E. W. CHRISTIE & T. ROBERTS.

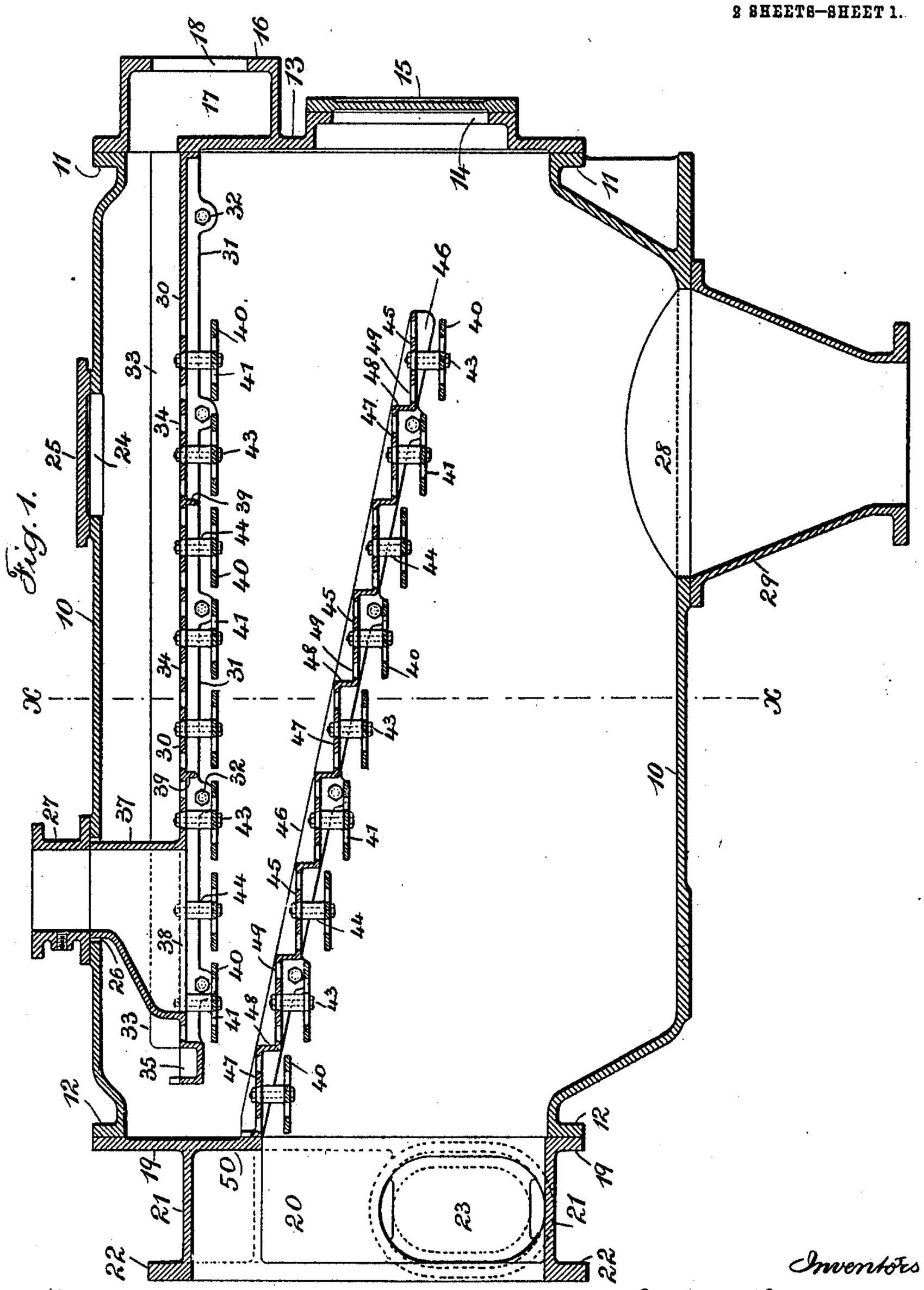
CONDENSER.

APPLICATION FILED SEPT. 12, 1910.

978,697. Patented Dec. 13, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

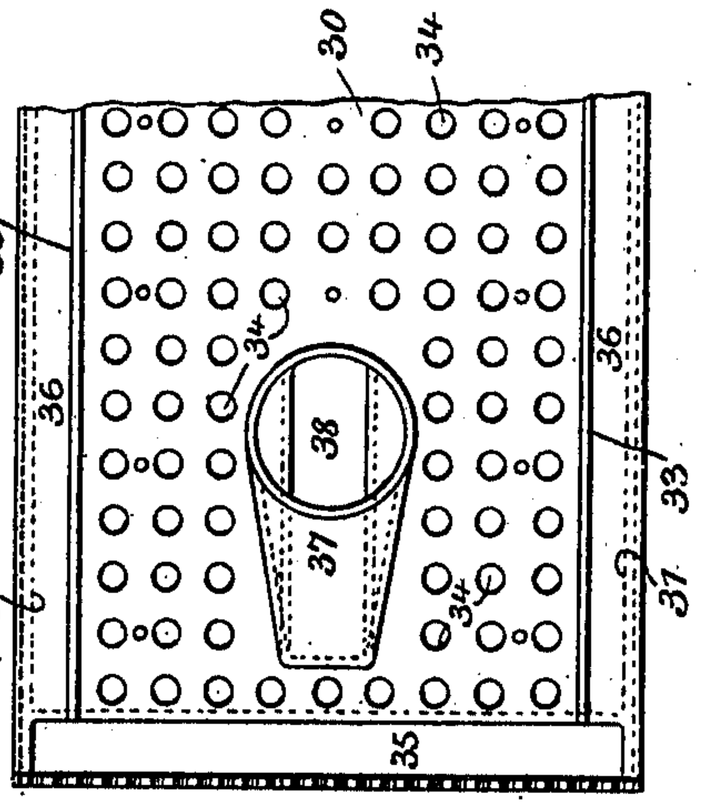

Fig. 3.

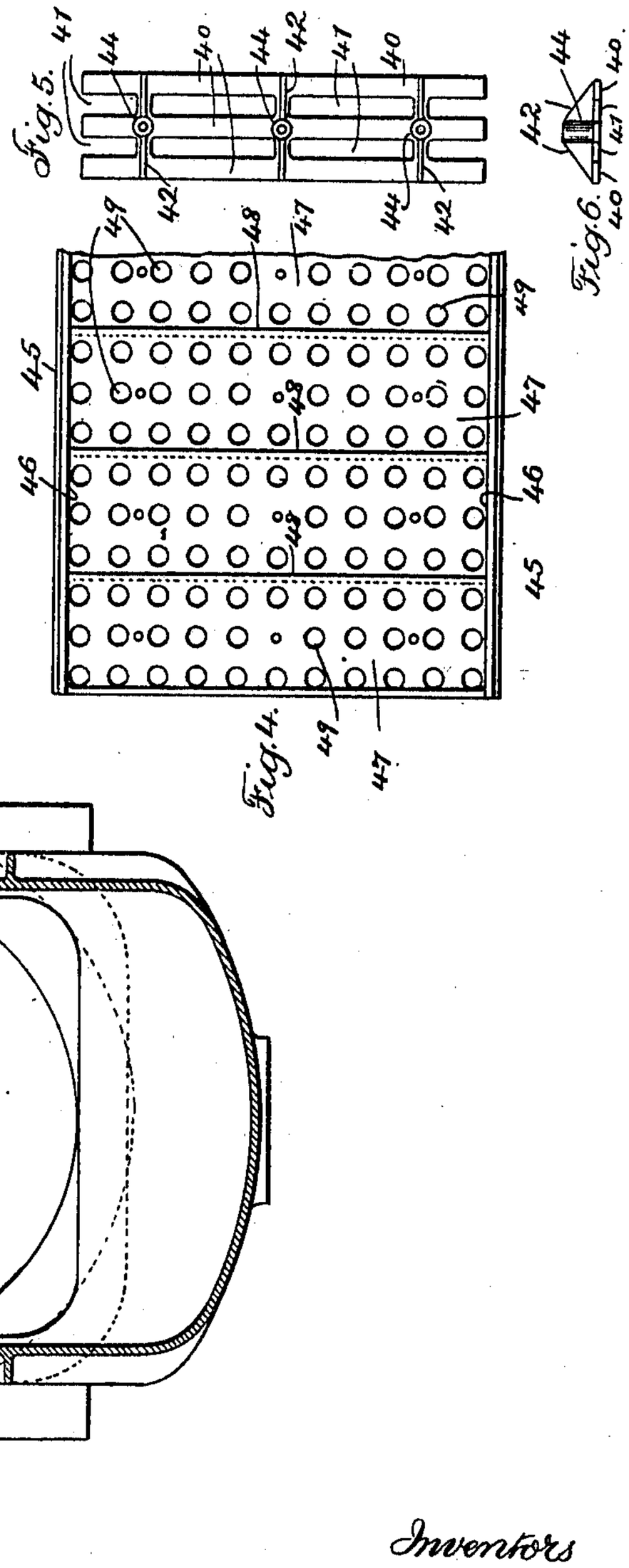

Fig. 5.

Fig. 6.

Fig. 4.

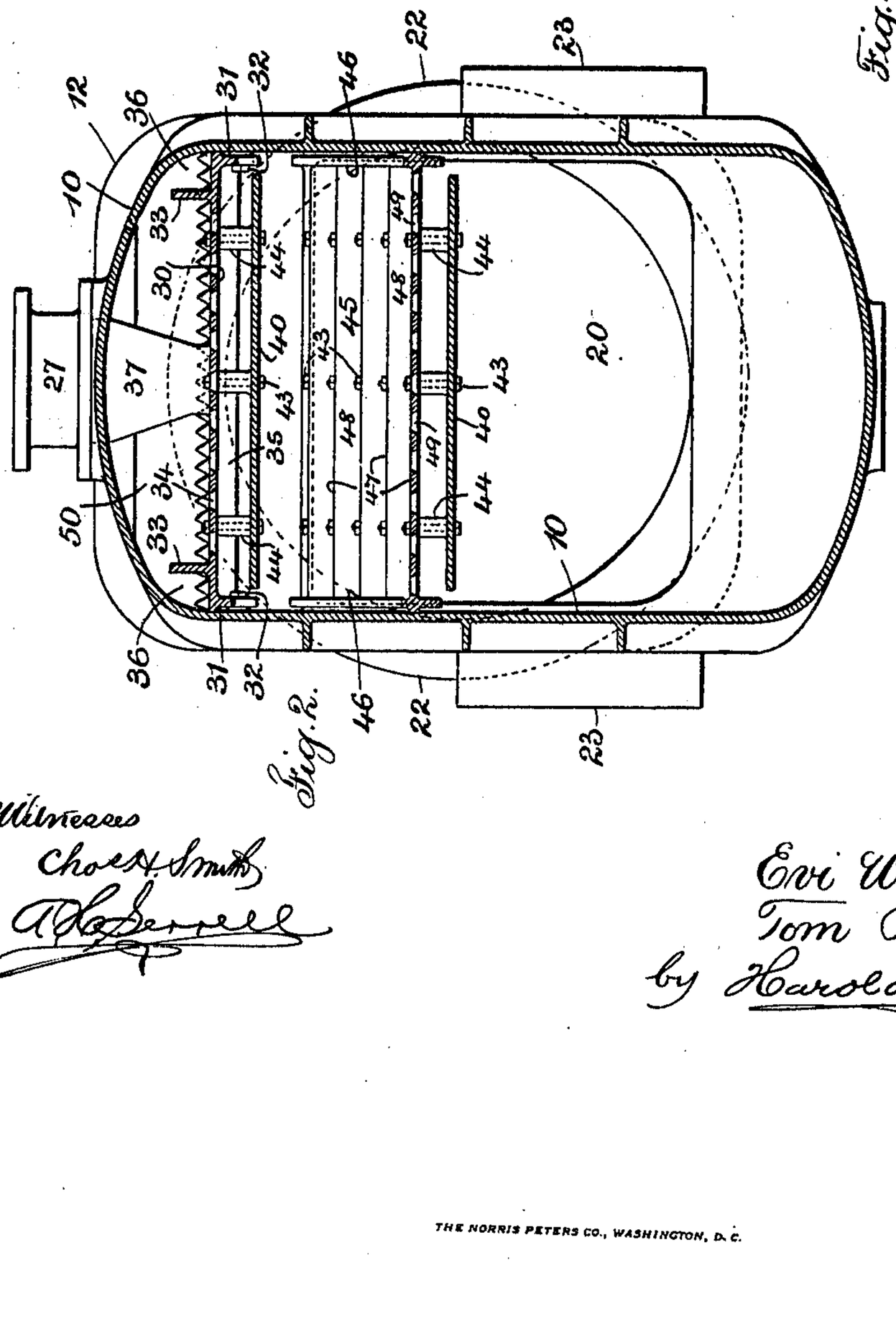

Fig. 2.

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UNITED STATES PATENT OFFICE.

EVI W. CHRISTIE, OF SEWAREN, AND TOM ROBERTS, OF ROSELLE PARK, NEW JERSEY, ASSIGNORS TO WHEELER CONDENSER AND ENGINEERING COMPANY, OF CARTERET, NEW JERSEY, A CORPORATION OF NEW JERSEY.

CONDENSER.

978,697. Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed September 12, 1910. Serial No. 581,722.

To all whom it may concern:

Be it known that we, EVI W. CHRISTIE, residing at Sewaren, in the county of Middlesex and State of New Jersey, and TOM ROBERTS, residing at Roselle Park, in the county of Union and State of New Jersey, both citizens of the United States, have invented an Improvement in Condensers, of which the following is a specification.

Our invention relates to condensers and particularly to that type of condensers known as jet condensers employed in the condensation of exhaust steam or other vapor and is an improvement upon the construction of the condenser shown and described in the application Serial No. 475,360, filed February 1st, 1909, by Tom Roberts, one of the applicants herein, for Letters Patent for an improvement in condensers.

The particular type of jet condenser to which our invention relates is that in which means are provided for breaking up the injection water into a spray or finely divided particles with which the exhaust steam or other vapor is caused to pass and commingle in order to condense the same within the apparatus.

The objects of our invention are to so construct the condenser as to provide therein a passageway of uniformly diminishing capacity so as to effect as far as possible an even distribution of the steam or vapor to be condensed; to provide a means whereby the connection to the vacuum creating device employed will be free from the injection water, the water of condensation or of a mixture of the same; and to provide a structure in which the entire volume of steam or vapor admitted is completely condensed; all of which together with other obvious objects will be hereinafter more particularly described.

In the drawing, Figure 1 is a central vertical longitudinal section of the condenser embodying our invention. Fig. 2 is a cross section taken on line *x*, *x*, Fig. 1. Fig. 3 is a plan of the end of one of the partition walls adjacent to the connection for the vacuum creating device. Fig. 4 is a plan of a portion of the stepped and inclined partition wall. Fig. 5 is a plan of the spatter plates employed in the condenser, and Fig. 6 is an end view of the same.

Referring particularly to the drawing, the jet condenser comprising our invention preferably consists of a shell member 10 made of any suitable material and in any desired shape or configuration. This shell member 10 is preferably open at the opposite sides or ends thereof and is provided at one end with a flange 11 and at the opposite end with a flange 12. A head member 13 is provided and adapted to be connected with the flange 11 in any suitable manner. This head 13 is provided with a hand-hole 14 normally closed by a hand-hole cover 15, and the head 13 is also provided with a chamber 17 for the admission of the injection water which is supplied to this chamber through an opening 18 in the side thereof. The chamber 17 extends entirely across the head 13 and the purpose of the same is to insure an even distribution of the injection water, as will appear more plainly hereinafter.

At the opposite end of the shell member 10 a head 19 is employed and is adapted to be connected in any suitable manner to the flange 12. This head 19 includes an exhaust steam inlet chamber 20 inclosed by the wall 21 and the wall 21 terminates in a flange 22 to which is connected the pipe for leading the exhaust steam to the condenser. The head 19 in suitable positions may also be provided with a vacuum breaker connection indicated at 23.

In the upper portion of the shell 10 there is preferably provided a hand-hole 24 normally closed by a cover 25 and also preferably in the upper portion of the shell 10 there is provided an opening 26 surrounded by a suitable boss to which is secured the connection 27 for a vacuum creating device. In the bottom of the shell 10 there is also provided an opening indicated at 28 for the outlet of the condensed steam. This opening is also surrounded by a boss to which is secured a connection 29 leading to the hot well or other reservoir. Within the shell 10 and extending entirely across the same and running in a horizontal position from the end to which the head 13 is connected, to a point adjacent to the opposite end, we employ a partition wall indicated at 30. On the opposite sides of this partition wall there are flanges 31 adapted to

contact with the inner adjacent surfaces of the side walls of the shell 10 to which the partition wall 30 is secured by means of the bolts 32 passing therethrough and through the flanges 31 or otherwise.

Extending upwardly from the upper surface of the partition wall 30 and appreciably distant from the edges thereof, we provide ribs 33, so that when the partition wall 30 is in position within the shell, these ribs 33 provide channels or troughs 36, one on either side, bounded by the ribs 33, the adjacent portions of the shell 11 and the intermediate portions of the partition wall 30, these channels or troughs 36 extending the entire length of the partition wall 30.

The partition wall 30 is provided in suitably spaced apart positions with a plurality of openings 34 preferably arranged in rows extending both longitudinally and transversely thereof, the longitudinal rows of openings extending practically the entire length of the partition wall 30 and the transverse rows of openings extending between the ribs 33 of the partition wall 30.

At the end of the partition wall 30 which comes adjacent to the flange 12 of the condenser shell, this partition wall is provided with a transverse trough indicated at 35 and both the said channels or troughs 36 communicate with or lead into the trough 35, the outer edge of which is preferably serrated as indicated in Figs. 1 and 2. Connected to or integral with this same end of the partition wall 30 is a nozzle 37 extending upwardly from the partition wall into the opening 26 and bearing against the surface of the flange of the connection 27 for the vacuum creating device, there being an opening 38 in the partition wall 30 communicating with the interior of the nozzle 37. In connection with the partition wall 30 we also employ a series of spatter plates indicated at 40. Each of these plates is preferably provided with slots 41 running parallel with the long sides of the plates and also with strengthening ribs 42 running transversely thereof. These spatter plates are secured in position beneath the partition wall 30 by means of bolts 43 and spacer members 44 or otherwise, and when in position the spatter plates 40 are so designed as to come immediately below the transverse row of openings 34 in the partition wall 30. Within the condenser shell 10 we also employ a stepped partition plate 45 which from the nature of its construction occupies an inclined position within the shell 10 extending from side to side thereof, provided with side flanges 46 and connected in position by suitable bolts or otherwise in the same manner as that hereinbefore described in connection with the partition wall 30.

The longitudinal portions 47 of the partition wall 45 are provided with series of openings 49 extending entirely across the same and beneath which spatter plates 40 are secured in position by the bolts 43 and spacer members 44 in the same manner as that hereinbefore described in connection with the partition wall 30. The vertical portions of the stepped partition wall 45 are indicated at 48 and this stepped partition wall 45 extends from the wall 50 of the head 19 to a point adjacent to the opposite end of the shell, or that to which the head 13 is connected.

It will now be apparent that in the condenser structure as hereinbefore described, the space within the shell and between the lower portions of the stepped partition wall 45 and the bottom of the shell 10 is gradually and uniformly diminished in cross section, and that the space between the upper portions of the partition wall 45 and the lower portions of the partition wall 30 is similarly diminished, whereby the passageway or possible path of the exhaust steam or other vapor within the condenser is uniformly and progressively diminished from the time the exhaust steam enters the apparatus until it is entirely condensed; also that because of the chamber 17, an even distribution of the water over the partition wall 30 will be insured and even when running light and with a curtailed supply of injection water, the troughs or channels 36 will insure a certain amount thereof reaching the transverse trough 35 and overflowing therefrom to the partition wall 45, so that it will be impossible for all the injection water in use at any given time to pass through the openings in the partition wall 30 before reaching the inner end of this partition wall, whereby the end of the partition wall 45 adjacent to the exhaust steam inlet end of the condenser is always insured of being supplied with injection water, and furthermore by the use of the nozzle 37 it is substantially impossible for the injection water or the water of condensation to enter the connection 27 leading to the vacuum creating device.

We claim as our invention.

1. A condenser comprising a shell, an injection fluid inlet, a vapor inlet, a condensed vapor outlet, a connection for a vacuum creating device, a series of partitions having a plurality of openings therein within the said shell and dividing the same into a passageway of gradually and uniformly diminishing capacity, and means beneath the said openings in the said partitions for breaking up the injection fluid into finely divided particles after the same has passed through the said openings.

2. A condenser comprising a shell, an injection fluid inlet, a vapor inlet, a condensed vapor outlet, a connection for a vacuum creating device, a series of parti-

tions having a plurality of openings therein within the said shell, dividing the same into a passageway of gradually and uniformly diminishing capacity, means whereby the injection fluid is prevented from entering said connection for the vacuum creating device, and means beneath the said openings in the said partitions for breaking up the injection fluid into finely divided particles after the same has passed through the said openings.

3. A condenser, comprising a shell, an injection water inlet, a steam inlet, a condensed steam outlet, a connection for a vacuum creating device, a series of partitions having a plurality of openings therein within the said shell, dividing the same into a passageway of gradually and uniformly diminishing capacity, means insuring a flow of injection water to the end of the shell opposite that through which the injection water is admitted, and means beneath the said openings in the said partitions for breaking up the injection water into finely divided particles after the same has passed through the said openings.

4. A condenser comprising a shell, an injection water inlet, a steam inlet, a condensed steam outlet, a connection for a vacuum creating device, a series of partitions having a plurality of openings therein within the said shell, dividing the same into a passageway of gradually and uniformly diminishing capacity, means whereby the injection water is prevented from entering said connection for the vacuum creating device, means insuring a flow of injection water to the end of the shell opposite that through which the injection water is admitted, and means beneath the said openings in the said partitions for breaking up the injection water into finely divided particles after the same has passed through the said openings.

5. A condenser comprising a shell, an injection water inlet, a steam inlet, a condensed steam outlet, a connection for a vacuum creating device, a series of partitions having a plurality of openings therein within the said shell, dividing the same into a passageway of gradually and uniformly diminishing capacity, means whereby the injection water is prevented from entering said connection for the vacuum creating device, means insuring a flow of injection water to the end of the shell opposite that through which the injection water is admitted, spatter plates and means for securing the same in position beneath the said openings in the said partitions for breaking up the injection water into finely divided particles after the same has passed through the said openings.

6. A condenser comprising a shell, an injection fluid inlet, a vapor inlet, a condensed vapor outlet, a connection for a vacuum creating device, a partition wall running horizontally from one end of the said shell to a point adjacent to the opposite end and extending across the said shell and being provided with series of apertures, spatter plates secured beneath the apertures in the said partition wall, an inclined partition wall running from one end of the condenser shell to a point adjacent to the opposite end thereof and extending across the shell and being provided with a series of apertures and spatter plates beneath the said apertures in the said inclined partition wall, the passageway provided between the said partition walls and the said shell being a gradually and uniformly diminishing one.

7. A condenser comprising a shell, an injection fluid inlet, a vapor inlet, a condensed vapor outlet, a connection for a vacuum creating device, a partition wall running horizontally from one end of the said shell to a point adjacent to the opposite end and extending across the said shell and being provided with series of apertures, spatter plates secured beneath the apertures in the said partition wall, a stepped partition wall running from one end of the condenser shell to a point adjacent to the opposite end thereof and extending across the shell and the horizontal portions thereof being provided with series of apertures, and spatter plates beneath the said apertures in the said stepped partition wall, the passageway provided between the said partition walls and the said shell being a gradually and uniformly diminishing one.

8. A condenser comprising a shell, an injection fluid inlet, a vapor inlet, a condensed vapor outlet, a connection for a vacuum creating device, a partition wall running horizontally from one end of the said shell to a point adjacent to the opposite end and extending across the said shell and being provided with series of apertures, means for connecting the said partition wall in position within the said shell, ribs extending upwardly from the said partition wall and running parallel therewith adjacent to the opposite sides thereof whereby troughs are formed between the same and the adjacent walls of the said shell, the inner end of the said partition wall being formed with a trough with which the aforesaid troughs communicate, spatter plates secured beneath the apertures in the said partition wall, a stepped partition wall running from one end of the condenser shell to a point adjacent to the opposite end thereof and extending across the shell and being provided with series of apertures and means securing the said stepped partition wall in position within the said shell, and spatter plates beneath the said apertures in the said stepped partition wall, the passageway provided be-

tween the said partition walls and the said shell being a gradually and uniformly diminishing one.

9. A condenser comprising a shell, an injection fluid inlet, a vapor inlet, a condensed vapor outlet, a connection for a vacuum creating device, a partition wall running horizontally from one end of the said shell to a point adjacent to the opposite end and extending across the said shell and being provided with series of apertures, means for connecting said partition wall in position within the said shell, ribs extending upwardly from the said partition wall and running parallel therewith adjacent to the opposite sides thereof whereby troughs are formed between the same and the adjacent walls of the said shell, the inner end of the said partition wall being formed with a trough with which the aforesaid troughs communicate, a nozzle extending upwardly from the said horizontal partition wall into the opening provided for the said connection for the vacuum creating device, spatter plates secured beneath the apertures in the said partition walls, a stepped partition wall running from one end of the condenser shell to a point adjacent to the opposite end thereof and extending across the shell and the horizontal portions thereof being provided with series of apertures, means for securing the said stepped partition wall in position within the said shell, and spatter plates beneath the said apertures in the said stepped partition wall the passageway provided between the said partition walls and the said shell being a gradually and uniformly diminishing one.

10. In a condenser and in combination, means providing for the entrance of steam and condensing water, means for comminuting the water and spattering the same about in the condenser and for simultaneously and progressively lowering the level of the spattering action and means for discharging the water resulting from the condensation.

11. In a condenser and in combination, means providing for the entrance of steam and condensing water, two spaced apart series of devices for comminuting the water and spattering the same about in the condenser, each series being so placed as to narrow and restrict the available passageway or path of travel through the condenser for the steam, and means for discharging the water resulting from the condensation.

Signed by us this 6th day of Sept. 1910.

EVI W. CHRISTIE.
TOM ROBERTS.

Witnesses:
J. J. BROWN,
W. R. HERBST.