

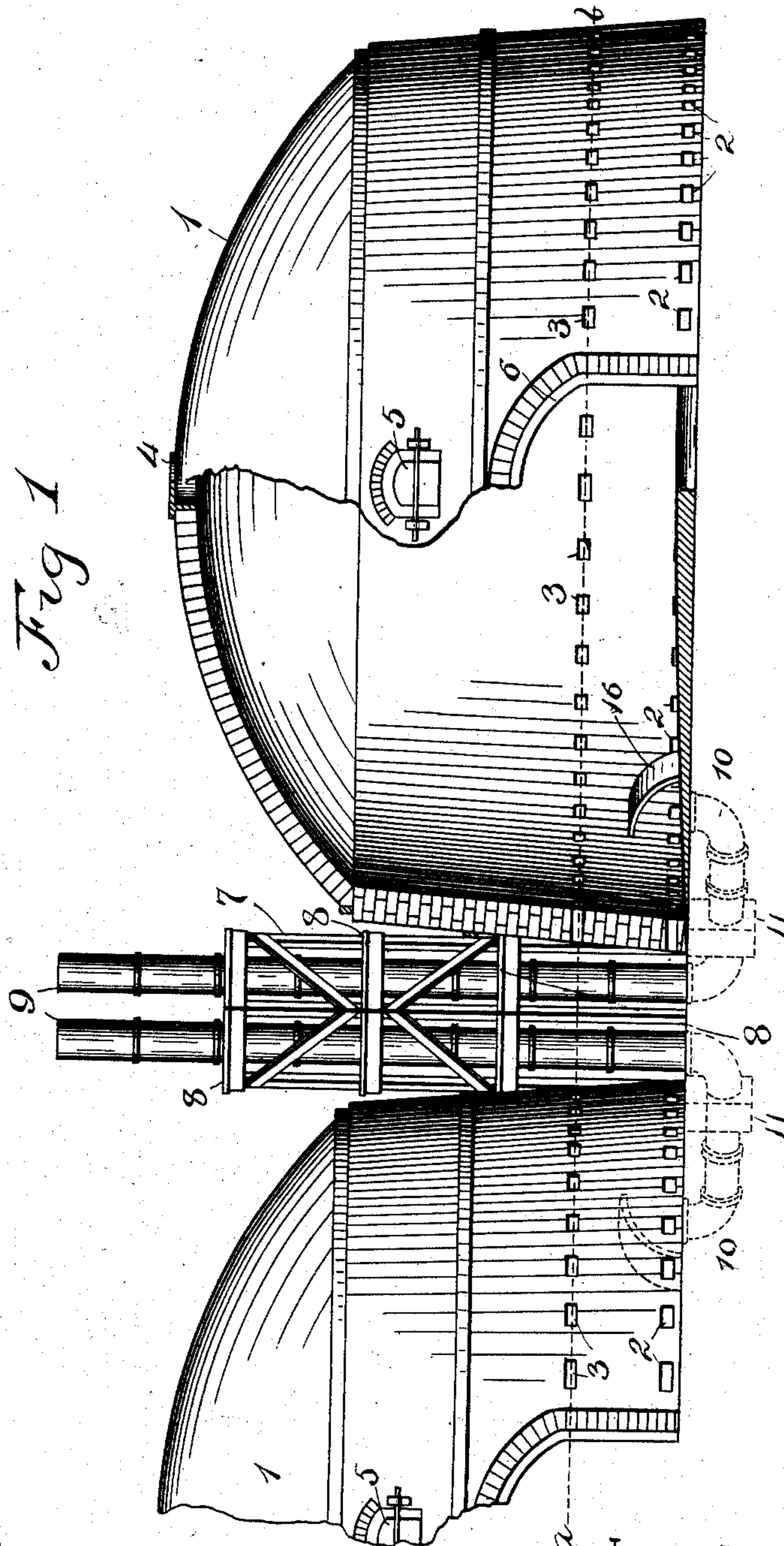
No. 865,067.

PATENTED SEPT. 3, 1907.

C. D. TRAIN.  
CHARCOAL KILN.

APPLICATION FILED APR. 4, 1903.

4 SHEETS—SHEET 1.



Witnesses:

*R. H. Hamilton.*  
*W. C. Long*

Inventor  
*Charles D. Train,*  
By *Warren H. House,*  
*His Attorney*

No. 865,067.

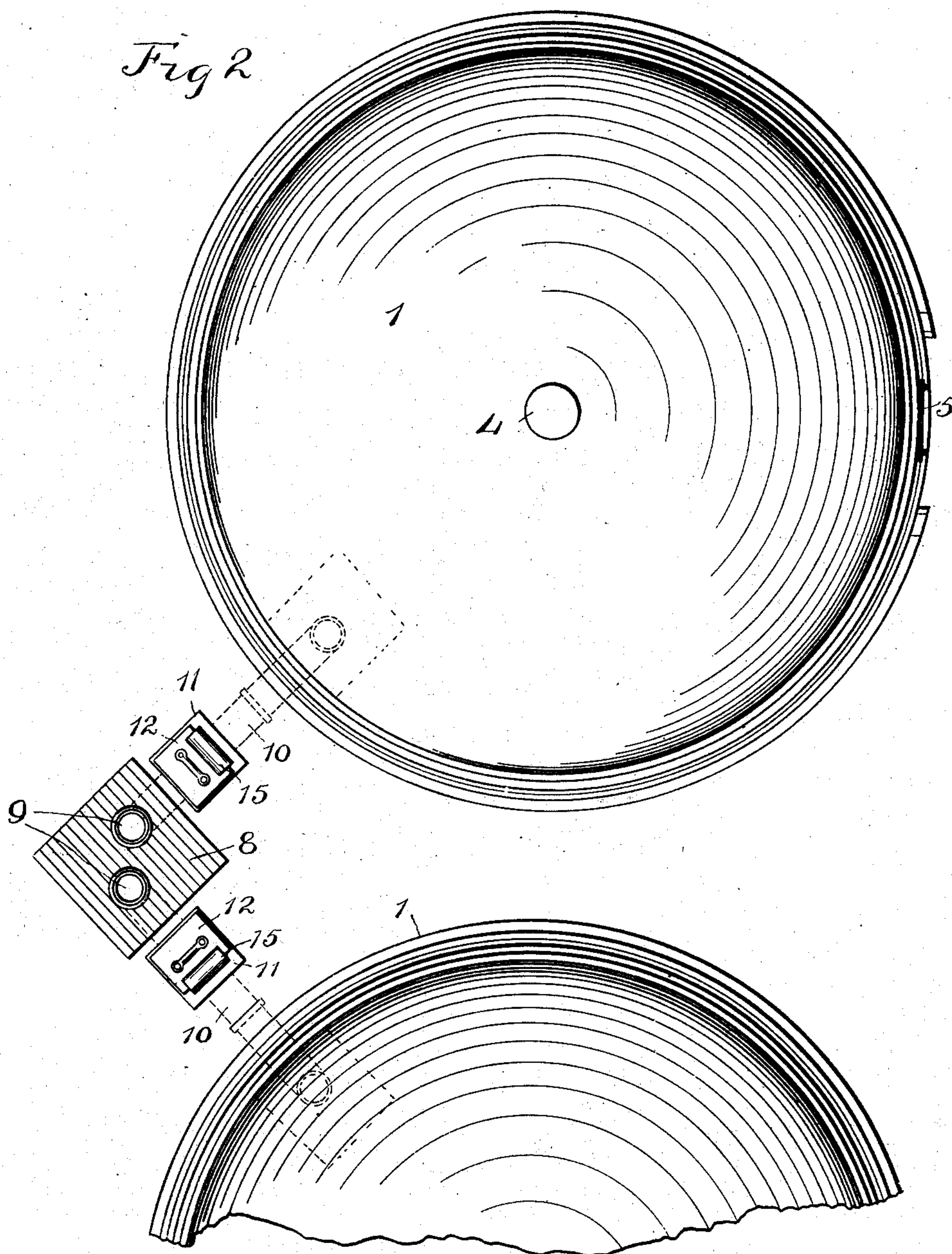
PATENTED SEPT. 3, 1907.

C. D. TRAIN.  
CHARCOAL KILN.

APPLICATION FILED APR. 4, 1903.

4 SHEETS—SHEET 2.

*Fig 2*



Witnesses:

*R. L. Hamilton.*

*W. C. Long*

Inventor

*Charles D. Train,*  
*By Warren D. House,*  
*His Attorney*



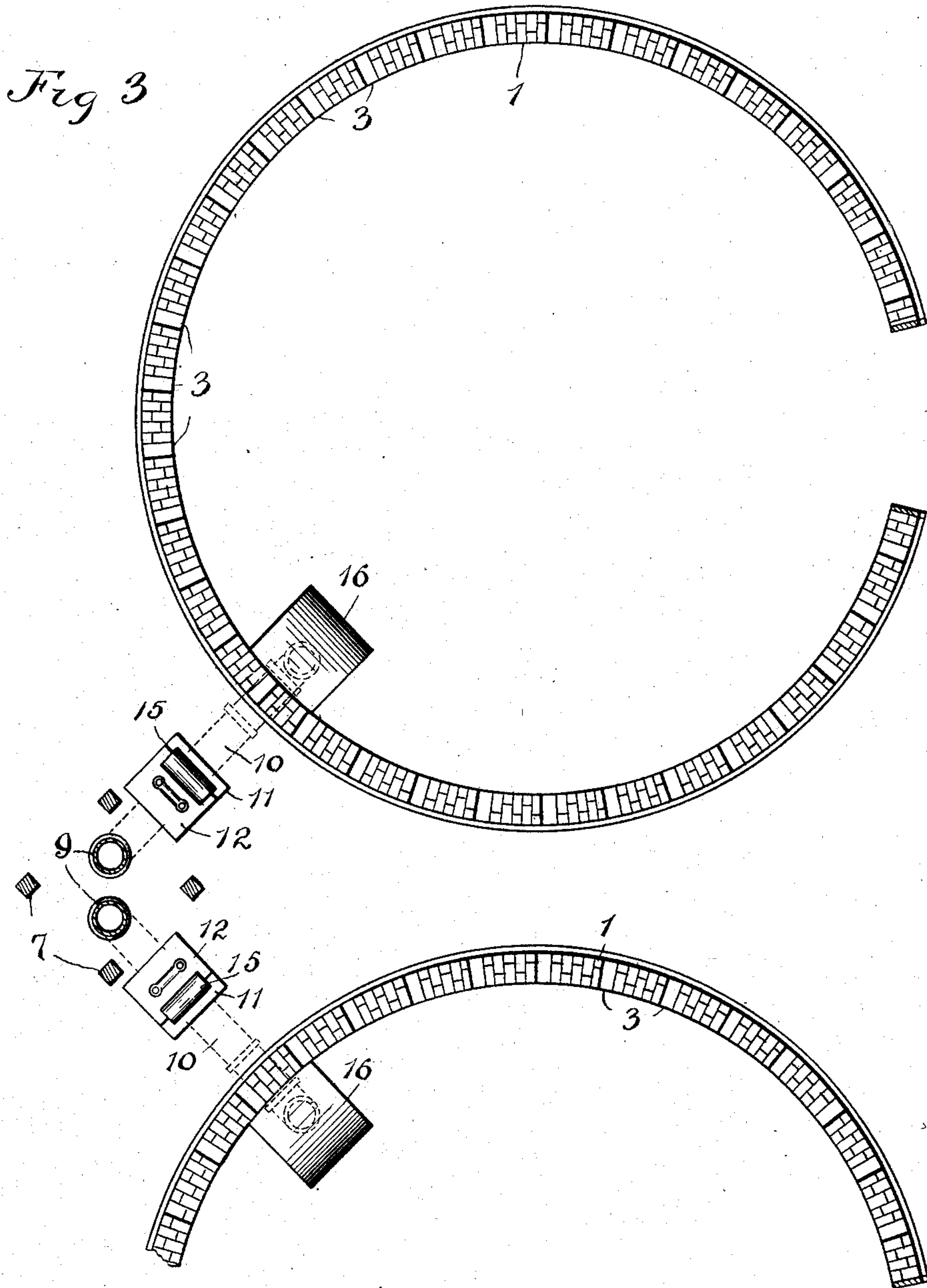
No. 865,067.

PATENTED SEPT. 3, 1907.

C. D. TRAIN.  
CHARCOAL KILN.

APPLICATION FILED APR. 4, 1903.

4 SHEETS—SHEET 3.



Witnesses:

*R. Hamilton.*  
*W. C. Long*

Inventor

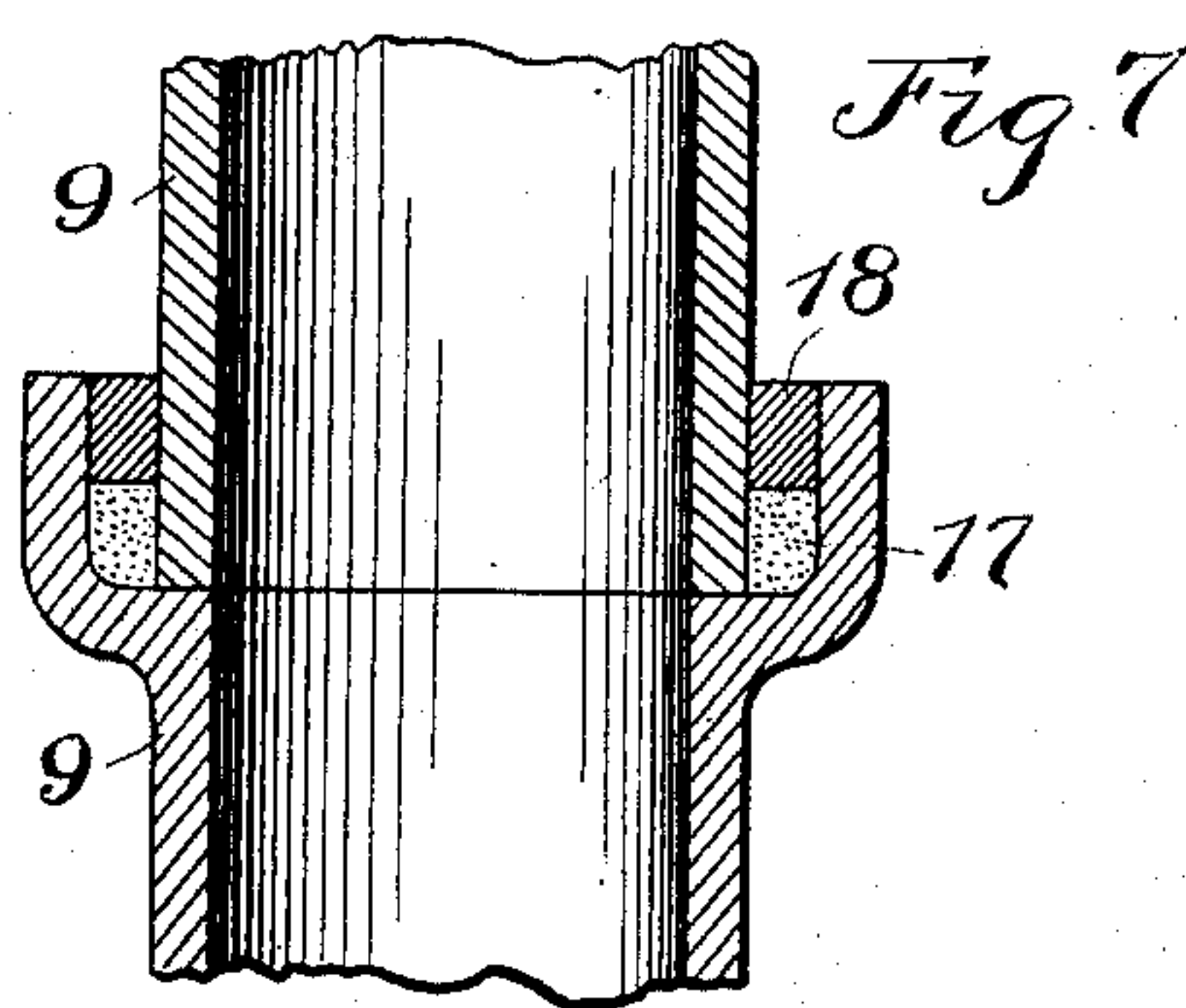
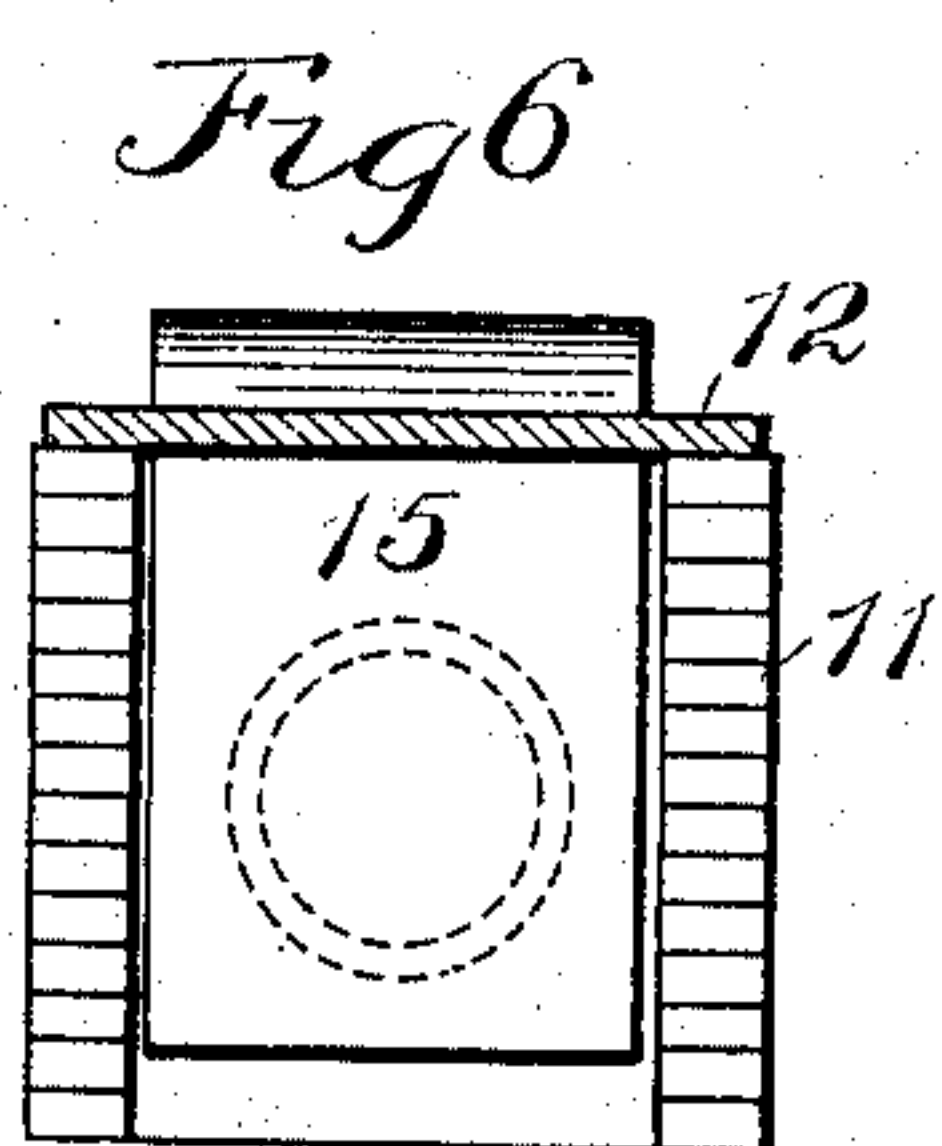
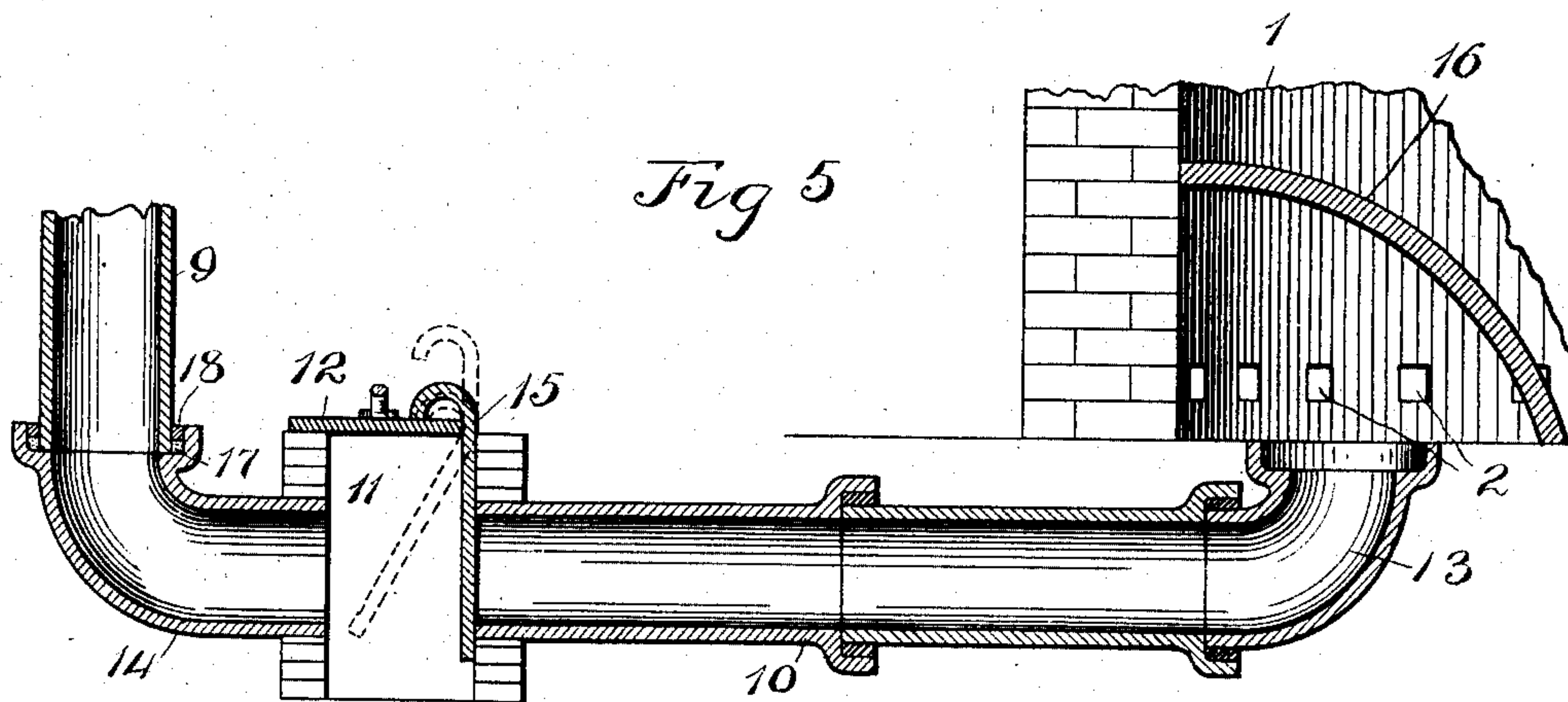
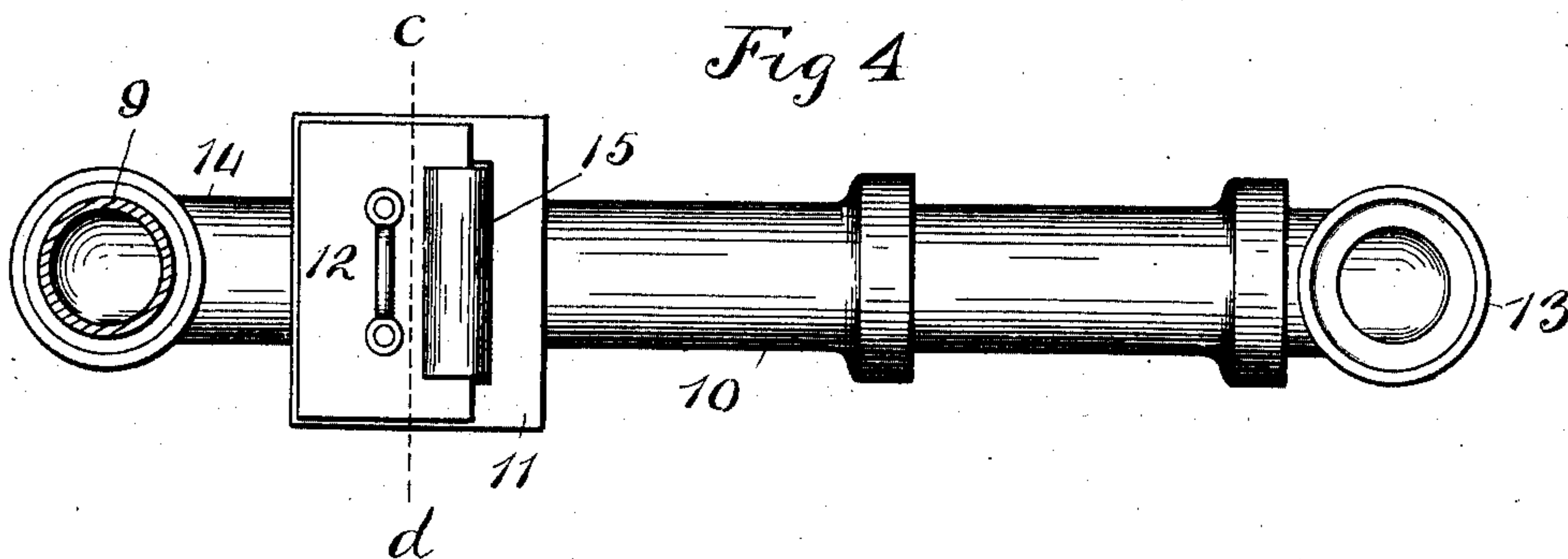
*Charles D. Train,*  
*By Warren D. House,*  
*his Attorney*

No. 865,067.

PATENTED SEPT. 3, 1907.

C. D. TRAIN.  
CHARCOAL KILN.  
APPLICATION FILED APR. 4, 1903.

4 SHEETS—SHEET 4.



Witnesses:

R. & H. Hamilton.

W. C. Long

Inventor

Charles D. Train,  
By Warren D. House,  
His Attorney



# UNITED STATES PATENT OFFICE.

CHARLES D. TRAIN, OF BELKNAP, ILLINOIS.

## CHARCOAL-KILN.

No. 865,067.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed April 4, 1903. Serial No. 151,127.

*To all whom it may concern:*

Be it known that I, CHARLES D. TRAIN, a citizen of the United States of America, residing in Belknap, in the county of Johnson and State of Illinois, have invented a new and useful Improvement in Charcoal-Kilns, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

My invention relates to improvements in charcoal kilns.

The object of my invention is to provide a charcoal kiln so constructed and controlled that a very large percentage of charcoal is produced from the wood fired in the kiln, and a great saving in time is effected in reducing the wood to charcoal.

My invention provides further a construction in which a very superior quality of charcoal is produced.

My invention provides further a chimney connected to the firing chamber at the bottom thereof, the chimney being extended to a height sufficient that the natural draft therein is requisite for proper combustion in the chamber.

My invention provides further a novel construction of damper for controlling the draft in said chimney, the damper being arranged for transverse adjustment across the chimney passage and so mounted as to be forced to a position by gas pressure in the chimney such that the damper will not obstruct the passage of gas through the chimney, thus acting as a safety valve for the kiln and preventing disastrous explosive effects.

My invention provides further a novel construction of chimney in which the chimney comprises a series of members or sections of material refractory to the action of pyroligneous acid or other products resulting from the firing of the wood in the kiln.

My invention provides further a novel joint for such members or sections in which the joints are first luted with a refractory material, as for instance, clay, and then cemented by cement placed outside the refractory luting but connecting the adjacent ends of the sections, thus insuring the cementitious material from destruction by contact with the products of distillation due to the firing of the wood in the kiln chamber.

My invention provides further a floor in the firing chamber rising from the periphery toward the center of the chamber, a construction which I have found materially aids in increasing the amount of charcoal produced and reducing the quantity of brands not reduced to charcoal. This formation of the floor combined with the novel receptacle forming part of the chimney affords a means for the ready collection of non volatile products when woods rich in resinous material are fired in the chamber.

My invention provides further a novel form of guard in the firing chamber for protecting the open end of the chimney from being obstructed with wood or ashes.

Other novel features are hereinafter fully described and claimed.

In the accompanying drawings which illustrate my invention Figure 1 is a view partly in elevation and partly in vertical section of one kiln and part of another and the chimney mechanism with which the two kilns are connected. Fig. 2 is a plan view of the same. Fig. 3 is a horizontal sectional view taken on the dotted line *a—b* of Fig. 1. Fig. 4 a top view of the horizontal conductor which connects the kiln with the chimney. Fig. 5 is a longitudinal vertical sectional view of the horizontal conductor and a portion of the kiln firing chamber. Fig. 6 is a cross section taken on the dotted line *c—d* of Fig. 4. Fig. 7 is a longitudinal sectional view of the abutting ends of two sections or members forming a part of the chimney of the kiln and showing the refractory luting and cement filler connecting the ends of the sections.

Similar characters of reference indicate similar parts.

1 indicates the firing chamber of the kiln, preferably circular in form with inwardly inclined side walls and a dome shaped roof. The floor of the chamber 1 is preferably crowning or rising from its periphery toward the center of the chamber. One object of this form of the floor is to prevent the fire from creeping toward the air inlet openings 2 located near the floor and arranged in series horizontally disposed around the side wall of the chamber. Where the floor is level or inwardly inclined the tendency of the fire to creep toward the openings must be overcome by closing the said openings and thus prevent complete combustion. Another object of the floor rising toward the center, is to cause water or non volatile liquid products to flow to the periphery of the chamber from which it is conducted by the conductor hereinafter described.

Another series of openings 3 is provided in the wall of the chamber and disposed above and parallel with the series 2.

4 is the ordinary cover placed in a central hole in the top of the chamber.

5 and 6 indicate the ordinary doors in the side wall of the chamber through which wood may be inserted into and charcoal withdrawn from the chamber.

7 indicates a vertical frame of any desirable construction placed outside and adjacent to the firing chambers 1. The frame 7 is provided with a series of transverse platforms or braces 8 through which the vertical chimneys 9 extend and which embrace the chimneys and support them in the vertical position. Each chimney 9 is connected to its firing chamber by a horizontal conductor 10 disposed lower than the floor of the chamber 1 and communicating at its inner end therewith below the openings 2. The conductor 10 comprises preferably a series of horizontal sections and two upwardly extending end sections one of which



connects with the chamber 1 and the other with the lower end of the chimney 9.

Forming a part of the conductor 10 is a rectangular receptacle 11 having a top opening over which is movably mounted a cover 12. The receptacle 11 is provided also with an inlet and an outlet opening. In the inlet opening thereof is fitted the outer end of the inner section of the conductor indicated by 13, and the outlet has fitted in it the outer section 14 of the conductor 10.

In front of the inlet of the receptacle 11 is mounted a vertical damper 15 the upper end of which is laterally curved so as to provide a supporting device which, when the damper is closed rests upon the cover 12. The damper 15 is mounted so as to be adjustable transversely across the inlet opening of the receptacle 11 by vertically raising the damper. It is also mounted so as to be swung by a strong pressure of gas toward the outlet opening of the receptacle, or lengthwise of the conductor 10 as shown in dotted lines in Fig. 5.

A guard 16 is located in the chamber 1 and extends in the form of an arch, preferably, from the floor to the side wall over the inlet of the conductor 10. This guard prevents the wood or ashes from stopping up the inlet end of the conductor 10.

Each chimney 9 is constructed preferably of material which is refractory to the action of the products passing through the chimney. I have found that ordinary tiling is impervious to the action of the pyroligneous acid and other products emanating from the burning wood. The chimney is formed of a series of vertical tubular sections or members inserted one in the other and an annular space being provided between the inner and the outer members. In this annular space, is first placed a luting of refractory material, as for instance, clay, this protects the filling of cement which is placed in the said annular space outside the clay luting, as shown in Fig. 7. The clay luting is indicated by 17 and the cementitious filling by 18.

In operating my invention, the chamber 1 is filled in the ordinary manner and the wood fired, the cover 4 being removed until the fire is well started and the chamber sufficiently heated. The cover 4 is then placed in position, the doors 5 and 6 having been put in position prior to the firing of the wood. The natural draft of the chimney 9, which is extended above the top of the chamber 1 to a height sufficient to provide strong enough draft for proper combustion, keeps up the fire in the chamber 1, the air for combustion entering at first through both series of openings 2 and 3. After the fire is well started the openings 3 are closed and sealed in the ordinary manner. The damper 15 is adjusted to permit the proper amount of draft. If the draft is too strong the damper is lowered, if it is desired to quicken the reduction of the wood the damper is elevated. The damper may be sustained in the position to which it is adjusted by any desirable means. In the event that an explosion of gas occurs in the chamber 1, the pressure of the gas will force the damper lengthwise of the receptacle 11, as indicated by the dotted lines in Fig. 5, thus permitting the gas to escape through the conductor 10 and the chimney 9. The damper thus serves as a safety valve, which prevents the blowing out of the walls of the firing chamber 65 by the explosions of gas therein. Any water or

liquid products passing from the chamber will swing the damper so as to permit the liquid to enter the receptacle 11 from which it may be removed through the lateral or top opening of the receptacle after the cover 12 has been removed for the purpose.

With a kiln of the construction herein shown and described a large percentage of charcoal is obtained from the wood, and the time for reducing is greatly shortened compared with ordinary methods.

Having thus described my invention, what I claim 75 and desire to secure by Letters Patent, is:—

1. An improved down-draft charcoal oven, comprising an oven wall having suitable openings, a stack exterior of said oven, a plate arranged at an angle within the oven with one edge resting upon the bottom thereof and the outer edge resting upon the adjacent vertical wall, and an under-ground smoke passage connecting with said stack and with the space beneath said plate, substantially as specified.

2. An improved down-draft charcoal oven, comprising the usual oven body, a stack located exterior of said oven, an underground passage connecting said stack to the exterior of said oven, a housing forming a part of said underground passage, and a damper movably mounted in said housing, substantially as specified.

3. An improved down-draft charcoal oven, comprising the usual oven body, a stack located exterior of said oven, an underground passage connecting said stack to the interior of said oven, a housing forming a part of said underground passage, a damper movably mounted in said housing, the upper end of said housing being normally open, and means by which said opening may be temporarily closed and sealed, substantially as specified.

4. In a charcoal kiln, the combination with the firing chamber provided with two series of horizontally disposed openings arranged one series above the other, of a discharge chimney having its inlet end connecting with the interior of the firing chamber below the lower series of openings, and a damper controlling the flow through said chimney, the said damper being movable by the pressure of gas in the firing chamber toward the outer end of the chimney.

5. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its side wall disposed above the floor of the chamber, of a discharge chimney connected to the said chamber below the said series of openings, and a damper for controlling the flow through the chimney, the damper being provided with means for being moved by the pressure of the gas in the chamber so as not to obstruct the chimney.

6. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its side wall disposed above the floor of the chamber the said chamber floor rising upwardly from its periphery toward the center, of a chimney connected to the chamber below the said series of openings and extending upwardly to a height sufficient to produce the draft requisite for proper combustion in the chamber, and means for controlling the draft through the chimney.

7. In a charcoal kiln, the combination with the firing chamber provided with two series of openings in the wall thereof disposed one series above the other, the floor of the chamber rising from its periphery toward the center, of a chimney connected to the chamber below the lower series of openings and extending to a height sufficient to produce the draft requisite for the proper combustion in the chamber, and means for controlling the flow through the chimney.

8. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its wall disposed above the floor, of a chimney connected to the chamber below the said openings, a guard in the chamber protecting the inlet to the chimney, a damper for controlling the flow through the chimney, the damper being provided with means by which it is removed by pressure of gas from the chamber from obstructing the passage of gas through the chimney.



9. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its wall disposed above the floor of the chamber, of a chimney connected to the chamber below the said openings, a guard in the chamber for protecting the inlet of the chimney, and a damper adjustable transversely across the chimney passage and movable by pressure of gas from the chamber toward the chimney outlet.
10. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its wall, of a chimney connected to the chamber below the said openings, the chimney being provided with an enlarged portion provided with an outlet opening, a cover for said outlet opening, a damper movable in said enlarged portion transversely and lengthwise therein, and a guard protecting the inlet of the chimney in the said chamber.
11. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its wall, the floor of the chamber rising from its periphery toward the center thereof, of a chimney connected to the chamber below the said openings and discharging above the top of the chamber, a guard protecting the inner end of the chimney in the chamber, and a damper movable transversely across and lengthwise toward the chimney outlet in the chimney passage.
12. In a charcoal kiln, the combination with the firing chamber provided with two series of openings disposed one series above the other, the floor of the chamber rising from its periphery toward the center, of a receptacle disposed outside the said chamber, a conductor for gas leading from the chamber below the lower series of openings to the said receptacle, the receptacle being provided with an opening, a cover for said opening, a damper located in said receptacle and adapted to control the passage into the receptacle of gas from the conductor, the damper being movable by the pressure of the gas from the said conductor so as not to obstruct the passage of gas through the said conductor, and a conductor leading from the said receptacle to a plane above the said chamber.
13. In a charcoal kiln, the combination with the firing chamber provided with a series of openings around its wall, of a chimney connected to the chamber below the said openings, and a damper mounted so as to be slidable transversely across the chimney passage and mounted also so as to be swung by gas pressure from the chamber lengthwise of said passage.
14. In a charcoal kiln, the combination with the firing chamber provided with a series of openings in its wall, of a chimney connected to the chamber below the said openings, a guard extending from the floor of the chamber over the chimney inlet to the side wall of the chamber, and a damper mounted so as to be swung lengthwise in the chimney passage and adjustable transversely across the said passage.
15. In a charcoal kiln, the combination with the firing chamber provided above the floor with suitable air inlet openings, of a receptacle located outside the chamber and provided with an inlet, an outlet and a lateral opening, a removable cover for the lateral opening, a conductor leading from the chamber below the said air inlet openings to the inlet opening of the receptacle, a conductor leading from the outlet opening of the receptacle to a point higher than said chamber, and a damper mounted in said receptacle and movable transversely across the inlet opening thereof and pivotally mounted so as to swing away from the inlet opening of the receptacle.
16. In a charcoal kiln, the combination with the firing chamber provided with a series of suitable inlet openings for air, of a receptacle located outside the chamber and provided with an inlet, an outlet and a lateral opening, a removable cover for the lateral opening, a conductor leading from the chamber below the air inlet openings therein to the inlet opening of the receptacle, a guard in the chamber extending over the inlet opening of said conductor, a conductor leading from the outlet opening of said receptacle to a point higher than the chamber, and a damper mounted in said receptacle and movable transversely across the inlet opening thereof and pivotally mounted so as to swing away from said inlet opening of the receptacle.
17. In a charcoal kiln, the combination with the firing chamber provided with a floor rising from the periphery of the chamber towards its center and having suitable air inlet openings disposed above the said floor in the side wall of the chamber, of a chimney connected with the chamber below the air inlet openings and extending to a sufficient height to produce a draft requisite for proper combustion in the chamber, a guard in the chamber extending over the inlet to the chimney, a lateral opening in the chimney, a cover therefor, and a damper adjustable transversely across the chimney passage and pivotally mounted so as to be swung lengthwise in the chimney.
18. In a charcoal kiln, the combination with the firing chamber provided with suitable air inlet openings, of an upwardly projecting chimney disposed outside of and extending higher than the said chamber, a horizontal conductor disposed lower than the floor of the chamber and having upwardly extending ends, one end being connected to the chamber below the said air inlet openings, and the other end being connected to the lower end of the chimney, a guard in the said chamber extending over the open end of the said horizontal conductor, a receptacle forming part of the said conductor and having an opening in its top, a cover for said opening in the receptacle, and means for controlling the flow of gaseous products through said conductor.
19. In a charcoal kiln, the combination with the firing chamber provided with two series of air inlet openings disposed one series above the other, the floor of the chamber being higher in the center than at the periphery of the chamber, of an upwardly extending chimney projecting higher than the chamber, a horizontal conductor disposed lower than the chamber floor and connecting at one end with the chamber below the lower series of air inlet openings and connecting at the other end with the lower end of the chimney, a guard in the chamber extending over the open end of the said conductor, a receptacle forming part of said conductor and having an opening in the top, a cover for said opening, and a damper transversely movable in said receptacle for controlling the draft therethrough and mounted so as to be swung by gas pressure in the conductor to a position in which the passage of the gas through the conductor will not be obstructed.
20. In a charcoal kiln, the combination with the firing chamber provided with suitable inlet openings for air, of a vertical chimney disposed outside the said chamber and extending higher than the said chamber, the chimney comprising a series of tubular sections disposed vertically adjacent sections being fitted one in the other, a vertical framework provided with a series of transverse braces disposed one above the other and each brace embracing the said chimney, a conductor disposed lower than the floor of the chamber and connected at one end thereto below the air inlet openings, and connected at the other end to the lower end of the chimney, and a damper adjustable transversely across the conductor passage and movable lengthwise therein by the pressure of gas passing there-through.
21. In a charcoal kiln, the combination with a firing chamber provided with two horizontal series of air inlet openings disposed one series above the other, the floor of the chamber rising from the periphery toward the center of the chamber, of an external chimney of tiling disposed vertically, a framework supporting the said chimney, and a conductor connected at one end to the lower end of the chimney and at the other end to the said chamber below the lower series of openings.
22. In a charcoal kiln, the combination with a firing chamber provided with two horizontal series of air inlet openings disposed one series above the other, of an external chimney of tiling disposed vertically, a framework supporting said chimney, a conductor leading from the said chamber below the lower series of air inlet openings to the lower end of said chimney, a receptacle forming a part of said conductor and having an opening in the top, a cover for said opening, and a damper adjustable transversely in said receptacle for obstructing more or less the passage of gas therethrough and mounted so as to be swung by the pressure of the gas to a position in which the passage of gas will be unobstructed.



4

23. In a down draft charcoal kiln, the combination with the oven body, of an exterior stack, a smoke passage leading downward from the oven to said stack, and a damper for controlling the draft through said passage and movable by an excess of gas pressure in said oven so as not to obstruct the passage of gas through said passage.

24. In a down draft charcoal kiln, the combination with the oven body, of an exterior stack, a smoke passage leading downward from said oven to said stack and having a housing forming a part of said passage, and a damper mounted in said housing and movable by an excess of gas pressure in said oven to a position in which it will not obstruct the passage of gas through said passage.

25. In a down draft charcoal kiln, the combination with the oven body, of an exterior stack, a smoke passage leading downward from said oven to said stack and having a

housing forming a part of said passage, the said housing having a lateral opening and means by which said opening may be closed, and a damper mounted in said housing.

26. In a down draft charcoal kiln, the combination with the oven body having an air inlet, of a stack exterior of said oven body, a smoke passage leading from said oven below said air inlet to said stack, a guard in said oven over said passage, a housing forming a part of said passage and provided with a lateral opening having a removable closure therefor, and a damper mounted in said housing.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

CHARLES D. TRAIN.

Witnesses:

WARREN D. HOUSE,  
HENRY F. ROSE.