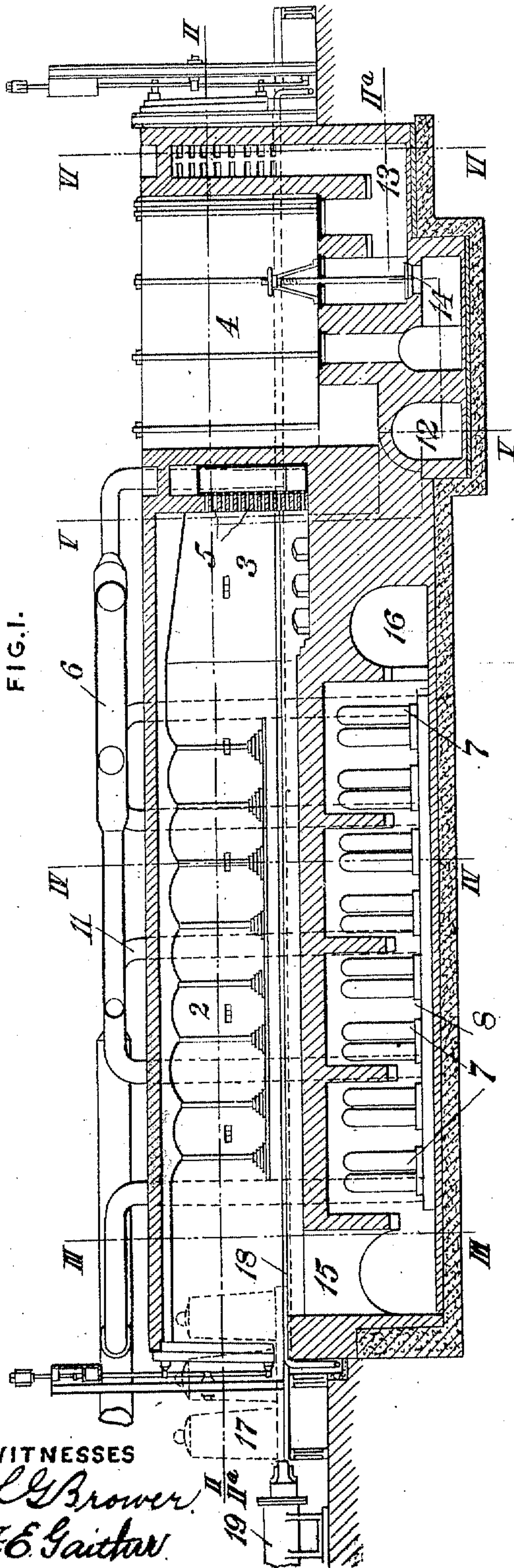


F. H. DANIELS.
 APPARATUS FOR ANNEALING.
 APPLICATION FILED JAN. 25, 1910.

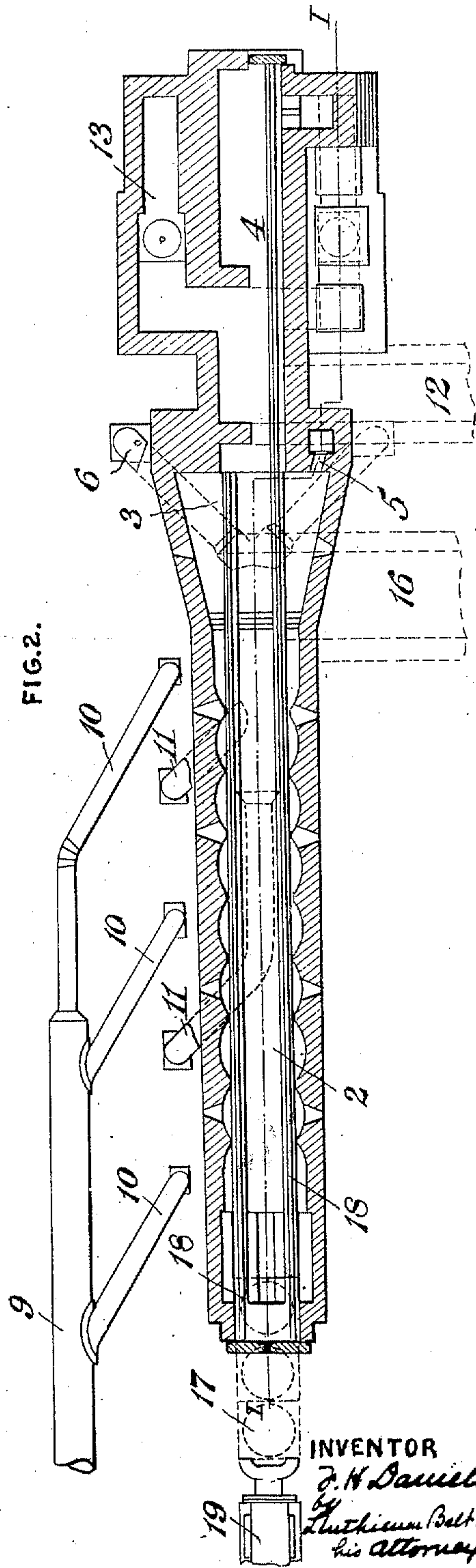
983,981.

Patented Feb. 14, 1911.

4 SHEETS—SHEET 1.



WITNESSES
L. S. Brower
F. E. Gaither



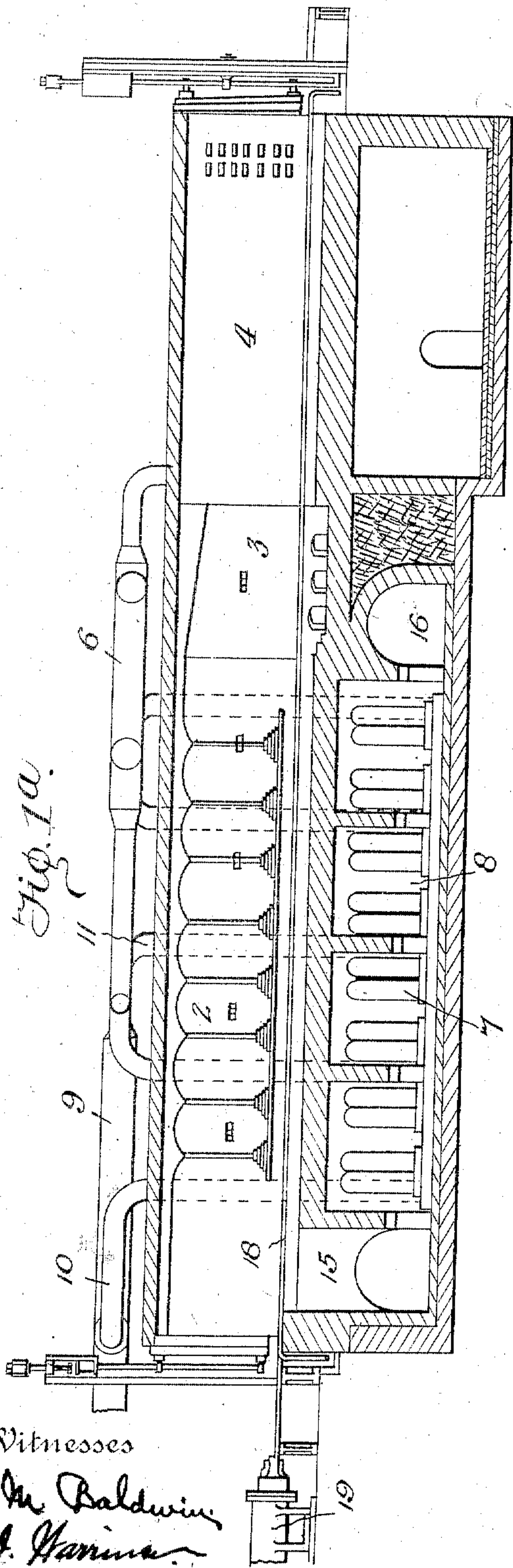
INVENTOR
F. H. Daniels
 by *Luthium Bell & Fuller*
 his attorneys.

983,981.

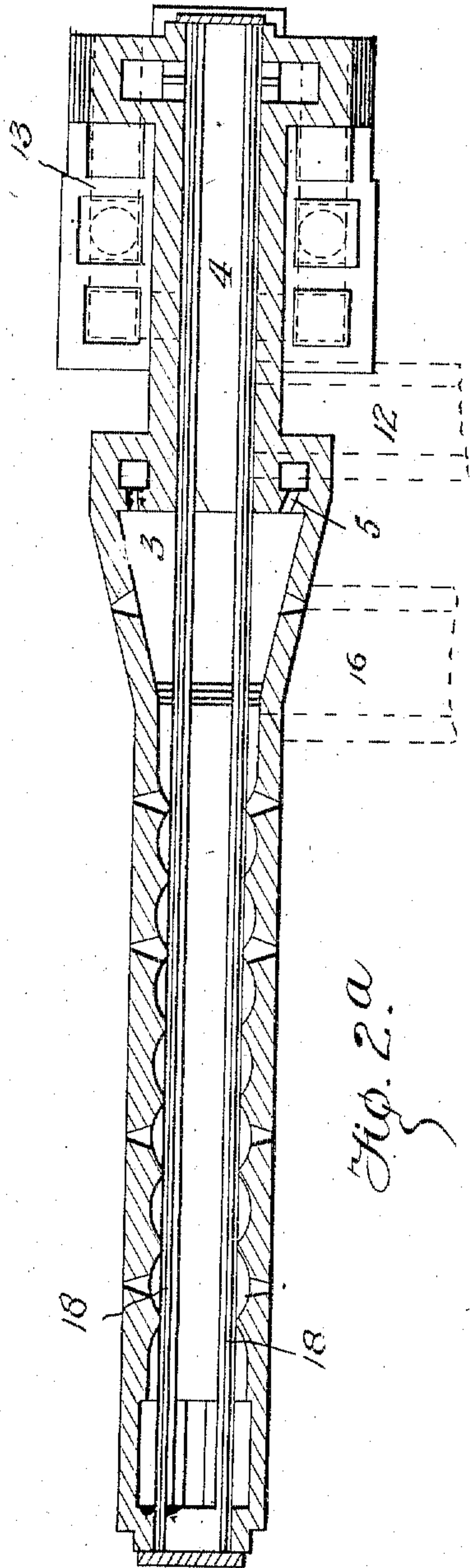
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

FIG. 3.

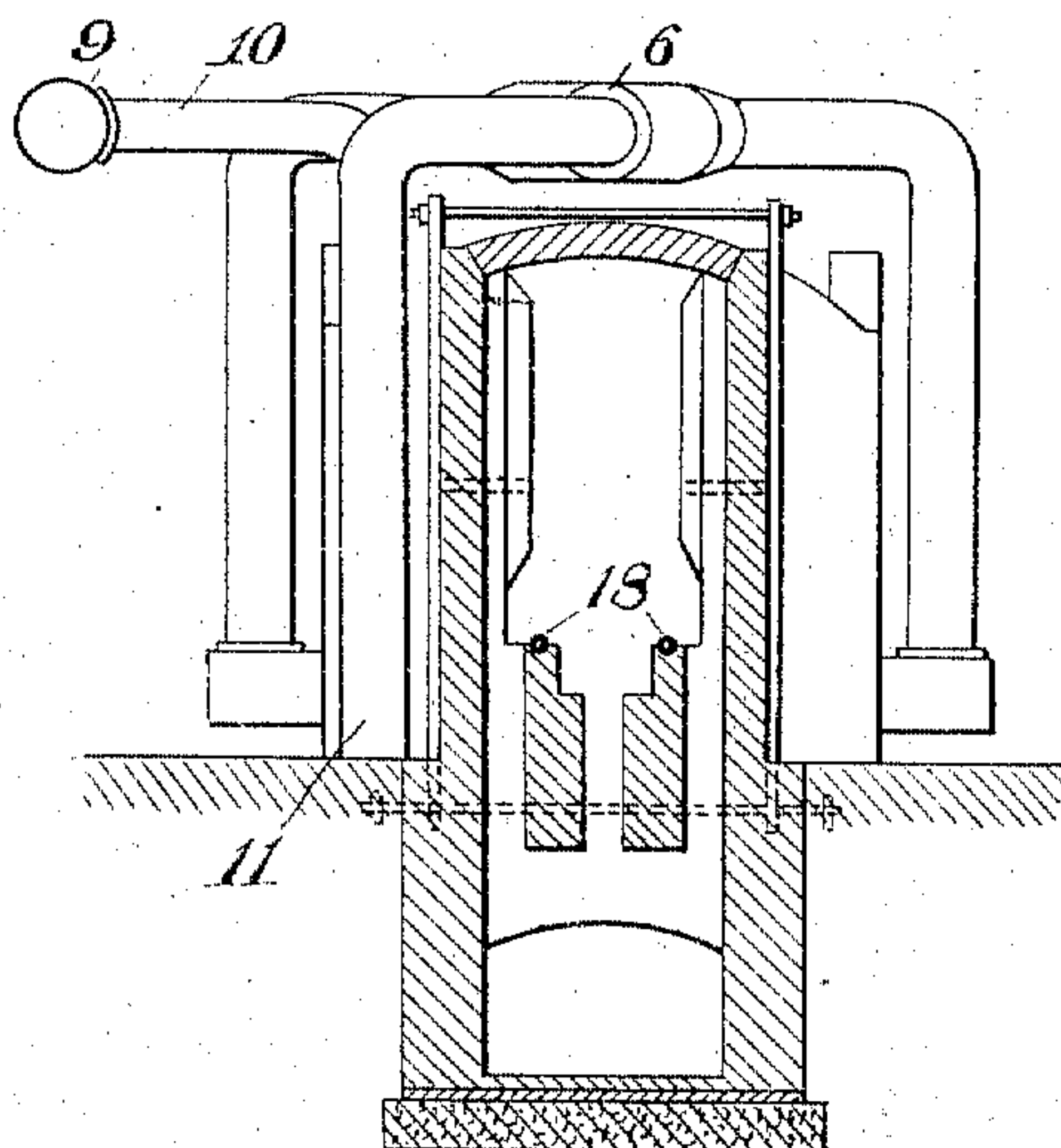


FIG. 4.

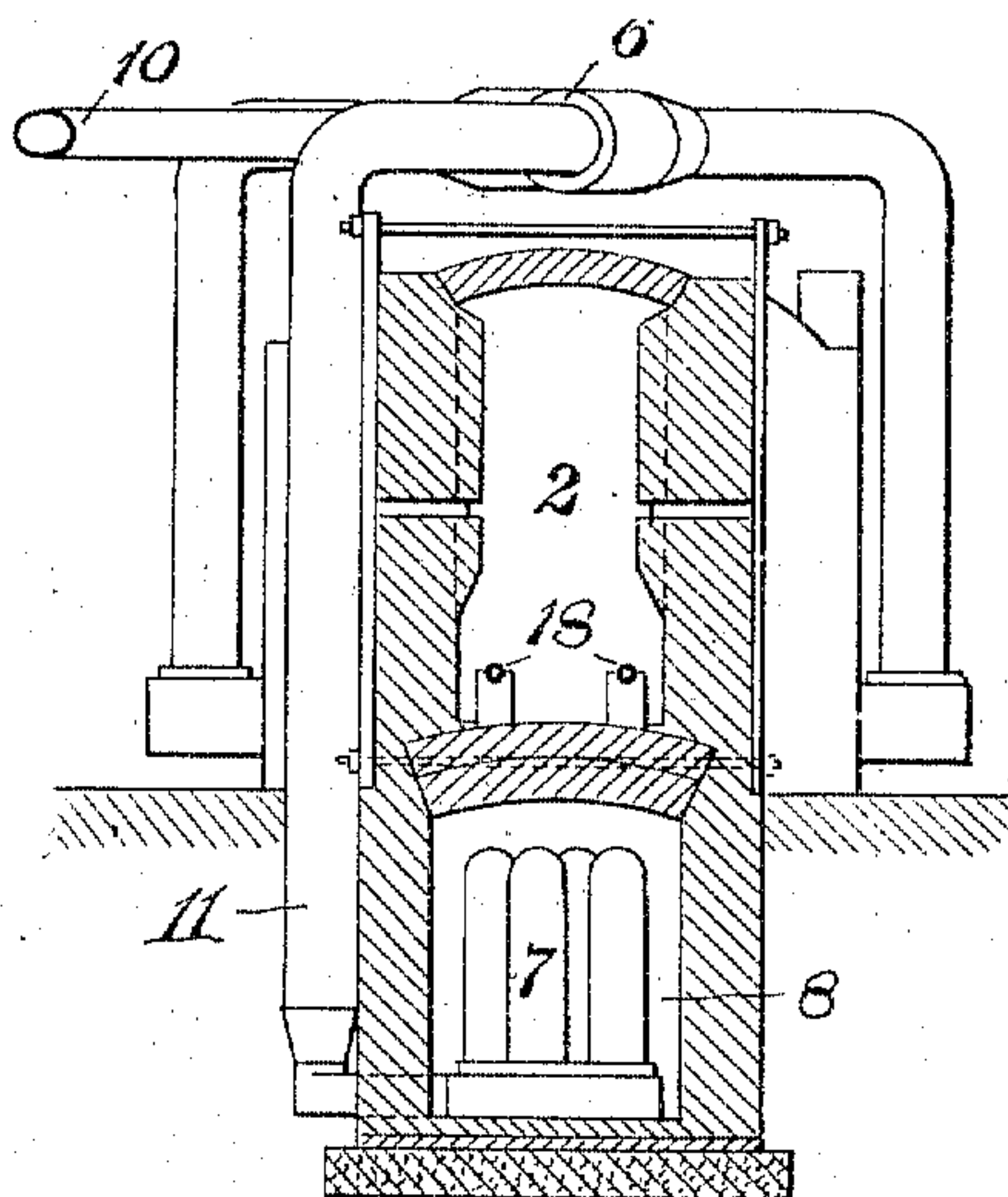


FIG. 5.

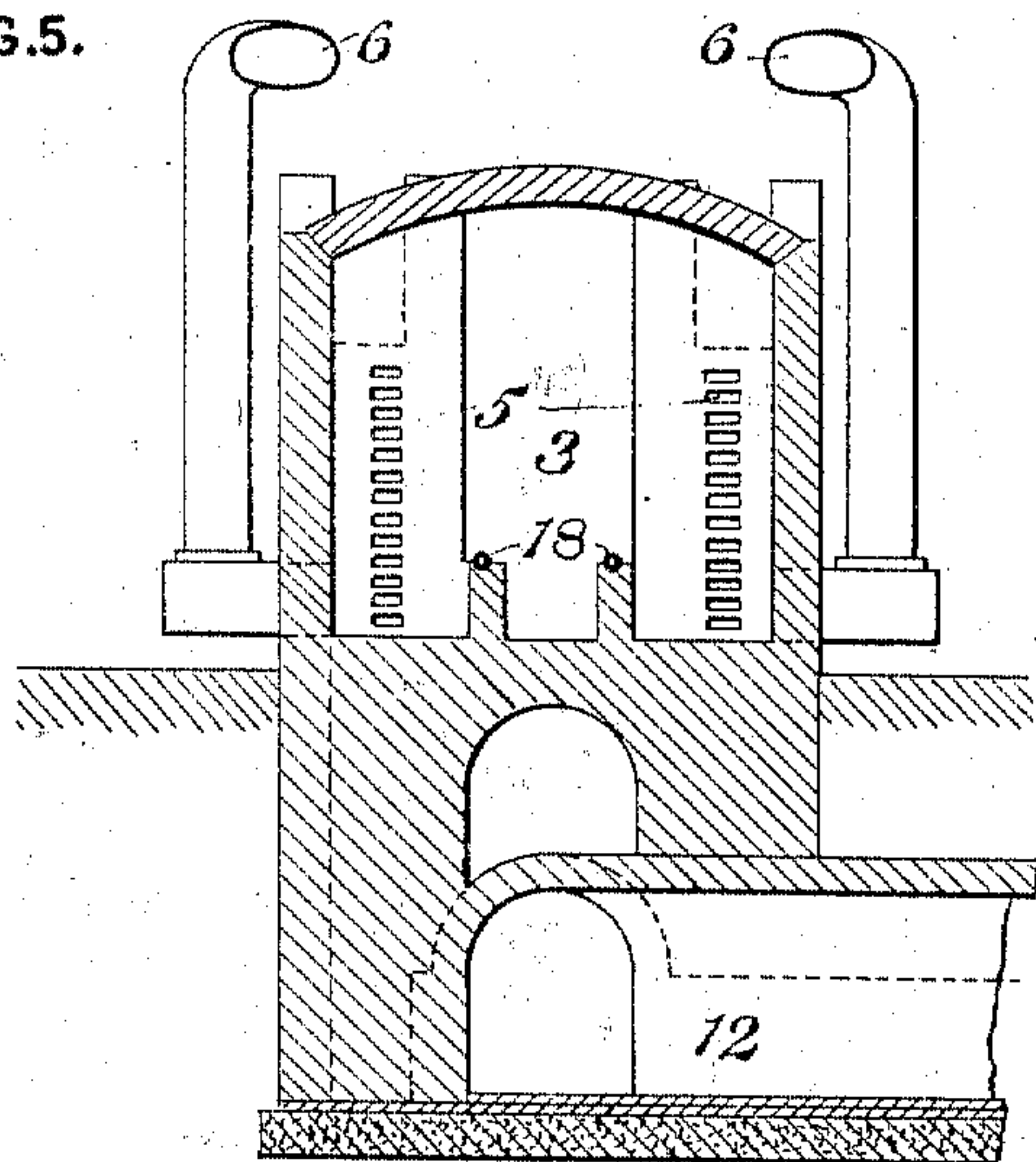
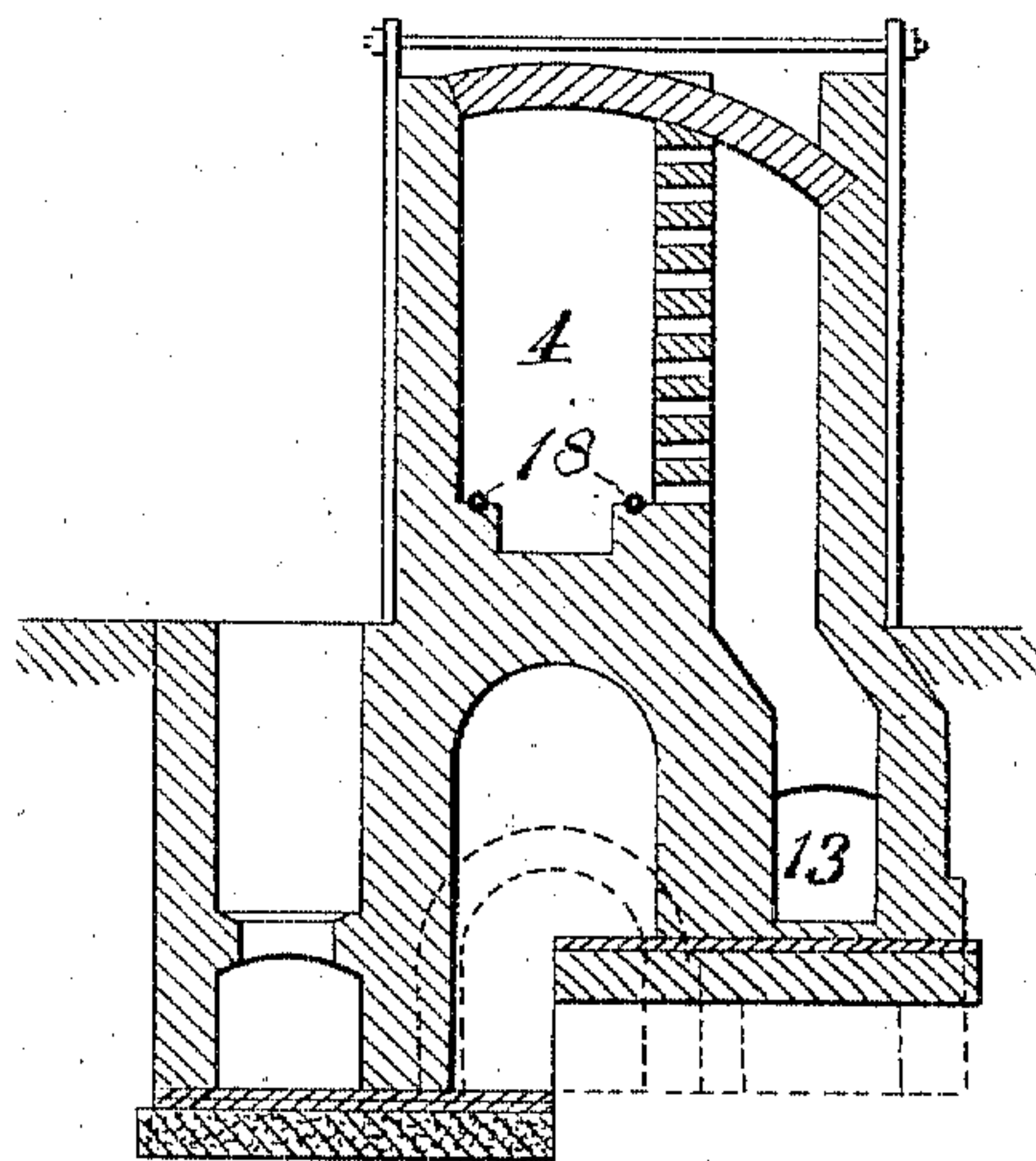


FIG. 6.



WITNESSES

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4 SHEETS—SHEET 4.

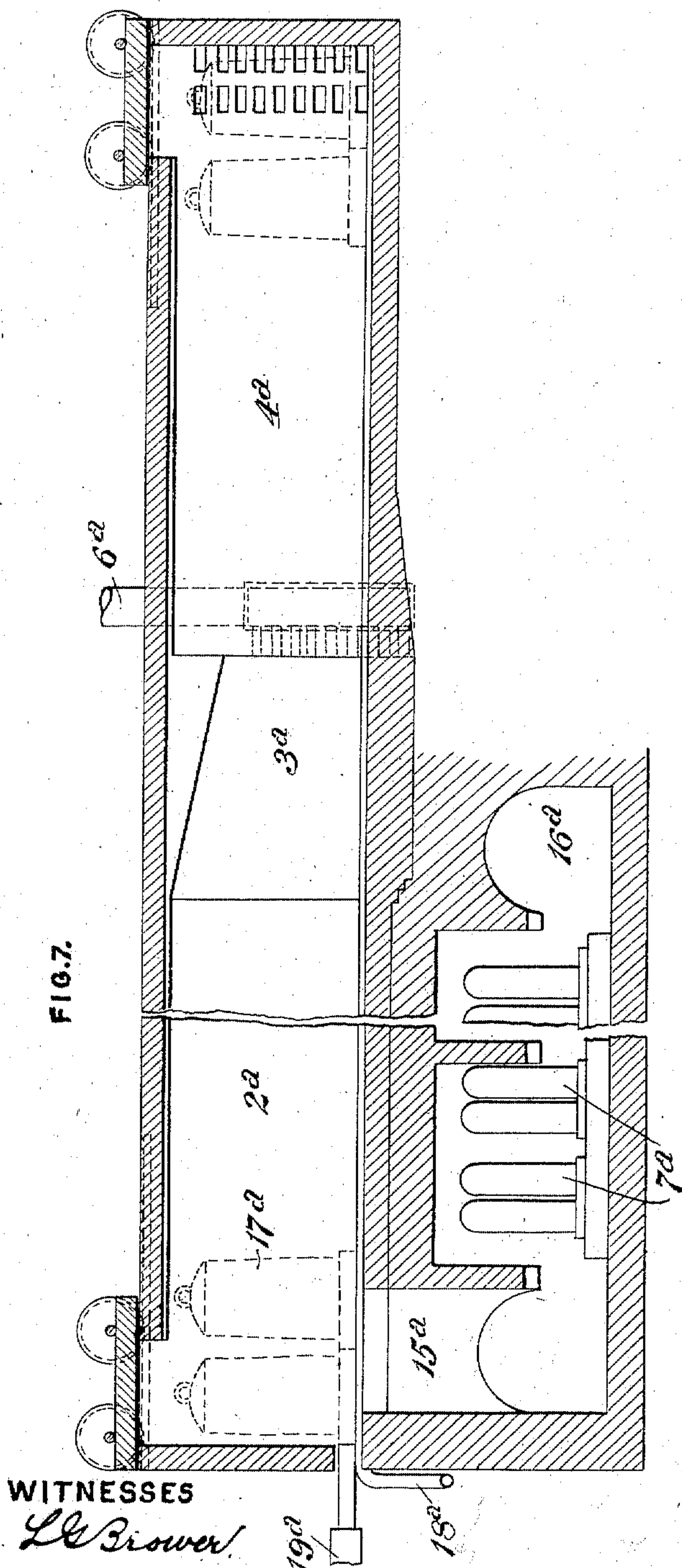


FIG. 7.

WITNESSES

L. C. Brower
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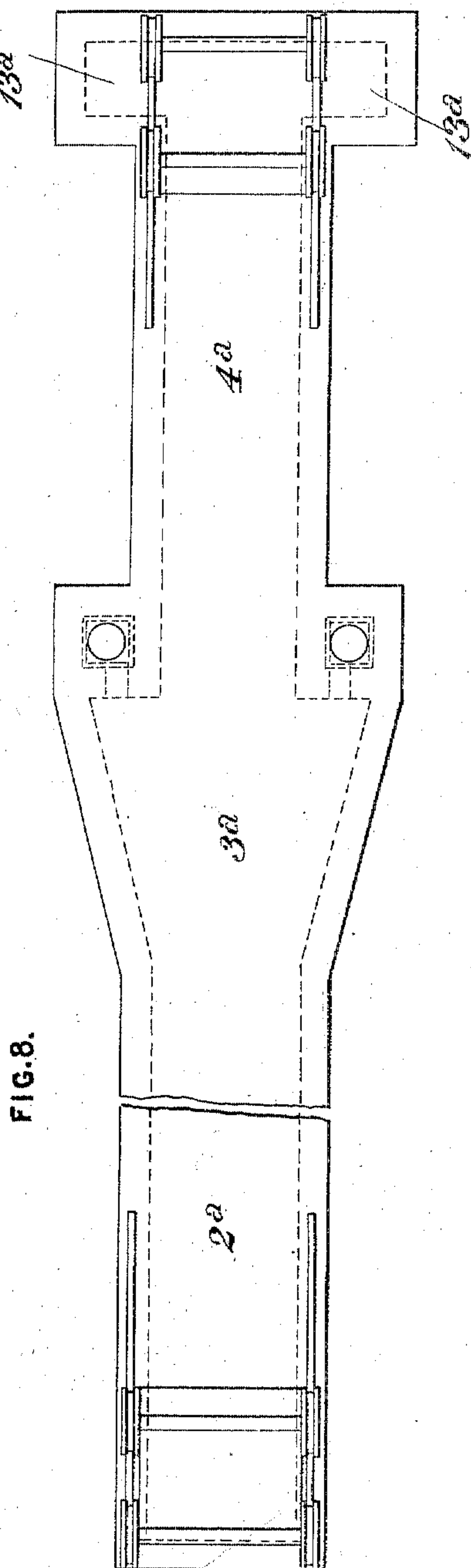


FIG. 8.

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UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

APPARATUS FOR ANNEALING.

983,981.

Specification of Letters Patent. Patented Feb. 14, 1911.

Application filed January 25, 1910. Serial No. 540,061.

To all whom it may concern:

Be it known that I, FRED H. DANIELS, of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Apparatus for Annealing, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Figure 1 is a longitudinal sectional elevation on the line I—I of Fig. 2, showing an annealing furnace constructed and arranged in accordance with my invention. Fig. 2 is a sectional plan of the bottom half of the section being taken on the line II—II of Fig. 1, the top half of the section being taken on the line II^a—II^a. Fig. 1^a is a longitudinal sectional side elevation showing in vertical section the heating chambers forming the furnace. Fig. 2^a is a sectional plan showing the heating chambers in horizontal section. Fig. 3 is a sectional end elevation of the apparatus on the line III—III of Fig. 1. Fig. 4 is a similar sectional end elevation through the heating chamber of the furnace on the line IV—IV of Fig. 1. Fig. 5 is a sectional end elevation through the combustion chamber of the annealing furnace, on the irregular line V—V of Fig. 1. Fig. 6 is a sectional end elevation showing the gas inlet opening leading from the gas flues into the pot cooling chamber of the annealing furnace, this section being taken on the line VI—VI of Fig. 1. Fig. 7 is a longitudinal sectional elevation showing a modified form of furnace and Fig. 8 is a plan view of the same.

My invention relates to the annealing of various materials in pots, and more particularly relates to annealing rods or wire in such annealing pots.

The object of the invention is to provide a pot annealing furnace of improved construction having novel means for heating and cooling the pots and for heating the gases burned in the furnace in the annealing operations.

Heretofore in annealing in pot annealing furnaces, the materials being annealed remain in the furnace only for a sufficient length of time to be heated, the pots containing the hot materials being removed while in a heated condition from the furnace and afterward allowed to cool, or the pot with its contents allowed to remain in the

furnace, until the furnace pot and contents had become cool.

In the use of the improved apparatus shown and described, the annealing pots which contain the materials which are to be annealed, are introduced into the heating chamber of the furnace, and are caused to gradually move through the furnace, passing successively through the heating chamber into the combustion chamber forming part of the furnace and through the combustion chamber into and through the gas heating chamber also forming part of my improved apparatus. In this way the pots and their contents are heated during their passage through the heating and combustion chambers, become cooled gradually while passing through the gas heating chamber, and at the same time the incoming, unburned gases become highly heated by contact with the heated pots in the gas heating chamber, and, when entering the combustion chamber, are in a proper condition for mixing with the air therein, in order to promote combustion and burn, the burned gases highly heating the pot heating chamber of the furnace while passing therethrough.

In the drawings, referring to Figs. 1 to 6, 2 represents the pot heating compartment or chamber of my improved furnace and 3 is the combustion chamber, which is located intermediate of the heating chamber 2 and a gas heating chamber 4. The combustion chamber 3 is supplied with air through ports 5 located in the end wall of the combustion chamber, as is clearly shown in Figs. 1, 2 and 5. Air is supplied to the ports 5 through flues or pipes 6 which are connected to the outlets on the heaters 7 mounted in the air heating chamber 8, which is located below the heating chamber 2 of the furnace.

The air is supplied by means of a suitable blower, through the air pipe 9 and branch pipes 10 to the inlet side of the heaters 7 in the air heating chamber 8, the air passing outwardly from the heaters 7 through the vertical legs 11 of the pipe 6, which is shown by dotted lines in Fig. 2.

Gas is supplied to the gas heating chamber 4 through the gas flue 12 and the branch flues 13, the supply of gas being controlled by means of the mushroom valves 14, or in any other desired manner, and the products of combustion are caused to travel through and pass from the heating chamber 2, down-

wardly through the connecting flue 15 into the air heating chamber 8 where the heat of these outgoing burned gases is utilized to heat the air passing through the heaters, then passing outwardly through the stack flue 16 to the furnace stack.

The annealing pots 17, after being filled with the materials to be annealed are placed in front of the inlet opening in the end of the heating chamber 2, these pots resting upon water cooled skid pipes 18 which extend lengthwise through the heating chamber 2, combustion chamber 3 and gas heating chamber 4 of the furnace.

As shown in Fig. 1, a pusher 19 is employed to cause the pots to pass gradually through the furnace by a step by step movement. As a pot is introduced into the heating chamber 2, one is moved out from the door or opening in the opposite end of the furnace in the gas heating chamber 4.

In the operation of the annealing furnace by my improved method, the annealing pots 17 are successively placed in position in front of the pusher 19 by means of a traveling crane or other suitable pot handling device and the piston of the pusher 19 is caused to actuate so as to move the annealing pots 17 resting on the skid pipes 18 into the furnace. After the furnace becomes filled with the annealing pots, when a pot is introduced one is caused to issue from the opposite end of the furnace. The furnace is of considerable length and, while the pots are passing through the heating chamber 2 of this furnace, they and their contents become highly heated by contacting with the burned gases passing through the chamber 2 from the combustion chamber 3. The pots are passed through the combustion chamber 3 from the heating chamber 2, and are then caused to slowly move through the gas heating chamber 4. In this chamber 4 the cold, or relatively cold, gases entering through the gas ports are brought into contact with the outer surfaces of the highly heated pots and cause these pots and their contents to gradually become cooled in a non-oxidizing atmosphere during their passage through the gas heating chamber 4. The gases, by coming in contact with the surfaces of the heated pots, become highly heated and, on entering the combustion chamber 3, from the chamber 4, are there mixed with the air passing from the air ports 5 and are burned, the resulting products of combustion passing forwardly into the pot heating chamber 2, where they contact with and heat the pots and materials in the pots while in this chamber, then passing into the air heating chamber 8 where they are brought into contact with the air heaters 7 and heat the air during its passage through the air heaters 7 in the chamber 8, the air becoming heated before

issuing finally from the ports 5 in the combustion chamber 3.

In the modification shown in Figs. 7 and 8, the arrangement of the pot heating chamber, combustion chamber and gas heating chamber is the same as in the preceding figures, like parts being marked with like numbers with the letter "a" applied thereto, and the pots, instead of being moved into and out of the furnace through doors located in its end walls, are placed in and are taken from the furnace through suitable openings in the ends of the roof of the furnace. These openings are normally closed by means of a cover mounted on wheels so as to be horizontally movable upon the track, as is shown in the drawings.

After the pots have been introduced through the opening in the roof of the furnace shown in Figs. 7 and 8, the operation is the same as in the preceding figures until they have reached the opposite end of the furnace, when they are removed through the opening in the roof at the cooling chamber end of the furnace.

The advantages of my invention will be apparent to those skilled in the art.

Instead of heating the annealing pots and their contents and then removing the pots from the furnace while in a highly heated condition, and afterward allowing the pots to cool by contact with the atmosphere while without the furnace, the pots are gradually cooled by contact with the unburned gases passing to the combustion chamber of the furnace and these gases, forming a non-oxidizing atmosphere, prevent oxidization of the pots and very materially increase their life. The gases, by contacting with the highly heated pots during their passage through the gas heating chamber, become highly heated and when leaving the cooling chamber are in the best possible condition for mixing with the air in the combustion chamber of the furnace, in this way avoiding the necessity for gas regenerators and utilizing the heat from the heated pots to raise the temperature of the gases and at the same time gradually cool the pots and their contents.

Modifications in the construction and arrangement of the parts may be made without departing from my invention. The air burned in the furnace may be heated or not, as is desired. The gas may be heated partly, prior to its entrance into the gas heating chamber. The means employed for moving the pots through the furnace may be varied and other changes may be made without departing from my invention.

I claim:

1. Apparatus for annealing comprising annealing pots, a pot heating furnace having a compartment for heating unburned gases and means for passing the annealing

pots from the heating compartments through the gas heating compartment of the furnace; substantially as described.

2. Apparatus for annealing comprising
5 annealing pots, a pot heating furnace having a compartment for heating unburned gases, a compartment forming a combustion chamber, a heating compartment for the annealing pots and means arranged to pass the
10 pots from the heating compartment and compartment forming the combustion chamber into the gas heating compartment; substantially as described.

3. Apparatus for annealing comprising
15 annealing pots, a pot annealing furnace having a compartment for heating unburned gases, a compartment forming a combustion chamber, a pot heating compartment and means arranged to pass the annealing pots
20 from the pot heating compartment through the compartment forming the combustion chamber into the gas heating compartment; substantially as described.

4. Apparatus for annealing comprising
25 annealing pots, a pot heating furnace having a compartment for heating unburned gases, a compartment forming a combustion chamber, a pot heating compartment, and means for passing the annealing pots successively through the compartments of said
30 furnace; substantially as described.

5. Apparatus for annealing comprising annealing pots and a pot heating furnace, said furnace having a compartment for heating unburned gases, a compartment forming a combustion chamber communicating with the gas heating compartment and a pot heating compartment communicating with the compartment forming the combustion
40 chamber, and means for passing the annealing pots successively through the heating compartment, the compartment forming the combustion chamber and the gas heating chamber; substantially as described.

45 6. Apparatus for annealing comprising annealing pots, a heating furnace, said furnace having a compartment for heating unburned gases, a compartment forming a combustion chamber and a pot heating compartment, means for successively passing the
50 pots through the compartments of the furnace, and means for supplying air to the combustion chamber of said furnace; substantially as described.

55 7. Apparatus for annealing comprising

annealing pots, a pot heating furnace having a compartment for heating unburned gases, a compartment forming a combustion chamber, a pot heating compartment, and means for passing the annealing pots successively through each compartment of the
60 furnace, said furnace having means for supplying air to said combustion chamber and an air heating chamber through which the burned gases are passed to heat the air prior
65 to its entering said combustion chamber; substantially as described.

8. A pot annealing furnace having a compartment forming a pot heating chamber, a compartment forming a pot cooling chamber and an intermediate compartment forming a combustion chamber, means for passing the pots through said furnace and through said pot cooling chamber, connections for supplying air to the combustion
75 chamber, and means for supplying unburned gases to said combustion chamber, said means being arranged to bring the unburned gases into contact with heating pots in the pot cooling chamber and thereby cool the
80 pots; substantially as described.

9. A pot annealing furnace having a compartment forming a pot heating chamber, a compartment forming a combustion chamber, a compartment forming a cooling chamber, and means for passing the annealing
85 pots through said furnace and through said pot cooling chamber, the combustion chamber having openings therein forming air ports, an air heating chamber connected to
90 the air ports and means for conducting burned gases through said air heating chamber to thereby heat air passing through the air heating chamber to said air ports; substantially as described. 95

10. Apparatus for annealing articles in pots, comprising a chamber having a pot heating compartment, a compartment forming a combustion chamber and a compartment for heating unburned gases, and means
100 for passing the annealing pots through said compartments forming the furnace; substantially as described.

In testimony whereof, I have hereunto set my hand.

FRED H. DANIELS.

Witnesses:

GEO. SIEURIN,
G. A. MERKT.