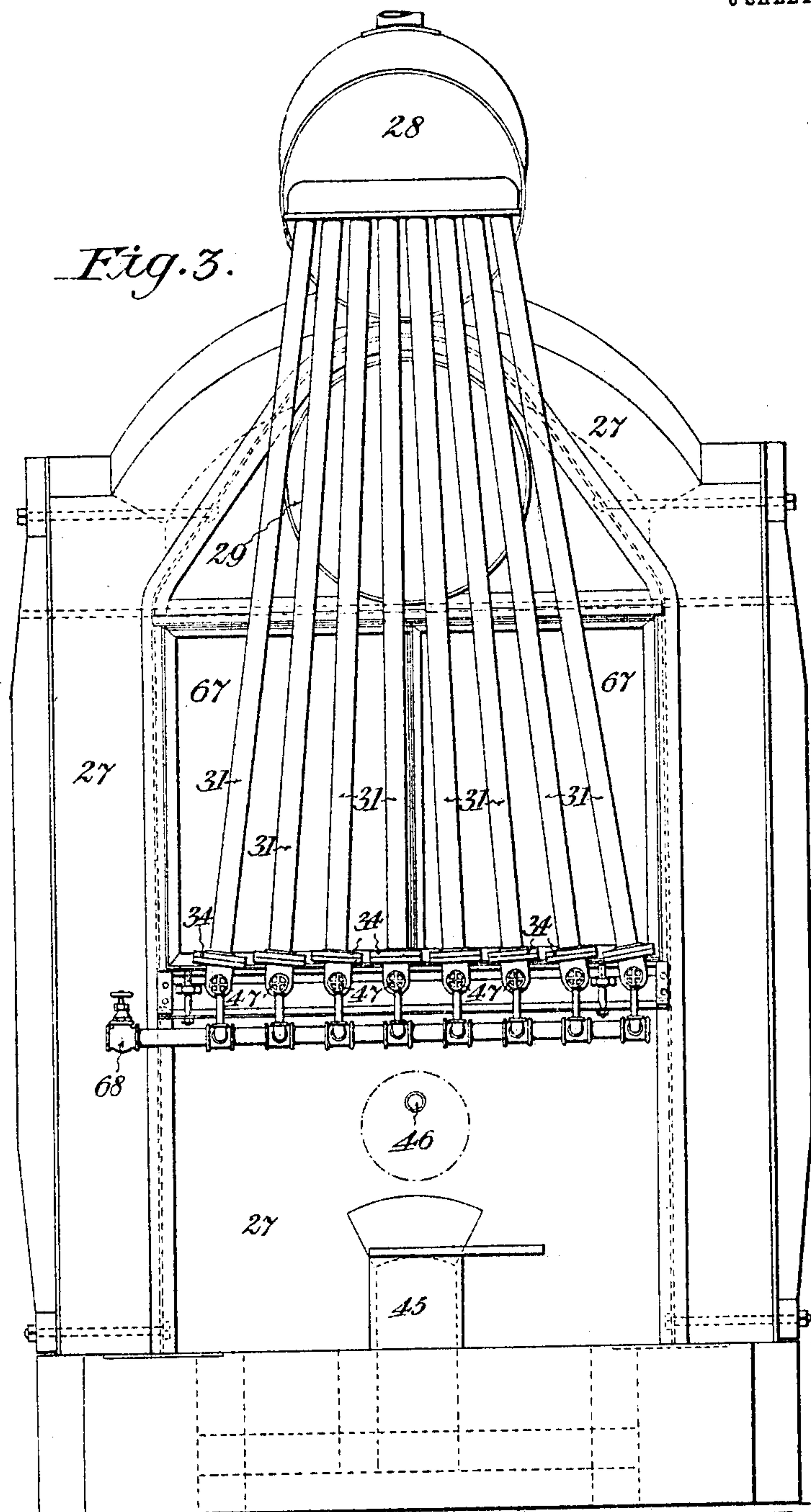
*John C. Parker:*

*by Henry H. Bates.*  
*att'y*



J. C. PARKER.  
STEAM GENERATOR.  
APPLICATION FILED JAN. 2, 1901.

6 SHEETS—SHEET 3.



Witnesses:

*A. M. Long.*

*M. J. Dixon*

Inventor:

*John C. Parker:*

*by Henry H. Bates,*  
*att'y.*

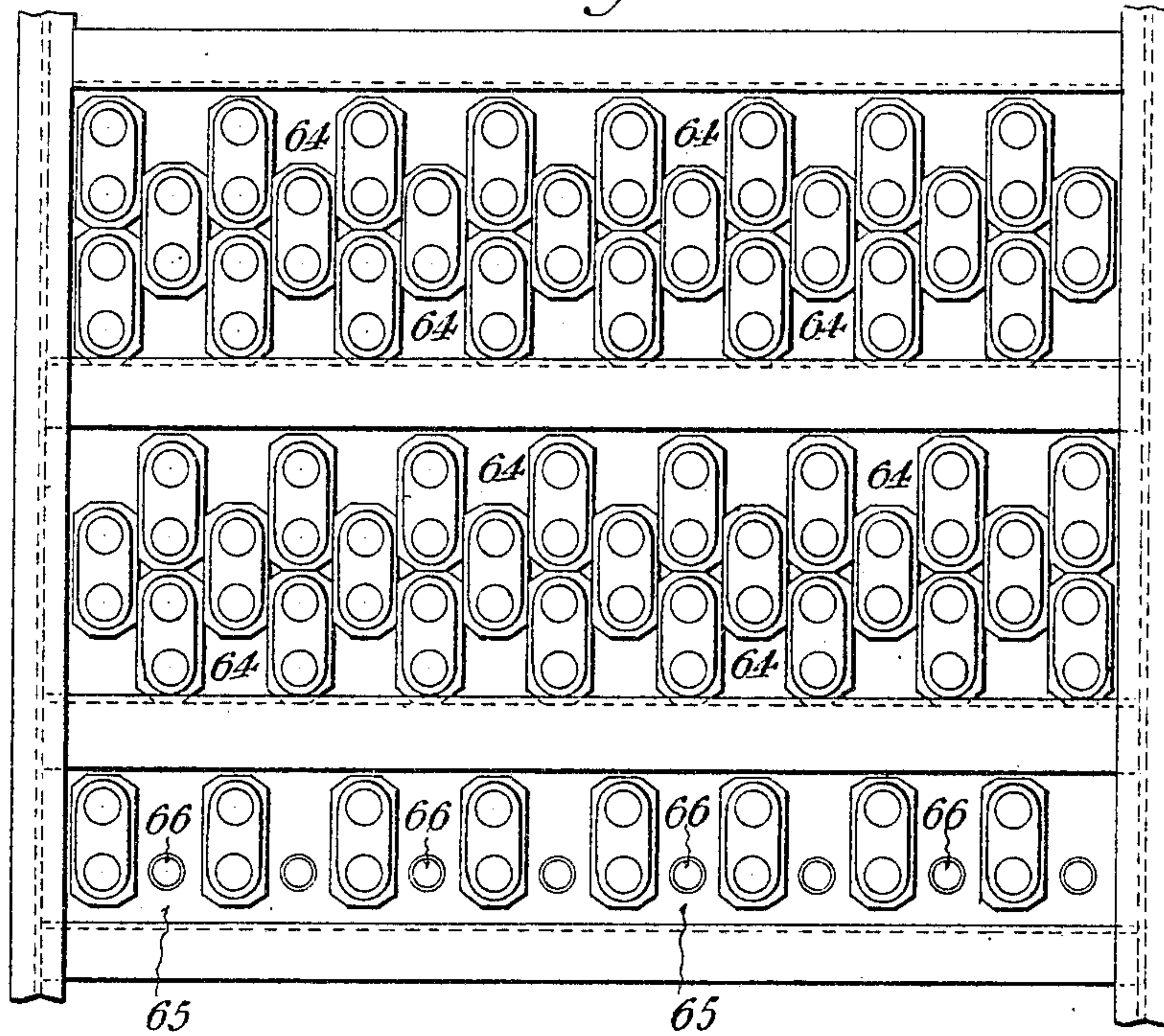
No. 799,083.

PATENTED SEPT. 12, 1905.

J. C. PARKER,  
STEAM GENERATOR.  
APPLICATION FILED JAN. 2, 1901.

6 SHEETS—SHEET 4.

*Fig. 4.*



*Witnesses:*

*A. M. Long,*  
*M. J. Dixon,*

*Inventor:*

*John C. Parker;*  
*by Henry H. Bates,*  
*atty*

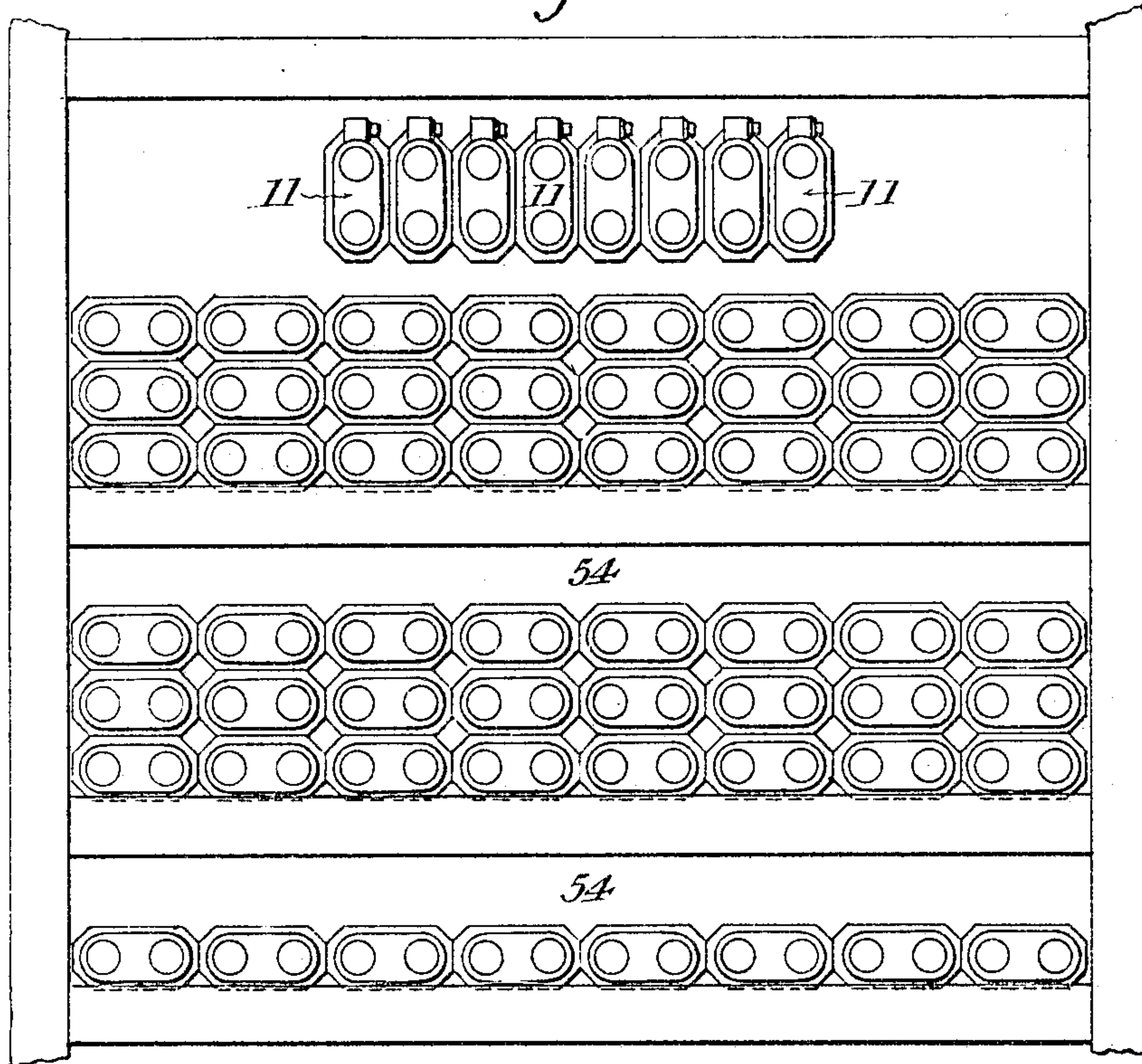
No. 799,083.

PATENTED SEPT. 12, 1905.

J. C. PARKER.  
STEAM GENERATOR.  
APPLICATION FILED JAN. 2, 1901.

6 SHEETS—SHEET 5.

*Fig. 5.*



WITNESSES:

*M. J. Dixon*  
*A. M. Long.*

INVENTOR:

*John C. Parker,*  
*by Henry H. Bates,*  
*Atty.*



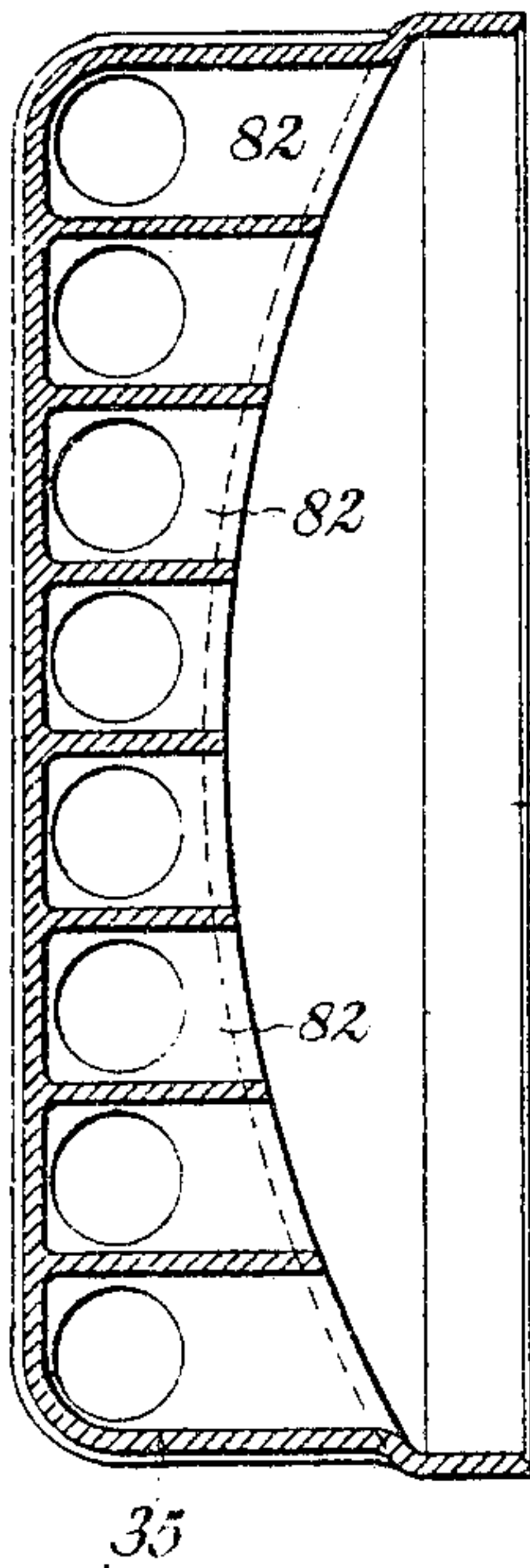
No. 799,083.

PATENTED SEPT. 12, 1905.

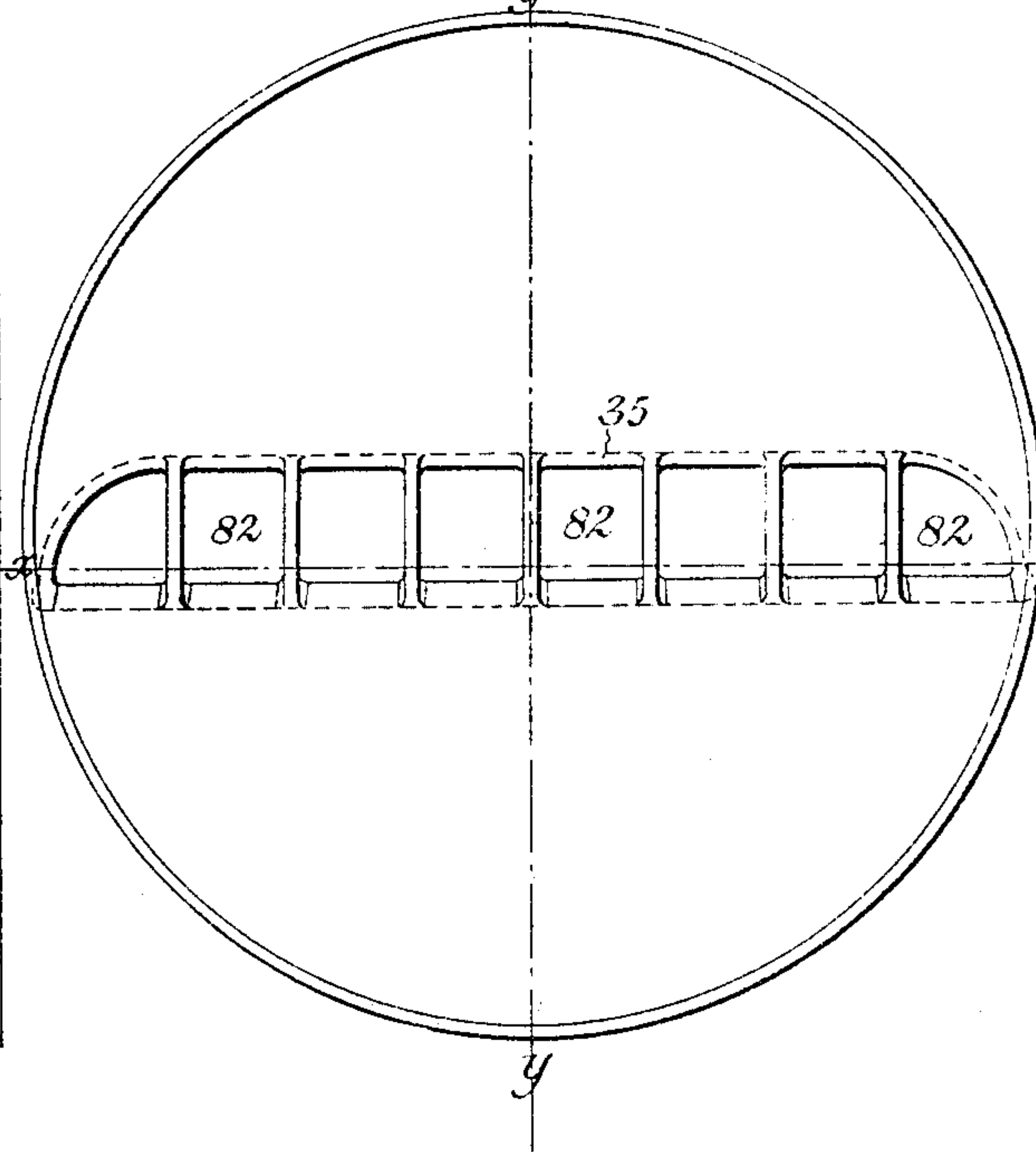
J. C. PARKER.  
STEAM GENERATOR.  
APPLICATION FILED JAN. 2, 1901.

6 SHEETS—SHEET 6.

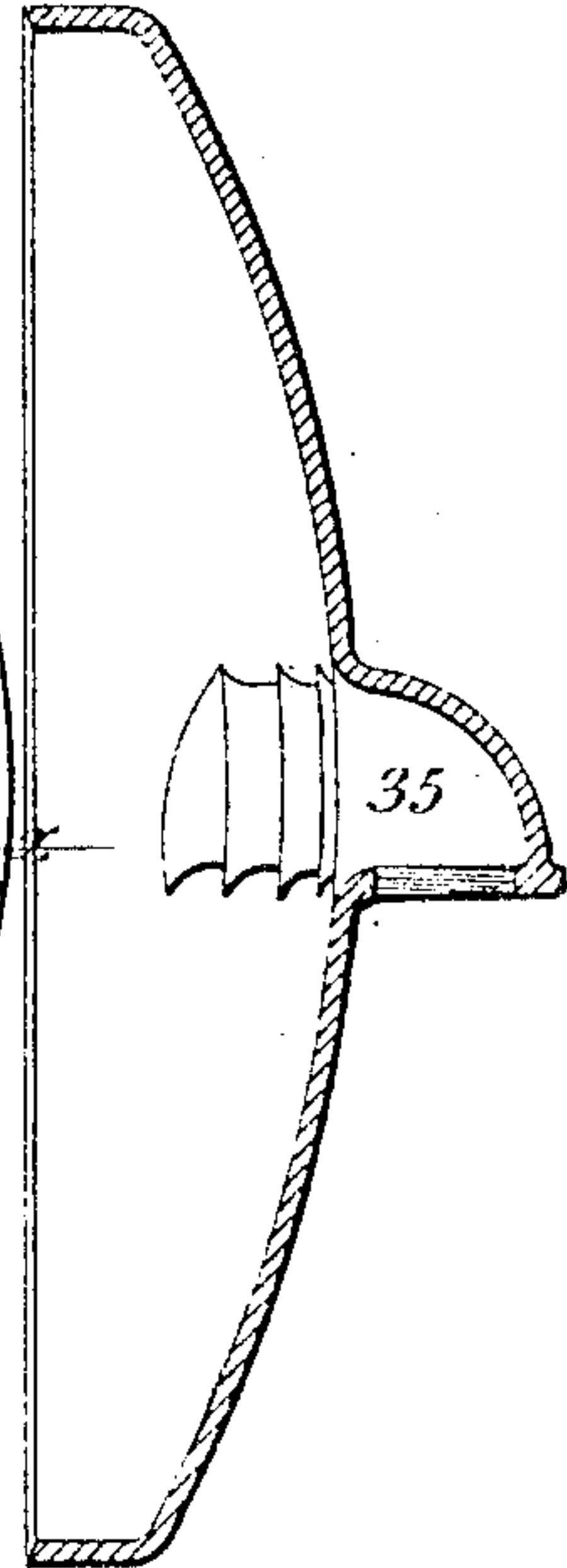
*Fig. 8.*



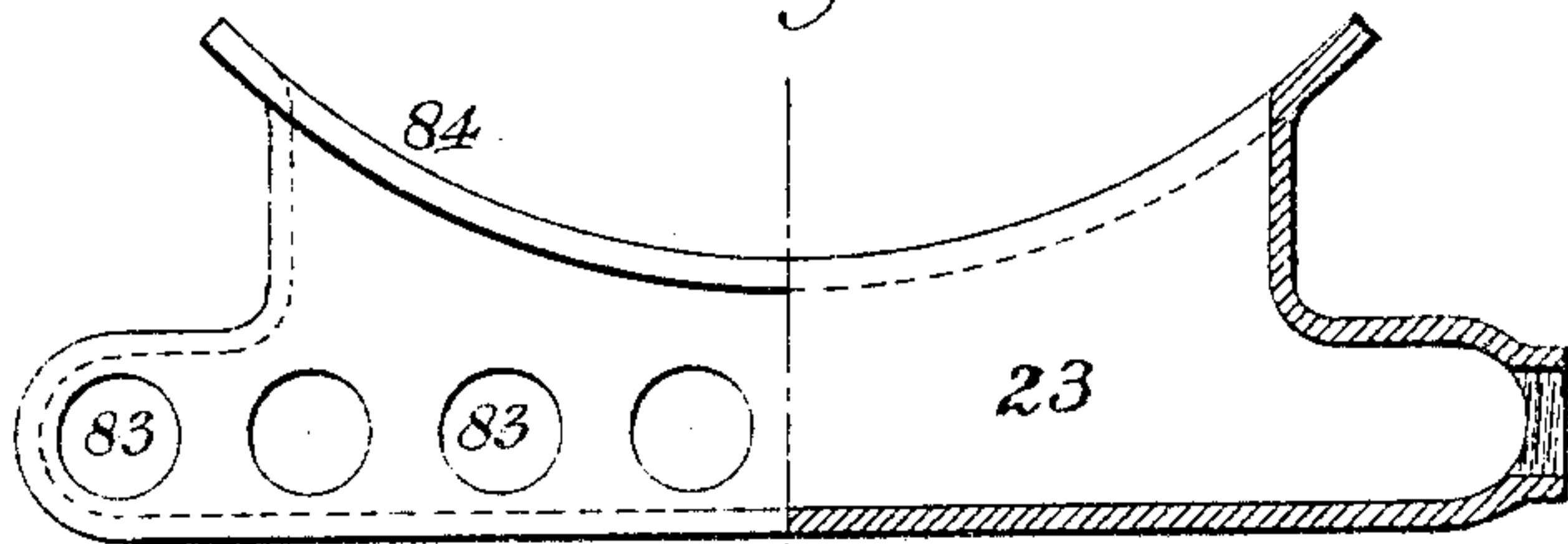
*Fig. 6.*



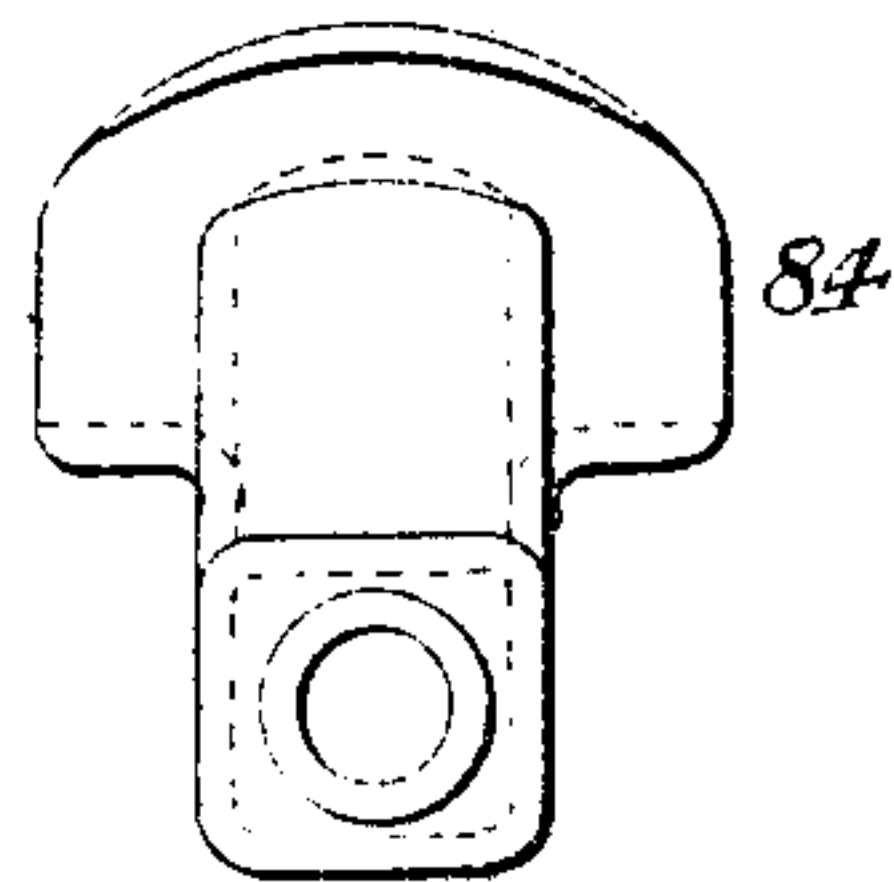
*Fig. 7.*



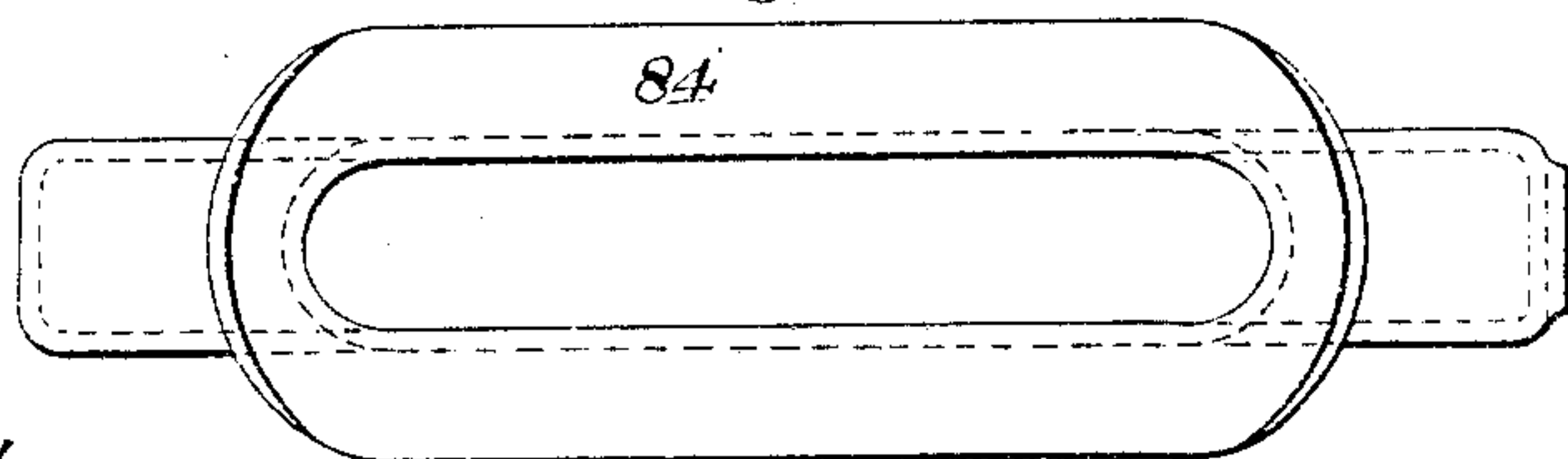
*Fig. 9.*



*Fig. 10.*



*Fig. 11.*



Witnesses:

*A. M. Long.*

*M. J. Dixon*

Inventor:

*John C. Parker,*

*by Henry H. Bates,*  
*att'y.*



# UNITED STATES PATENT OFFICE.

JOHN CLINTON PARKER, OF PHILADELPHIA, PENNSYLVANIA.

## STEAM-GENERATOR.

No. 799,083.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed January 2, 1901. Serial No. 41,859.

*To all whom it may concern:*

Be it known that I, JOHN CLINTON PARKER, a citizen of the United States, residing at 1006 Walnut street, Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in steam-generators, being an improvement in that class of generators of the water-tube type having separate drums or chambers for water and steam, respectively, a check-valve between said chambers opening toward the water-chamber, a check-valve or valves between the water-chamber and the generating-tubes to insure a circulation in one direction and a proportional increase in the cross-sections of the heating-tubes of said generators progressing downward or toward the point of highest temperature.

My present improvement consists in so proportioning the length and capacity of the steam-generating tubes to the required quantity of steam for a given power as to be able to use tubes of substantially uniform diameter throughout, and incidentally in the provision in such a generator of a restricted or regulable by-pass between the water-chamber and the steam-chamber to cooperate with the said check-valve between the chambers to eliminate the effects of changes of pressure upon the flow of water downward to the evaporating-point.

In the drawings forming a part of this specification, Figure 1 is a longitudinal section of a steam-generator in which the steam-chamber and the water-chamber are separate. Fig. 2 is a half front elevation and half transverse section of the generator shown in Fig. 1. Fig. 3 is a rear elevation of the same generator, showing inclined upcasts 31, drain-valves 47 for each element, sliding doors 67 in rear of the junction-boxes, and drain-valve 68, commanding all the valves 47. Fig. 4 is a detail view showing the arrangement of the rear junction-boxes, which are all vertical. Fig. 5 is a detail view of the junction-boxes at the front with spaces 54 for gaining access to baffles and soot. Fig. 6 is an elevation of the drum-head at one end of the steam-chamber, showing the cross-box integral with the head for receiving upcasts. Fig. 7 is a vertical

section of the same on line *y y*. Fig. 8 is a transverse section of same on line *x x*. Fig. 9 is a half-sectional elevation of cross-box attached to the under side of the water-chamber for making a suitable connection with the supply-tubes. Fig. 10 is an end view of said cross-box. Fig. 11 is a plan view of said cross-box.

The chambers are preferably set, as shown in Fig. 1, slightly inclined downward toward one end to facilitate drainage. The inclination may be in either direction.

27 is a furnace of the usual brick and iron construction in which are placed the steam and water chambers one over the other, 28 being the steam-chamber and 29 the water-chamber.

6 and 8 are girder-supports in the construction.

20 is the drum-head of the steam-chamber.

10 represents the junction-boxes.

30 represents the tubes constituting steam-generators. They are connected to the water-chamber underneath at any point by means of suitable cross-boxes or by direct connection, the junction being made in any approved workmanlike manner. I have shown them expanded into junction-boxes 11, having a check-valve therein, said boxes being connected to the cross-boxes by nipples expanded into both; but the check-valves may be placed anywhere in the line of flow where it may be most convenient, provided they are so near the top or induction ends that steam cannot form above them. At the other extremity the tubes connect with the steam-chamber by means of the upcasts 31. The tubes which lead from cross-box 23 to the generating series are arranged divergently or in fan-like shape to meet the junction-boxes of the respective series with which they make connection. The lowermost tubes are longer than the others to afford space between the upcast-tubes and the rear headers to admit of access to the hand-hole plates, and the said upcast-tubes are arranged convergently to meet the cross-box on the steam-chamber, as shown in Fig. 3.

26 is a check-valve which controls the opening 36 between the steam-chamber and the water-chamber. There is no opening at 33, that device being merely a saddle to keep the drums equidistant.

37 is a by-pass-pipe connection controlled by the valve 38, which provides the only direct communication between the water-cham-



ber and the steam-chamber when the check-valve 26 becomes closed. The valve 38 is so adjusted in ordinary use as to cause resistance to the upflow sufficient to close the check-valve 26, but not enough to create a marked difference in pressure between the two chambers, or in lieu of this adjustment the passage 37 may be made narrow enough to have the same effect with the valve 38 wide open.

The grate 39, tube-doors 40, fire-doors 41, and ash-doors 42 are of the usual construction. The baffles 43 are tiles of fire-clay made to conform to the tops of the tubes and placed adjacent to each other, so as to form, with the tubes, a continuous horizontal wall abridged at alternate ends, causing the gases to traverse several times the length of the tubes in escaping to the flue 48.

The tubes are grouped into several sections or units 49 50 51 52, two tubes wide. Each unit is entirely independent of the others from its induction end at cross-box 23 to its discharge end at the connection of upcasts 31 with the steam-chamber. The tubes in each unit are arranged, preferably, in pairs, and the junction-boxes which unite their ends are horizontal at one end and perpendicular at the other, thus facilitating access for the removal and replacement of tubes. Water is supplied to the water-chamber at inlet 53, which is preferably located at the lowest part of the drum, so as to permit drainage through the aperture. The water flows from said chamber through the cross-boxes, past the check-valves wherever located, into the generator system, where its course may be traced in each unit, generally downward, alternately through two tubes of each row until it reaches the upcasts 31 and seeks its level in them to coincide with the level in the chamber 29, which may be anywhere from nearly empty to full. When a fire is started on the grate 39, the columns of water in the upcasts are soon cleared out by the expansion of the steam formed in the lower tubes, and a circulation is then set up. When all the parts are properly proportioned and the relative dimensions are accurately determined, I can dispense with the progressively-enlarged tubes described in my former patent, No. 628,606, and use tubes all of substantially the same size, which economizes the cost of construction, while yielding equal or greater efficiency in practice. A theoretical advantage of enlarged lower tubes is the decrease of friction on the flowing stream for a given flow; but this is largely offset in practice by the increased danger of the tubes becoming overheated through the check in the velocity of the flow. Under my improved system I now first determine with accuracy the capacity of the lower or eduction members to discharge the required amount of steam for a given power, and this being accomplished there is no good reason for restricting the ca-

capacity of the tubes above, and thus increasing friction and diminishing the effective flow. The function of the by-pass 37 is to allow a restricted upflow from the steam-space of the water-chamber 29 to the steam-chamber 28 when the pressure is lowered in the steam-chamber by a withdrawal of steam in excess of the evaporation or from other cause sufficient to close the check-valve 26. Comparatively long elements or tube-coils are required to obtain the proportions above referred to and secure approximately the complete evaporation in a single circuit. The flow of the water is very sensitive to changes in pressure, and a slight fall of pressure tends to bend the long tubes, which tendency the antipriming-valve resists by automatically forcing the flow. With the antipriming check-valve only (between the chambers) water occasionally reaches the steam-chamber, causing sudden and serious falls of water-level; but by the conjoined use of the two valves—antipriming and by-pass—when properly arranged and set the bad effects of changes of pressure upon the flow of water in the generator-tubes are entirely eliminated, securing approximately the “one-circuit” system of flow, which is the aim of this invention. It is not good to have too much water flow into the tubes, nor yet too little. The by-pass with restricted area or means for regulating the aperture thereof affords a mean between these two extreme conditions of operation, thereby providing for complete control of the flow under all conditions. Any sudden fall of temperature in the steam-chamber will be promptly neutralized and the flow will continue without any apparent interruption. If the valve 38 is depended on to restrict the opening through the by-pass, it should be opened just sufficiently to prevent the fall of the water in the glass to any great extent when pressure is falling. It is practicable, however, to make the by-pass itself small enough to permit of the valve’s remaining wide open, so that careless handling cannot cause damage to the tubes.

As a result of this coil system, which does not require continuous headers; it is possible to leave spaces 54 between the tubes for admittance to clean out the soot and dust which accumulates on the baffles and tubes. These spaces are closed by the plates 55, or when the deposit of soot is not excessive sufficient access is afforded by the openings between the junction-boxes. In this case but one space is left, which is to allow the boxes to be raised for the removal of a tube should the necessity arise.

The flue 48 is shown in front; but it may be either front or rear or on top or on the sides at any point, the gases being directed by more or fewer rows of baffles variously arranged to secure the right direction.

The inclined tubes shown are to save spe-



cially long junction-boxes and have no other significance.

I claim and desire to secure by Letters Patent—

5 1. In a water-tube generator, a steam-chamber, a water-chamber connected therewith, a check-valve between said chambers opening toward the water-chamber, a restricted by-pass between said chambers, water-tubes connected together in series and forming continuous passages (one or more) leading from said water-chamber through the fire-space, heating means within said fire-space, a communication from said water-tube series to the steam-chamber, and check-valves between the water-chamber and each water-tube passage-way, substantially as specified.

2. In a water-tube steam-generator, separate chambers for steam and water respectively, a passage between said chambers, a check-valve controlling said passage, a by-pass between said chambers, means for regulating the aperture of said by-pass, and one or more series of connected water-tubes forming connected passages within the fire-space, leading from the water-chamber to the steam-chamber, substantially as specified.

3. In a water-tube steam-generator, a water-chamber, a steam-chamber, a check-valve between said chambers, a cross-box secured to the under side of the water-chamber, a series of connected water-tubes of uniform diameter in the fire-space, connected to the cross-box, forming continuous passages, check-valves in said passages near the water-chamber, and connecting-pipes from the end of said water-tube passages to the steam-chamber, substantially as specified.

4. In a water-tube steam-generator, a water-chamber, a separate steam-chamber, a check-valve between said chambers, a cross-box secured to the water-chamber at the under side, said cross-box being provided with tube-holes, junction-boxes connected to said cross-box, check-valves in said junction-boxes, a series of connected water-tubes of uniform diameter in the fire-space connected to the cross-box by the junction-boxes, and upcast-pipes from the water-tubes to the steam-chamber, substantially as specified.

5. In a water-tube steam-generator, a steam-chamber, a water-chamber beneath said steam-chamber, a check-valve between said chambers, one or more series of connected water-tubes of uniform diameter forming connected passages downward in the fire-space from the water-chamber, and upcast-pipes from the lowermost water-tubes to the steam-chamber, said upcast-pipes being separately connected

to said steam-chamber, substantially as specified.

6. In a water-tube steam-generator, a water-chamber, a steam-chamber, a passage between said chambers, a valve in said passage, normally open, but closing by agency of any reverse flow through said passage, a second passage between said chambers, means for restricting and adjusting the flow through said second passage, and means for circulating fluid continuously in one direction from said water-chamber to said steam-chamber, substantially as specified.

7. In a water-tube steam-generator, a water-chamber, a steam-chamber, water-tubes in separate series composed of units two tubes wide, forming connected passages downward in the fire-space from the water-chamber to the lowermost tubes, junction-boxes connecting the ends of each pair of tubes at one end, and adjacent pairs at the other end, upcast-pipes from the lowermost tubes of each series to the steam-chamber, said lowermost tubes being longer than the others to afford space between the said upcast-tubes and the rear headers for access to the hand-hole plates, substantially as specified.

8. In a water-tube steam-generator, having a water-chamber and a separate steam-chamber, a check-valve between the two chambers, a cross-box secured beneath the water-chamber, water-tubes extending from said cross-box in fan shape, water-tubes in separate series extending through the fire-space, connected to said fan-like-arranged tubes, check-valves in the series near the water-chamber, and separate uptake-pipes extending from the lowermost series of water-tubes to the steam-chamber, substantially as specified.

9. In a water-tube steam-generator, a water-chamber, a steam-chamber, a passage between said chambers, a check-valve in said passage opening toward the water-chamber, a means for allowing a restricted flow from the water-chamber to the steam-chamber when the check-valve is closed, evaporating-tubes forming continuous passages from the water-chamber to the steam-chamber, and means for supplying said evaporating-tubes with water from the water-chamber, converting it into steam during the passage, and discharging it as steam into the steam-chamber, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN CLINTON PARKER.

Witnesses:

HENRY RAINEY,  
S. C. DELAWATER.