No. 714,742. Patented Dec. 2, 1902.

W. RADFORD.

CONTINUOUS DOWNDRAFT KILN.

(Application filed Sept. 9, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

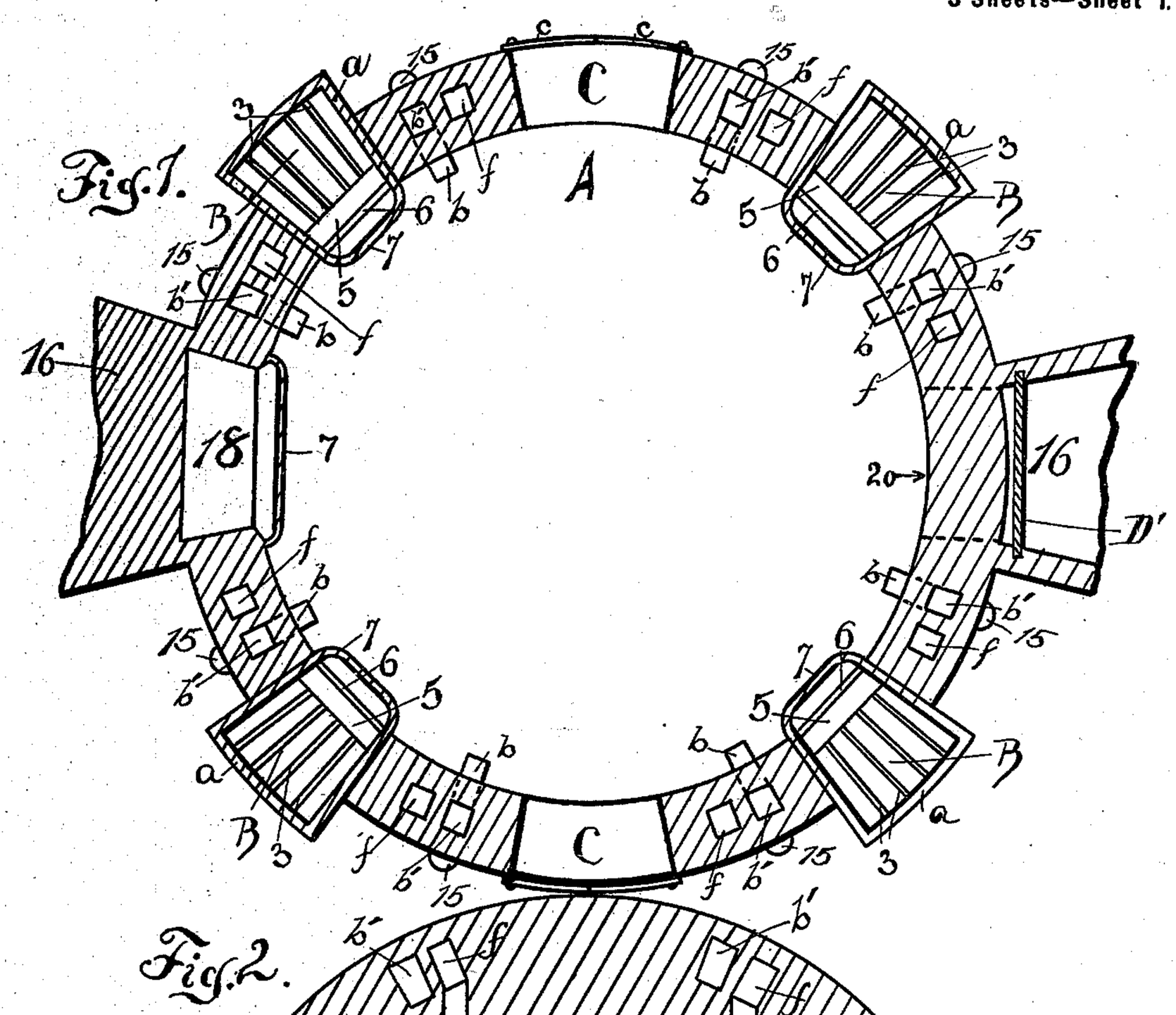
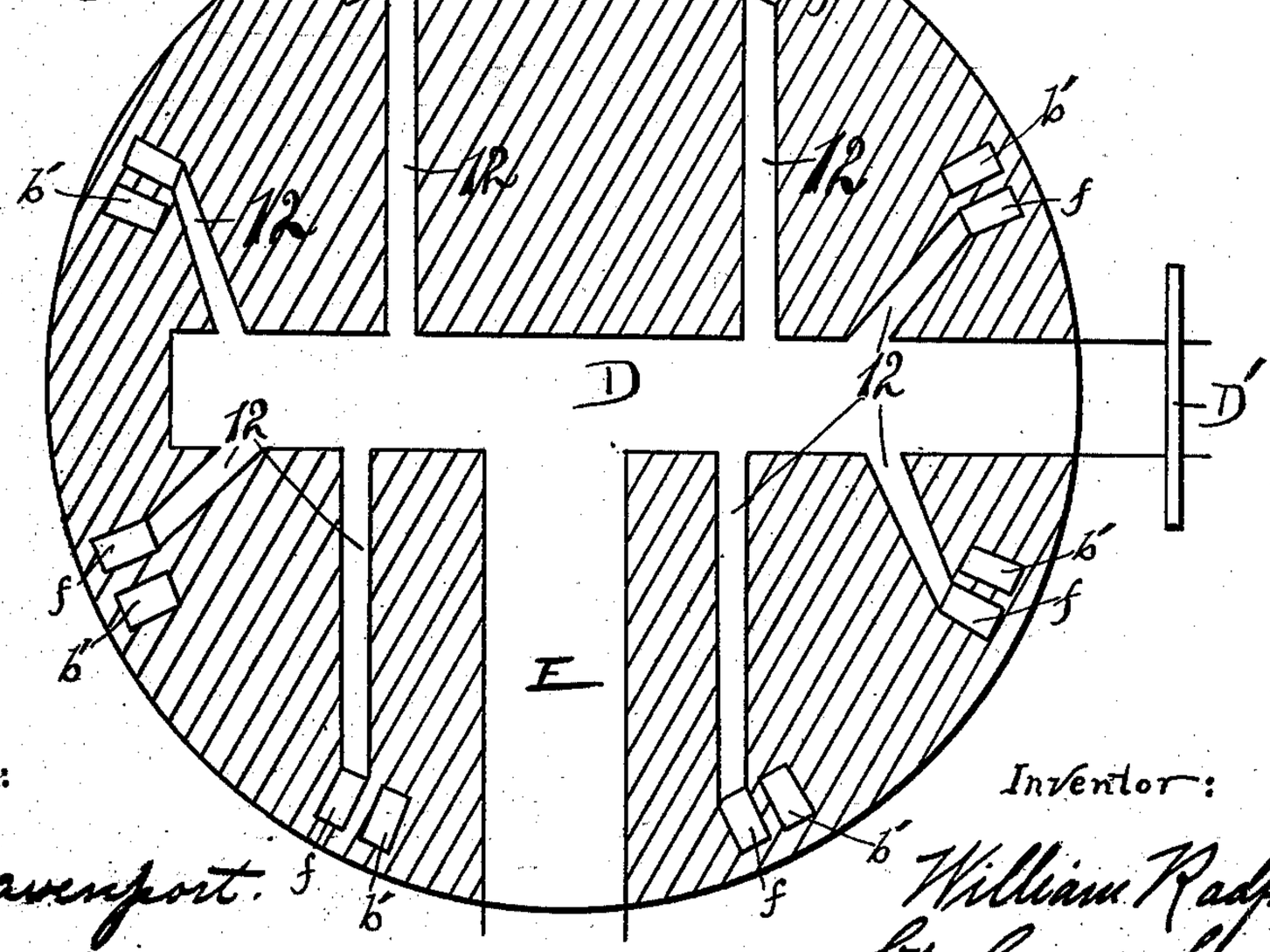


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

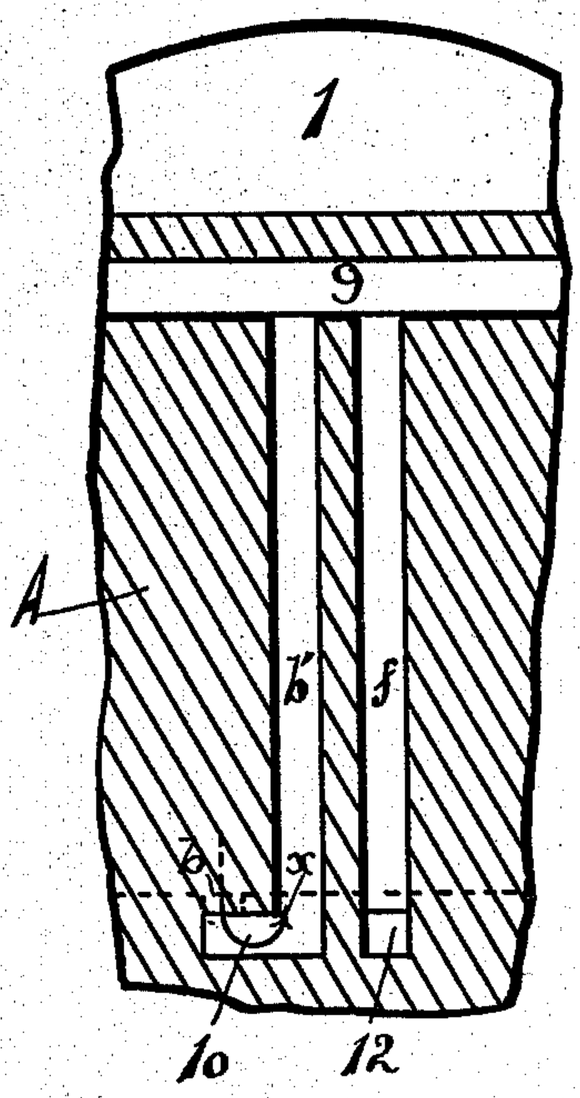

Fig. 4.

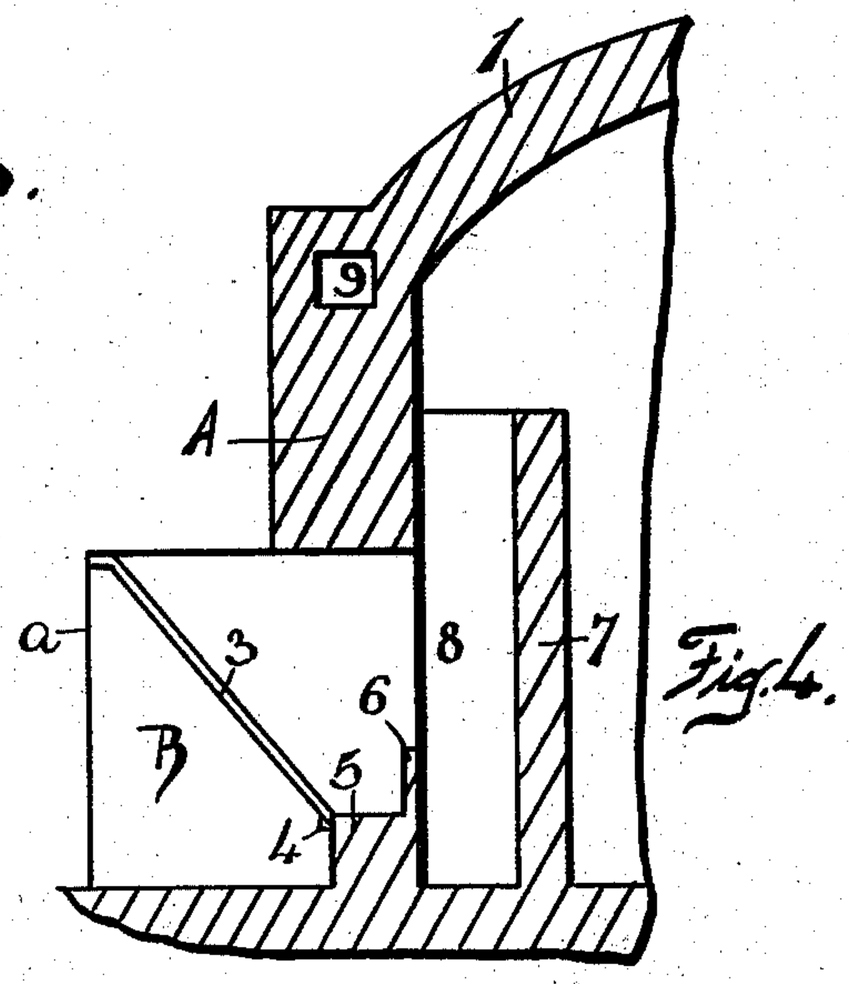

Fig. 5.

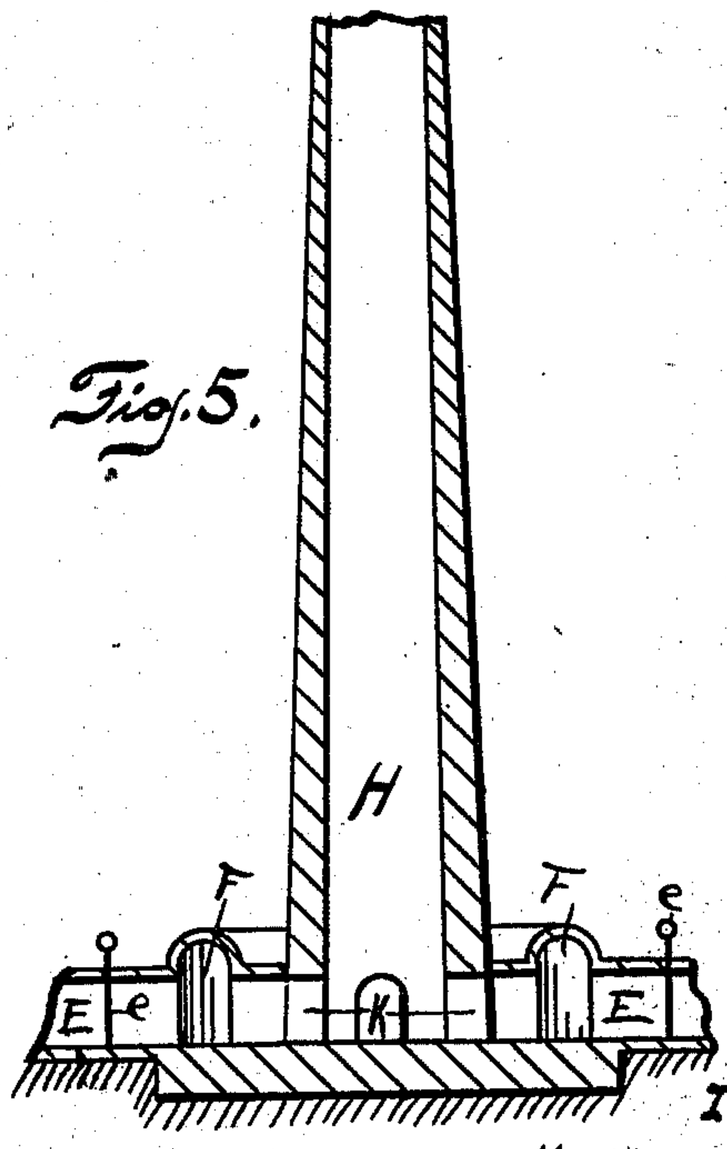

Fig. 6.

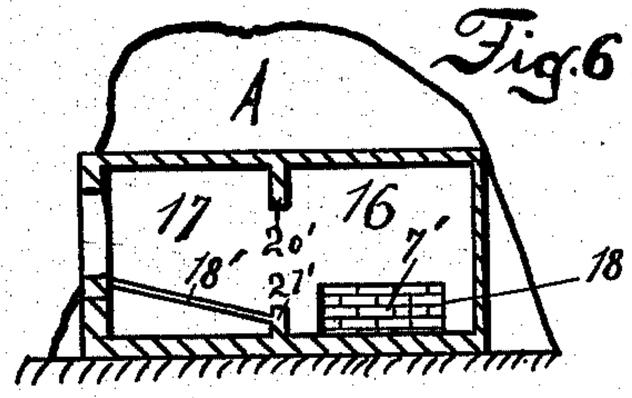

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Fig. 7.

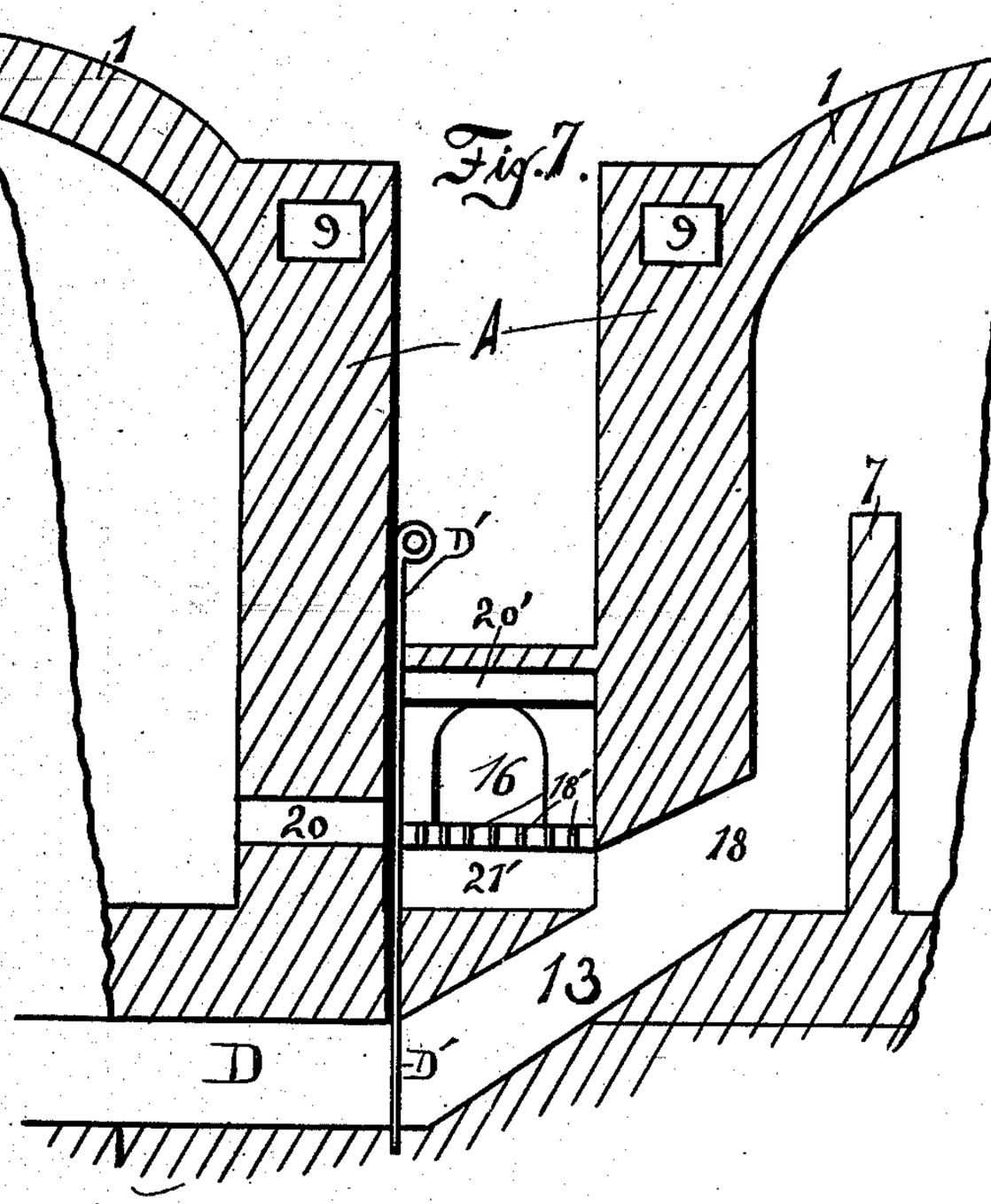
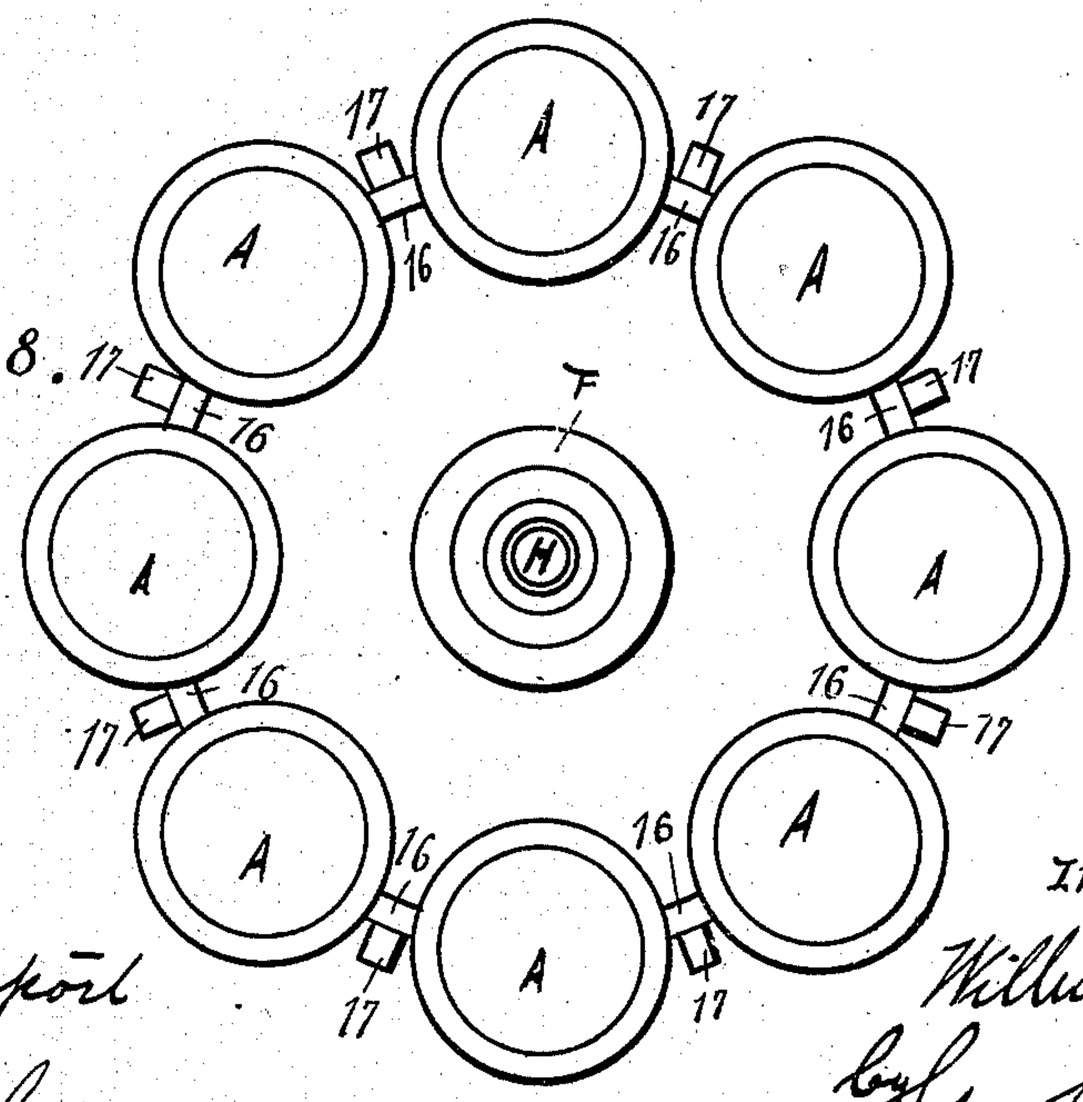


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM RADFORD, OF SIOUX CITY, IOWA.

CONTINUOUS DOWNDRAFT-KILN.

SPECIFICATION forming part of Letters Patent No. 714,742, dated December 2, 1902.

Application filed September 9, 1901. Serial No. 74,772. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM RADFORD, residing at Sioux City, in the county of Woodbury and State of Iowa, have invented certain useful Improvements in Continuous Downdraft-Kilns; and I do hereby declare that the following is 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, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to a new and novel improvement in continuous downdraft-kilns.

The object of my invention is to provide a plurality of connected kilns emptying into a chimney common to all, each kiln being so arranged that it may be cut off from the rest and be used independently. If desired, any two or more kilns may be used, or the whole connected series may be employed in a continuous use and simultaneously.

In the construction of my continuous kiln each kiln is provided with one or more fire-boxes or furnaces common to each kiln, while an additional main furnace or fire-box is interposed between each set of kilns to augment the heat escaping from one kiln into the other, as will be described more fully hereinafter.

In the accompanying drawings I have shown in Figure 1 a floor plan of a kiln embodying my invention. Fig. 2 shows a flue plan of one of the kilns. Fig. 3 shows a sectional detail disclosing the arrangement of the upper flue and the return-flues. Fig. 4 shows a sectional view of one of the kiln fire-boxes. Fig. 5 shows a view disclosing the chimney connection. Fig. 6 discloses a detail of my kiln. Fig. 7 shows a sectional detail disclosing the flues connecting two kilns, while Fig. 8 shows a plan view disclosing the arrangement of eight connected kilns.

My invention embodies, essentially, a plurality of similar kilns, each comprising a circular wall A, which wall is covered by means of a suitable dome 1, forming the top of the kiln. The walls of each kiln are pierced by two door-closed openings C, provided with the doors *c* of any desired construction. In referring to Fig. 1, wherein I show a floor plan, these doors are shown approximately opposite one another. Each kiln is provided with four fire-boxes or furnaces B. These fire-boxes comprise the outwardly-extending walls *a*, from which depend the grate-bars 3, referring now to Fig. 4, which below rest upon a support 4, while the masonry 5 forms the bottom of each fire-box. Extending upward a suitable distance is the stub-wall 6, as is shown in Fig. 4, which prevents the fuel from falling into the kiln. Each furnace opens into its kiln by means of an opening 8, and surrounding these openings 8 are the fire-bags 7, as is shown in Figs. 1 and 4, so that the heat as it escapes from the fire-boxes or furnaces in entering a kiln strikes these fire-bags and is directed upward, circulating through the kiln. Each kiln above is provided with a circular continuous flue 9, as is shown in Figs. 3 and 4. The floor of each kiln, referring now to Fig. 1, is pierced, preferably, by eight small floor-flues *b*, which drop downward a suitable distance, as is shown in Fig. 3, and then by means of a stub-flue 10 continues horizontally until it encounters a vertical return-flue *b'*, as is disclosed in Fig. 3, which flue *b'* empties into the continuous circular flue 9. Extending downward from flue 9, adjacent the flues *b'*, is a downward return-flue *f*, so that the heat within the kiln would escape through one of the floor openings or flues *b*, through the stub-flues 10, upward through the flue *b'*, and then downward through the adjacent flue *f*, as is indicated by the arrow *x* in Fig. 3, and this return-flue *f* would empty below into a floor-flue 12, there being one such floor-flue 12 in connection with each return-flue *f*. In Fig. 2, for instance, eight return-flues *f* are shown, and consequently there are disclosed eight floor-flues 12. These floor-flues 12 all empty into a main flue D. Each kiln is provided with one of these main flues D, into which the floor-flues 12 empty, and each main flue D empties by means of an opening 13, as is shown in Fig. 7, into a flue 18, adjacent the kiln upon one side. The flues D may be cut off by means of a valve D', as is shown in Figs. 7 and 2, so that these main flues D may be cut off to separate one kiln from the other.

As has been set forth, each kiln is provided with a plurality of fire-boxes or furnaces B, as is more clearly shown in Fig. 1, in which

figure the kiln is provided with four fire-boxes or furnaces. It should be understood, however, that if the kilns were exceedingly large or built quite small a greater or smaller number of fire-boxes or furnaces could be used.

As described, it will be noticed that my kilns are provided with door-closed openings C, so that the kilns may be readily entered. The heat from the fire-boxes enters the kiln, and after entering the kiln the heat escapes through a plurality of floor-openings *b* and then passes upward into a continuous circular flue 9. Each of these flues *b'* is closed by means of a damper 15, so that any one or all of them may be cut off if desired. The heat after having entered the circular upper flue 9 is permitted to escape downward through a flue *f* and distributes itself through flues 12 below the floor of the kiln and empties into a main flue D. This main flue is provided with a valve D', so that the heat may be maintained within this flue or be permitted to escape into an adjacent kiln, where it enters at a suitable point 18, forming a union between two kilns.

Referring to Fig. 7, it will be noticed that the kilns are united by means of the small chambers 16, and each one of these chambers 16 is provided with a furnace or fire-box 17, one of these furnaces or fire-boxes being disclosed in Fig. 6. These furnaces are provided with the grate-bars 18' and are of any suitable size or construction, the main object being to provide a main furnace or fire-box at the point of connection between two kilns, the furnace emptying into the connecting-chambers 16. In Fig. 7 one of these chambers 16 is shown, and it will further be noticed that there is an opening 20 extending horizontally through one of the kilns into these chambers 16, so that a portion of the heat may escape from one of the kilns A through the opening 20 into the chamber 16. The valve D', however, which may be used to disconnect the main flue D, may also be used to disconnect and cut off this communication 20. The heat escaping from the main furnace or fire-box 17 within the chamber 16 enters, by means of an opening 18, one of the adjacent kilns upon one side at a point adjacent the emptying or exit opening 13 of the main flue D, so that the heat escaping from one kiln into another is augmented by the furnace heat within the chamber 16. The opening 18, through which the heat escapes, is provided in front with a fire-bag 7, as is shown in Fig. 7, so that the heat is deflected or directed upward. From this it will be noticed that in addition to the direct furnace heat each kiln receives the escaping heat from an adjacent kiln, which is augmented by a main furnace heat within the chambers 16, connecting two kilns.

Extending from each main flue D within each kiln is a smoke-flue E, and each smoke-flue E is directed into an annular chamber F, surrounding a chimney H, the chimney being provided with openings K, communicating with the annular chamber F. Referring to Fig. 5, it will be noticed that the smoke-flue E is provided with a valve or damper *e*, so that these smoke-flues may be cut out from the chimney. These kilns have all been shown as round, though it should be understood that if desired these kilns could be made square or angular.

Having thus described my said invention, what I claim as new, and desire to secure by United States Letters Patent, is—

1. In a kiln provided with an upper continuous flue, the combination of a plurality of fire-boxes or furnaces emptying into said kiln, of a fire-bag in front of each fire-box or furnace, floor-openings, vertical flues communicating with said floor-openings, said vertical flues emptying into said upper continuous flue, downdraft-flues extending from said continuous flue, floor-flues receiving said downdraft-flues, and a main flue adapted to receive said floor-flues.

2. In a kiln provided with an upper continuous flue, the combination of a plurality of fire-boxes or furnaces emptying into said kiln, of a fire-bag in front of each fire-box or furnace, floor-openings, vertical flues communicating with said floor-openings, said vertical flues emptying into said upper continuous flue, downdraft-flues extending from said continuous flue, floor-flues receiving said downdraft-flues, a main flue adapted to receive said floor-flues, and a valve-controlled smoke-flue extending from said main flue.

3. The combination of two kilns, an upper continuous flue within each kiln, a valve-controlled chamber connecting said kilns, a furnace within said chamber, said chamber being in communication with each kiln, floor-openings within each kiln, updraft-flues communicating with said floor-openings and emptying in said upper continuous flue, downdraft-flues extending from each upper continuous flue, a plurality of floor-flues receiving said downdraft-flue, a main flue within each kiln adapted to receive said floor-flues, the main flue of one kiln emptying into the adjoining kiln, a damper within each updraft-flue, a chimney common to both of said main flues, and valve-controlled smoke-flues leading from each kiln to said chimney.

WILLIAM RADFORD.

In presence of—
HATTIE E. CARBERRY,
MARGARET BOEKHOFF.