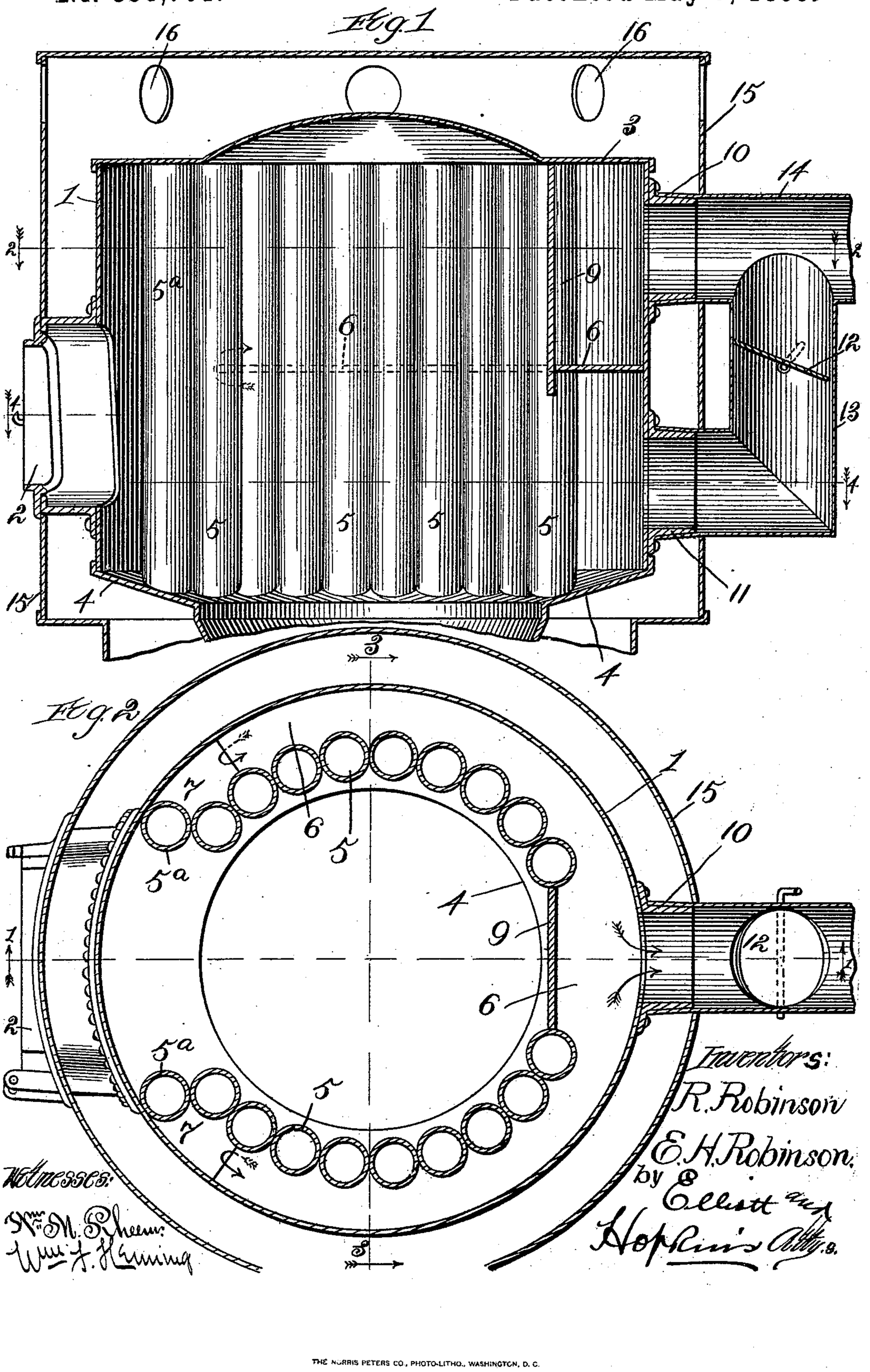
(No Model.) 2 Sheets—Sheet 1.

R. & E. H. ROBINSON.

HEATING FURNACE.

No. 538,701. Patented May 7, 1895.

Fig. 1



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

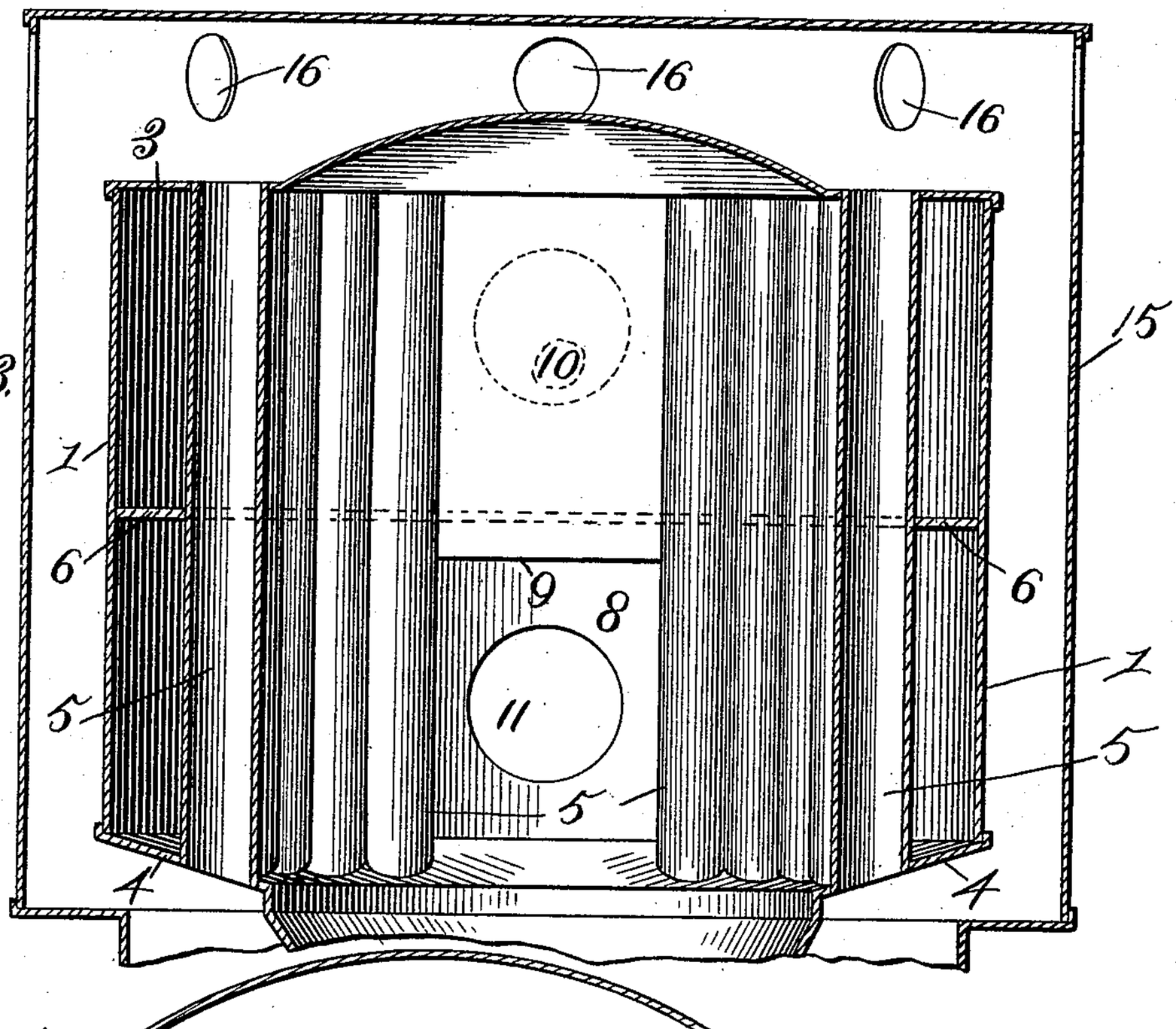
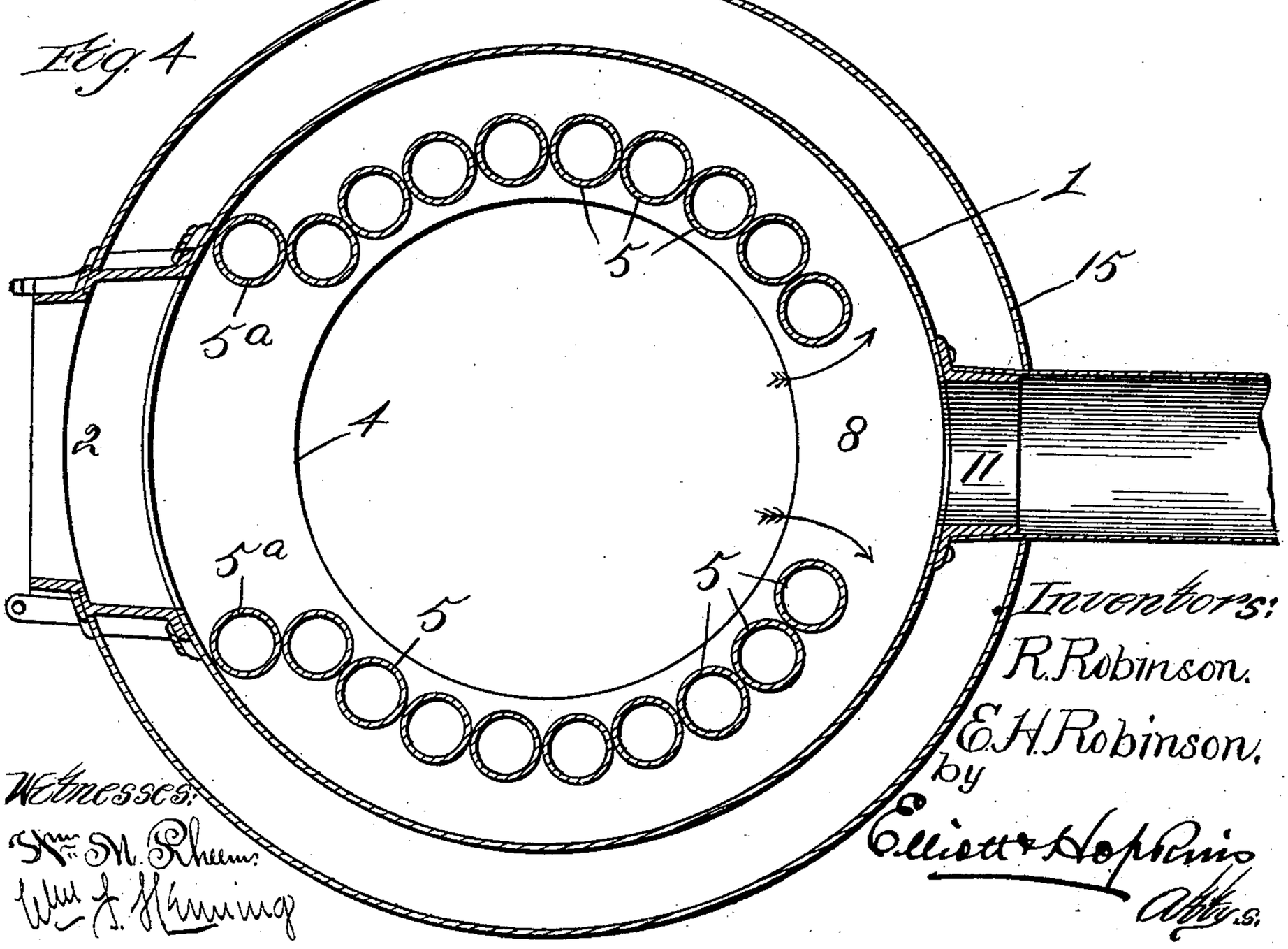


Fig. 4



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UNITED STATES PATENT OFFICE.

ROBERT ROBINSON AND EDWARD H. ROBINSON, OF CHICAGO, ILLINOIS.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 538,701, dated May 7, 1895.

Application filed April 9, 1894. Serial No. 506,805. (No model.)

To all whom it may concern:

Be it known that we, ROBERT ROBINSON and EDWARD H. ROBINSON, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Heating-Furnaces, of which the following is a full, clear, and exact specification.

Our invention relates to that class of heating furnaces which employ air heating flues or tubes, and more particularly to that type of such furnaces in which the said tubes or flues are so arranged within the combustion chamber or fire box as to constitute one wall of a smoke flue or passage, whereby the air tubes will be subjected to more intimate contact with the heat. Heretofore these air tubes or flues have been arranged at a short distance from the wall of the combustion chamber or a dome arranged over the combustion chamber, and in contact or close proximity with each other so as to prevent the smoke and products of combustion from passing between them directly to the smoke exit, the tubes at a point remote from the exit however being arranged at a slight distance apart so as to admit the smoke and products of combustion between them into the passage or flue constituted by the tubes and the wall of the dome whence the smoke passes along such flue or passage to the smoke exit. The described prior construction is only partially satisfactory as it permits of a too sudden escape of the smoke and products of combustion.

Our invention is designed to overcome this defect and it has for its primary object to prolong the duration of contact between the air tubes and the smoke or products of combustion in their course to the smoke exit.

A further object of our invention is to provide means whereby the duration of contact between the air tubes and smoke or products of combustion may be prolonged, or such products permitted to exit directly from the combustion chamber.

With these ends in view our invention consists in certain features of novelty in the construction, combination and arrangement of parts hereinafter fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a vertical longitudinal section taken on the line 1 1, Fig. 2, of the upper part of a heater provided with our improvements. Fig. 2 is a plan section thereof, taken on the line 2 2, Fig. 1. Fig. 3 is a vertical section, taken at right angles to that shown in Fig. 1, on the line 3 3, Fig. 2; and Fig. 4 is a plan section taken on the line 4 4, Fig. 1.

Like signs of reference indicate like parts throughout the several views.

In carrying out our invention we provide the combustion chamber or dome or other chamber in which the before mentioned air tubes are situated, with at least two smoke exits, and instead of leaving a space between the air tubes as heretofore, we close such space in some suitable manner so as to prevent the passage of smoke and products of combustion between the tubes. The flue or space formed by the tubes and the wall of the dome is divided horizontally into two flues by a suitable partition, and an opening is formed below this partition for the admission of the products of combustion to the lower one of these horizontal flues, whereby the products of combustion and smoke may be compelled to traverse both of the horizontal flues before reaching the smoke exit. One of the smoke exits communicates with each of the horizontal flues and a damper is arranged in one of the exits preferably the one which leads from the flue to which the smoke is first admitted, so that if desired the smoke may be permitted direct exit without having to traverse the other one of the horizontal flues.

Referring now to the drawings, 1 represents the wall of the dome which constitutes a combustion chamber or if desired a special chamber arranged over the combustion chamber and having a usual feeding door 2. This dome is provided at its upper and lower sides respectively with flue rings 3—4, the lower one of which is preferably inclined, and expanded in these rings are the air tubes 5 which are arranged in a row or series in an upright position a short distance from the wall 1 of the dome so as to constitute between the row of tubes and such wall a passage or flue. The tubes 5 start from a point on each side of the feeding door as shown more clearly in Figs. 2 and 4, and extend around both sides of the dome thus leaving a clear space immediately in front of the feeding door, and as a means of preventing the passage of smoke and pro-

ducts of combustion between the tubes, we arrange them in contact with each other, the end tubes 5^a on each side of the feeding door being arranged in contact with the wall of the dome. This space or flue formed by the wall 1 and the tubes 5 is divided into two horizontal flues or passages by means of a partition 6 arranged about midway between the upper and lower ends of the tubes and terminating at each end a short distance from the end tubes 5^a so as to leave an opening 7 to permit the smoke and products of combustion to pass from the lower one of the horizontal flues into the upper one.

The smoke and products of combustion are admitted into the lower one of the horizontal flues under the partition 6 through an opening 8 formed at the back of the furnace preferably immediately opposite the feeding door 2. This opening 8 is constituted by simply omitting a number of the tubes at the proper point as shown in Figs. 3 and 4, and then in order that the smoke and products of combustion may not pass directly into the upper one of the horizontal flues, the space left by the omission of said tubes is closed from its upper end downward to a point at least as low as the partition 6, by a suitable plate 9.

The smoke and products of combustion arising in the dome first enter the lower one of the horizontal flues *via* the opening 8 and then pass forward on both sides of the furnace between the dome 1 and the row of tubes 5 until the openings 7 adjacent to the feeding door are reached, whence they ascend into the upper one of the horizontal flues and again pass rearwardly therealong to the smoke exit 10 which is preferably arranged opposite the plate 9, that is to say, at a remote point from the openings 7. In this way we prolong the passage of the products of combustion and smoke through the furnace, heating the air arising in the tubes 5 more thoroughly than is possible with the prior construction. In order however that the smoke and products of combustion may be provided with a direct outlet from the combustion chamber or dome when desired, we form in the dome, preferably immediately below the exit 10, a second exit 11 which appears in the drawings directly opposite the opening 8 between the tubes 5; and in order that the smoke and products of combustion may be compelled when desired, to take a tortuous course through the furnace before described, we provide this second exit with suitable means for closing it, such as an ordinary damper 12. This damper may be arranged at any convenient place such as in the elbow or pipe 13 which connects the exit 11 with the pipe 14 leading from the exit 10 to the chimney or uptake (not shown).

The dome may be surrounded as usual with a drum or jacket 15 having air exit holes 16.

Having thus described our invention, what we claim as new therein, and desire to secure by Letters Patent, is—

1. In a heating furnace, the combination with a combustion chamber having a feeding door and two smoke exits, of a continuous row of air tubes starting from each side of the door and extending around the said chamber and forming a continuous space with the wall thereof, the spaces between said tubes being closed, a horizontal partition arranged in said space between the said smoke exits and dividing it into two horizontal flues having communicating passages with each other located at remote points from the said exits, the lower one of said flues having communication with the interior of the combustion chamber, and also with one of said smoke exits, and a cut-off arranged in said latter exit, substantially as set forth.

2. In a heating furnace, the combination with a combustion chamber having a feeding door in one side and two smoke exits in its opposite side, of vertical air flues extending from each side of said door to each side of said smoke exits, and forming a space with the wall of said combustion chamber, a horizontal partition arranged in said space and dividing it between the said exits into two horizontal flues communicating with each other at points adjacent to and on opposite sides of the feeding door, a plate 9 arranged in the space between said tubes opposite one of said smoke exits and joining with said horizontal partition so as to cut off direct communication between said smoke exit and the combustion chamber, the said partition being shorter than the said tubes whereby the lower one of said horizontal flues will have direct communication with the combustion chamber, and a cut-off or damper arranged in the smoke exit leading from the lower one of said flues, substantially as set forth.

3. In a heating furnace, the combination with a combustion chamber having a feeding door and two smoke exits, of a continuous row of air tubes starting from each side of the door and extending around the said chamber and forming a continuous space with the wall thereof, said tubes being in direct contact with each other, a horizontal partition arranged in said space and between the said smoke exits and dividing it into two horizontal flues having communicating passages 7 with each other located at remote points from the said exits, the lower one of said flues having communication with the interior of the combustion chamber, and also with one of said smoke exits, and a cut-off arranged in said latter exit, said tubes extending around the ends of said partitions and being in direct contact with the wall of the combustion chamber so as to form the said passages 7, substantially as set forth.

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