

No. 773,853.

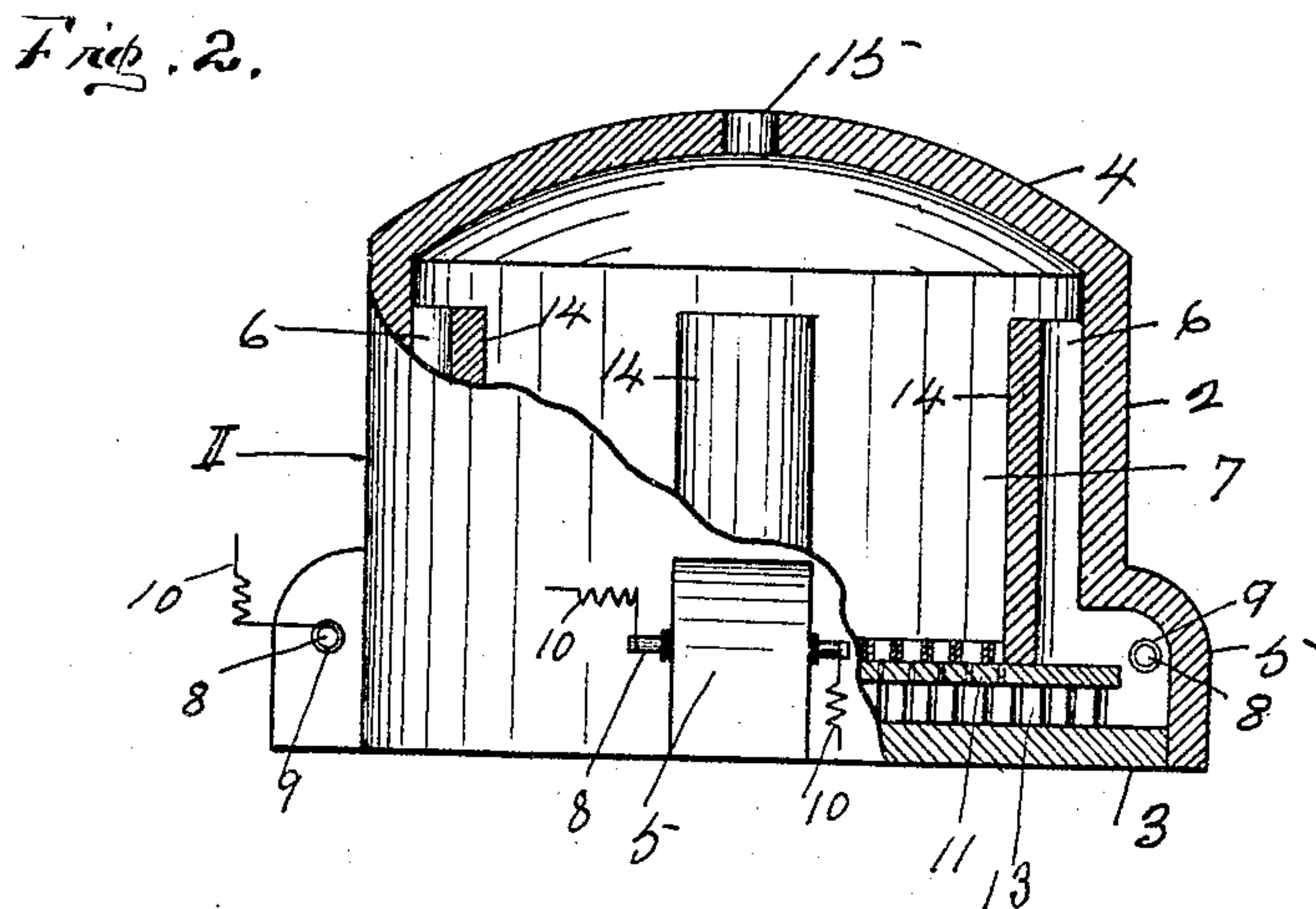
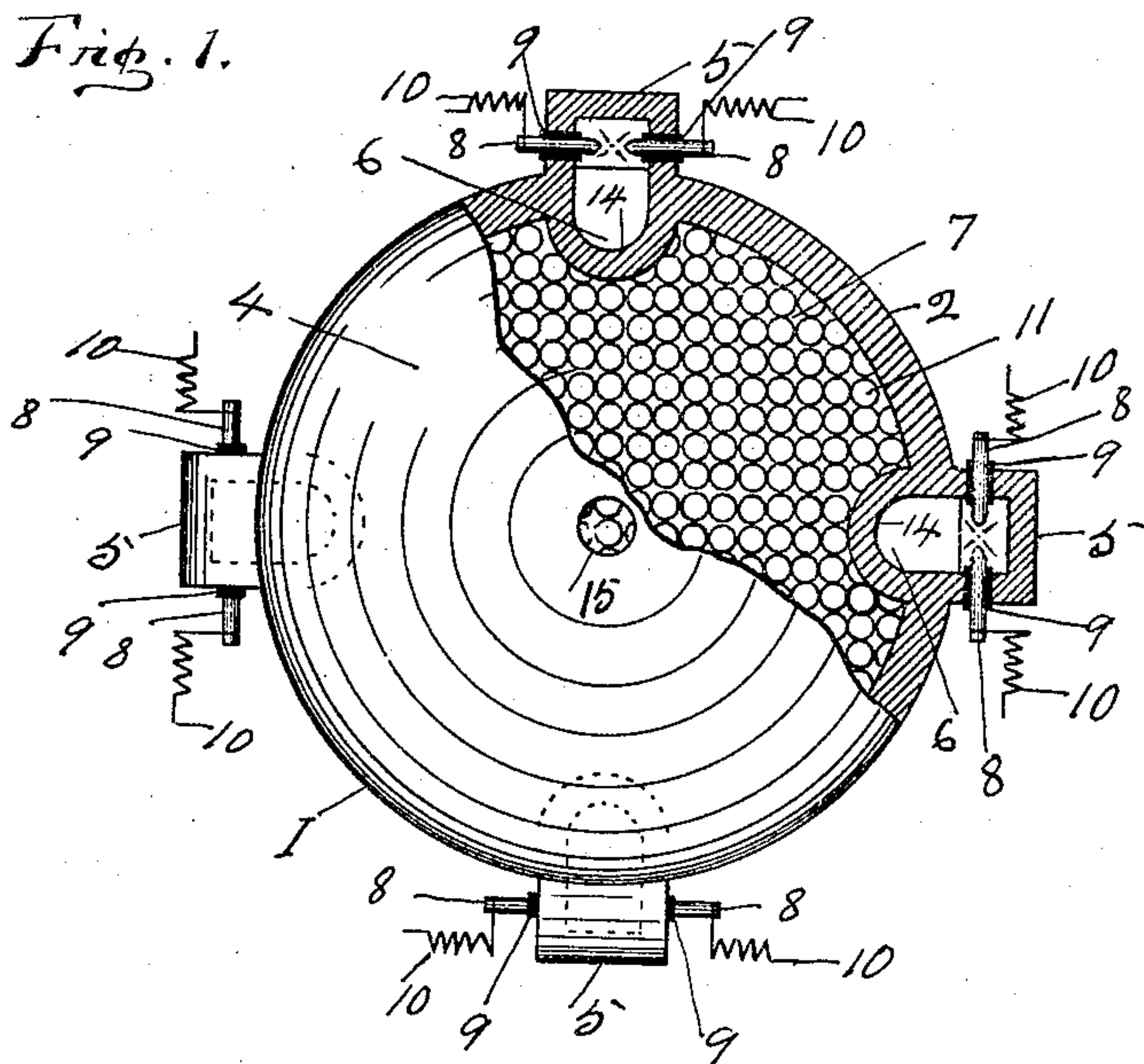
PATENTED NOV. 1, 1904.

F. E. DICKINSON.  
ELECTRIC KILN.

APPLICATION FILED JAN. 12, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

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3 SHEETS—SHEET 2.

Fig. 3.

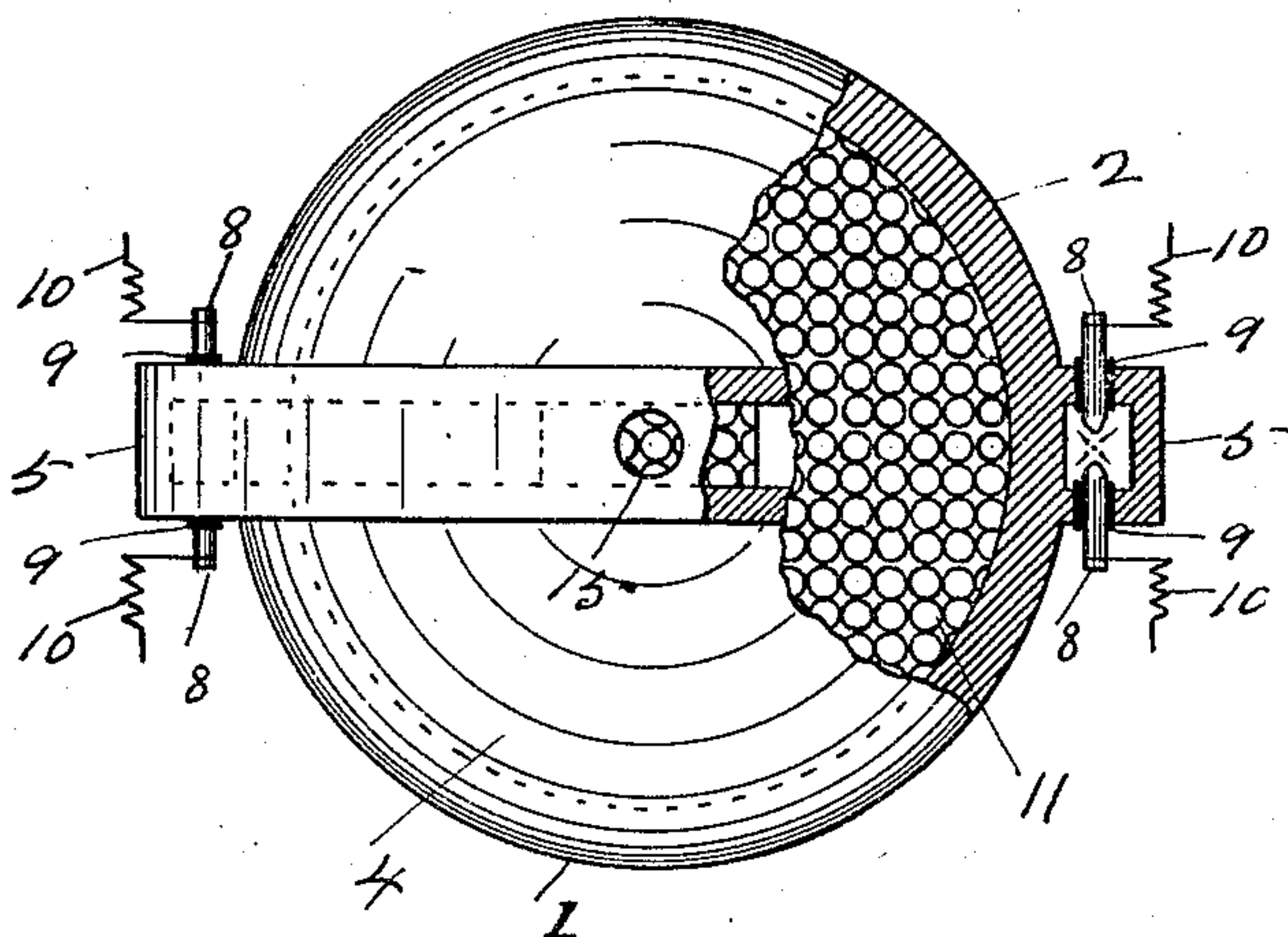
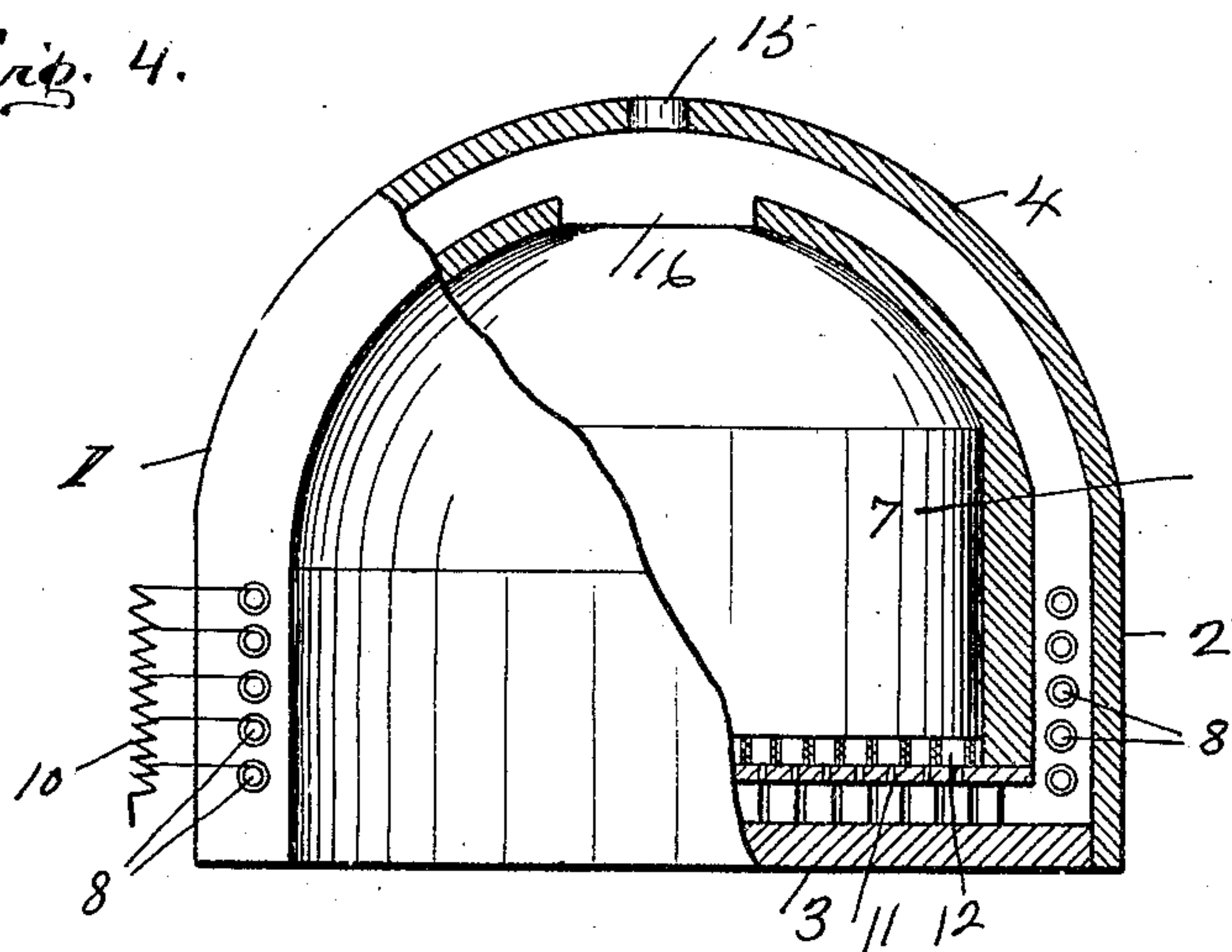


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

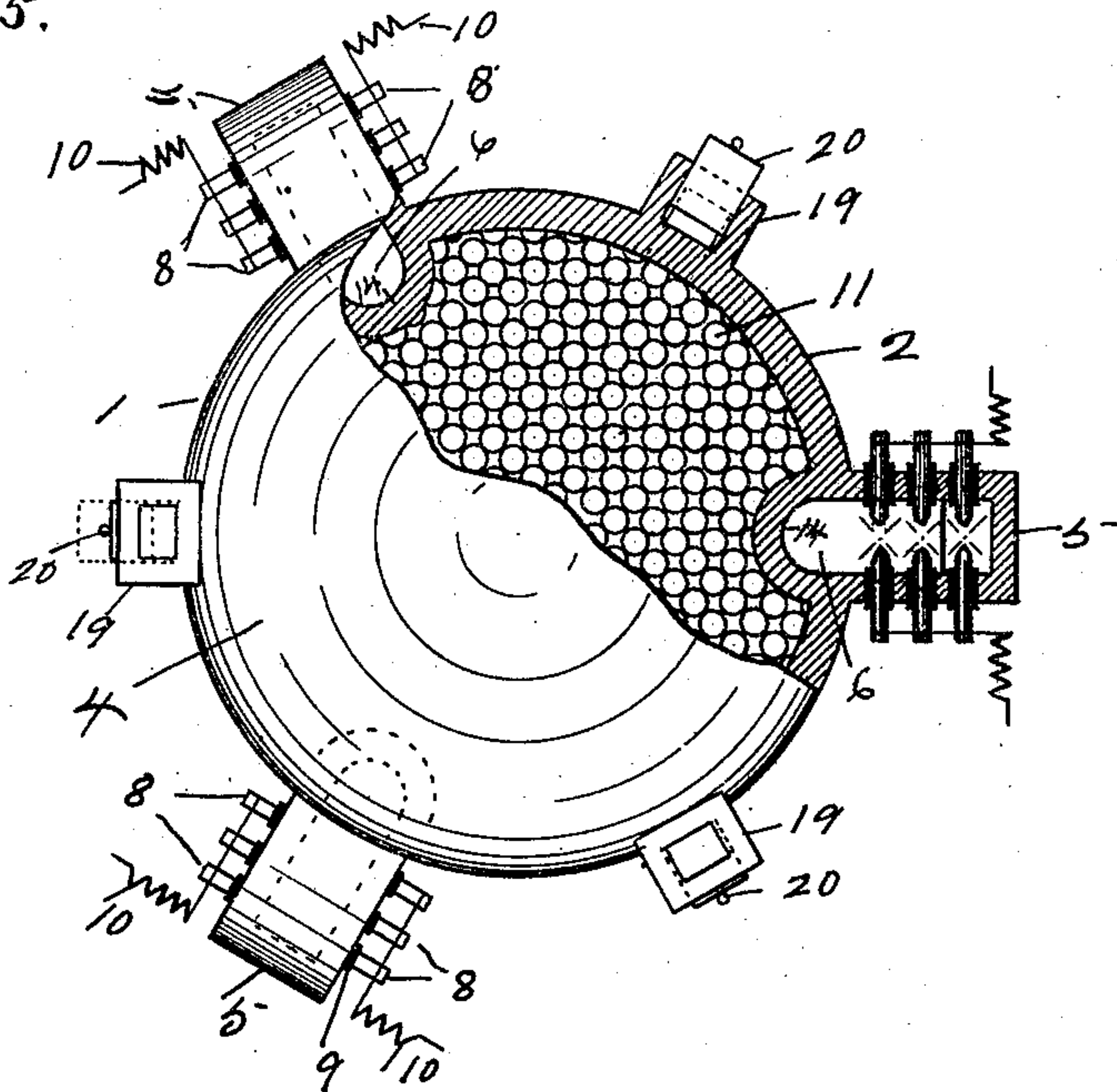
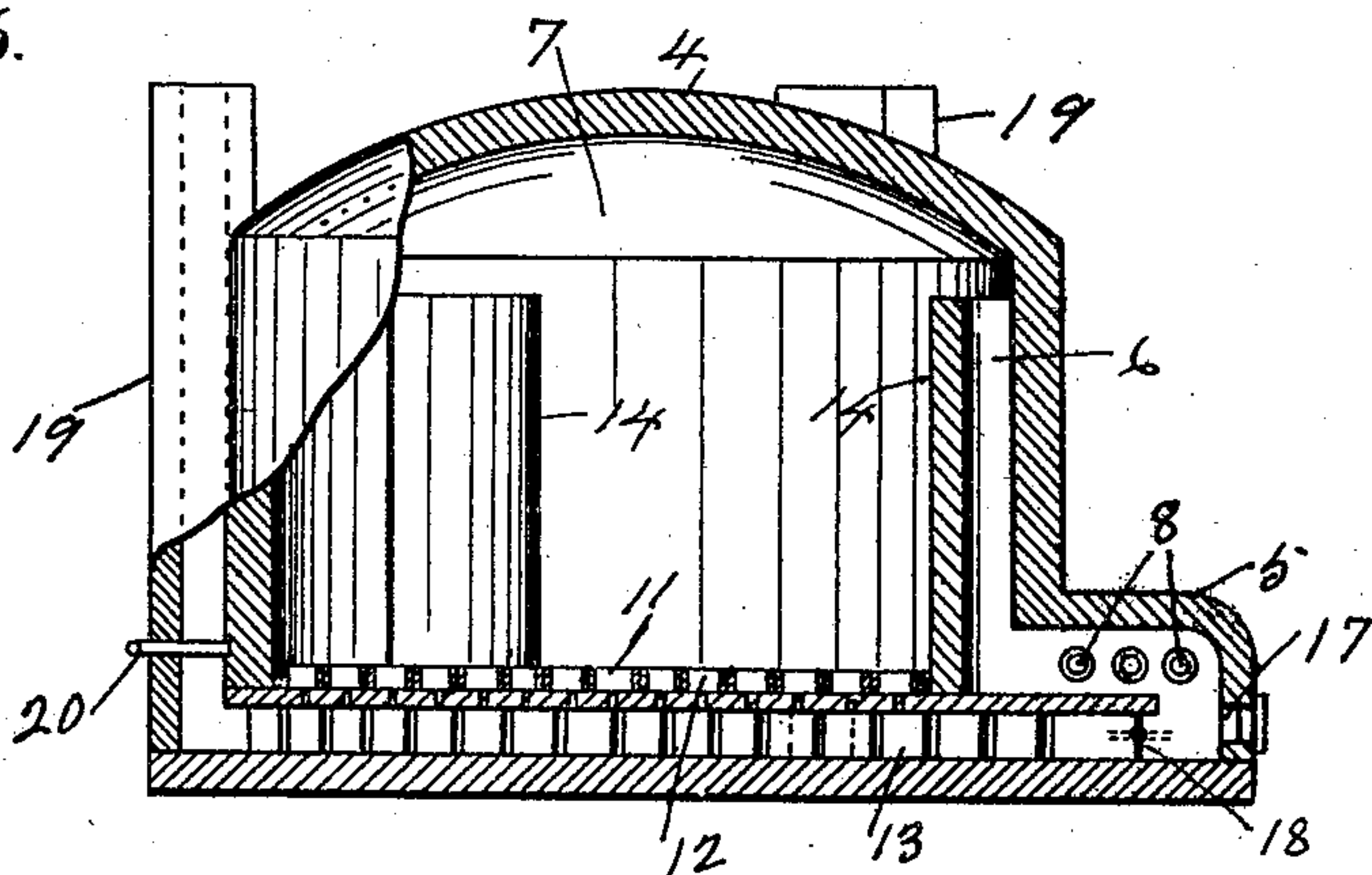


Fig. 6.



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# UNITED STATES PATENT OFFICE.

FREDERICK E. DICKINSON, OF KENDALLVILLE, INDIANA.

## ELECTRIC KILN.

SPECIFICATION forming part of Letters Patent No. 773,853, dated November 1, 1904.

Application filed January 12, 1903. Serial No. 138,618. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK E. DICKINSON, a citizen of the United States, residing at Kendallville, in the county of Noble, in the State of Indiana, have invented certain new and useful Improvements in Electric Kilns or Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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 part of this specification.

My invention relates to improvements in electric kilns or burning-ovens.

It is well known that in the kilns and furnace-chambers now in use in the manufacture of brick, pottery, and the like a continuous intake of cold air is required to maintain combustion and a proportionate escape of heated air from the furnace continuously takes place, thereby necessitating a very large waste of heat energy.

The primary object of my present invention is to obviate this great waste of energy by the continuous circulation through the furnace and heated or treating chamber of the same body of gas in a practically air-tight kiln in such a manner that the heating medium will require but slight reheating during each cycle and the loss of the heat energy thereof will be reduced to a minimum, being only such as results from conduction and radiation from the walls of the furnace. This object I accomplish by a novel arrangement of a plurality of electric arcs within the kiln to serve as the heating agent in the manner shown in the accompanying drawings, in which similar reference-numerals indicate like parts throughout the several views, and in which—

Figure 1 is a top plan of my improved furnace with a portion thereof shown in longitudinal section to show the relative arrangement of the furnace-compartments, the circulation-flues therefor, and the heating-arcs therein. Fig. 2 is a view in elevation of the same, partly in vertical section, to show the relative arrangement of the operative parts. Fig. 3 is a plan view of a modified form of my

invention in which the circulating-flue is carried up over the kiln and is adapted for the employment of a series of electric heating-arcs, the top of the kiln being broken away in part. Fig. 4 is a side view of Fig. 3, partly in vertical central section. Fig. 5 is a plan view of another modified form, partly in horizontal section, taken through the furnace boxes, flues, and dampers, by means of which the heated gases can be allowed to escape and fresh air introduced when desired. Fig. 6 is a view of the same in elevation shown mostly in vertical section.

The novelty of my invention resides in the production of a furnace and the development of hot gases external to the treating-chamber, and then conveying these to the heated or treating chamber, and then withdrawing these gases and returning them to be reheated and again conveying them to the furnace or treating chamber. My invention thus embraces the production of a furnace and the arrangement of a heating medium, such as an electric arc or arcs, in compartments of the furnace adjacent to and connected with the treating chamber, whereby air or gases may be heated to the desired temperature and then freely and uniformly circulated over, around, and about the entire surface of the articles or substances within the treating-chamber, after which these same gases are again utilized by returning them to the heating boxes or compartments to be reheated and again circulated and brought into contact with the said articles or substances. A constant and continuous action of gases upon the articles or substances contained in the treating-chamber is thus secured, and thereby securing a quicker heating of the gases in the furnace-box than can be done by heating fresh cold air continually during operation. I thus secure a consequent saving in cost incident to such reheating and also a uniform and constant application of heat to any and all portions or surfaces of the said articles or substances. In this manner I am enabled to conserve the gases and effect the heating thereof rapidly and continuously without waste or added expense and without resupplying to the



furnace new gases for the purpose. In view of its many advantages I prefer to utilize the arc of an electric current for the purpose of heating and reheating the gases, though other  
 5 appropriate heating mediums may be employed for this purpose.

Referring now to the drawings, the kiln chamber or furnace 1, of any desired size or contour, preferably has a circular wall 2, a  
 10 base 3, and an arched dome 4. At or near the base of the kiln are arranged a plurality of furnace-chambers or heating-boxes 5, preferably approximately equidistant and in radial relation. These furnace or heating cham-  
 15 bers 5 preferably project beyond the wall 2 of the kiln, and are roofed over and tightly closed exteriorly, but open at their inner side into an upright flue 6, communicating with the interior of the heated chamber 7, in which the  
 20 articles to be acted upon are placed. The opposite walls of the chambers 5 are provided with lateral perforations in which are slidably but snugly arranged the electrodes or carbons 8, each pair being in proper opposite arrange-  
 25 ment to produce an arc. These carbons 8 are each properly insulated, as shown, by any suitable annular insulator 9 and are connected with any proper source of electrical energy by means of the conductor 10, the electric  
 30 current thus employed being either alternating or continuous.

The manner of regulating the arcs is obviously immaterial, whether by hand or by automatic mechanism.

35 At a suitable point above the base 3 is arranged an auxiliary floor 11 of the same general form as that of the base 3, but preferably extending or projecting into the heating-chamber 5 and in close proximity to the arc-  
 40 forming carbons 8. This auxiliary floor 11 is provided with a series of vertical apertures 12 of proper size to permit a free passage of the partially-cooled gases of the treating-chamber. In register with the lower end of these  
 45 apertures 12 are arranged a series of return-flues 13, which lead to and terminate in the arc-chambers 5.

The flues 6, one for each arc-chamber, are formed by a semicircular vertical wall 14,  
 50 which rests upon the auxiliary floor 11 and whose width is preferably equal to that of the arc-chambers. These vertical flues terminate at or near the top of the kiln and conduct the heated gases of the arc-chambers to the treat-  
 55 ing-chamber.

A central opening 15, Figs. 1, 2, 3, and 4, may be provided for two purposes—first, to permit the moisture given off by the green wares in the treating-chamber at the first  
 60 stage of the burning to escape from the kiln and, second, to permit a limited ventilation of the kiln at any desired stage of the process.

Obviously the number of the heating-chambers 5 and of the arc-producing devices 8 may  
 65 be indefinitely increased and the arrange-

ment of the carbons variously modified, as shown in Figs. 4, 5, and 6.

The flue for conducting the gases of the arc-chambers to the heating-chamber may also be variously modified in construction without  
 70 departing from the spirit of my invention as shown in Figs. 3 and 4, in which the two diametric arc-chambers are upwardly extended in parallel arrangement with the arched top of the kiln until they meet and form a con-  
 75 tinuous conduit with a central opening 16 in its lower sides, through which the ascending gases enter the treating-chamber, and is provided with an outlet-opening 15 in the apex of the dome, as in the form shown in Figs. 1  
 80 and 2.

In the modified form shown in Figs. 5 and 6 a lateral vent or opening 17, forming an adjustable inlet, is provided in the outer wall of the arc-chamber, and a damper 18 may be  
 85 arranged in the outlet of the flues. In this form I have also provided one or more chimneys 19, leading upward from the flues 13, which chimneys have a proper regulating-damper 20, forming an adjustable outlet.  
 90

The operation of my improved kiln is briefly stated as follows: The articles to be burned or treated having been properly arranged in the treating-chamber, the arcs are drawn in their respective chambers, thereby heating  
 95 the air therein, which then ascends the respective flues 6 and enters the treating-chamber, where it parts with the greater portion of its heat by contact with the articles to be treated and then descends through the perforated  
 100 floor 11 into the flues 13 and thence passes back into the arc-chambers to be reheated and again enter the circulation, as before, whereby a constant circulation of the heated air throughout the kiln is indefinitely maintained.  
 105 After the moisture of the articles to be treated has been eliminated, as described, all vents and chimneys are closed and the entrance of outside air to the kiln is prevented, or practically so, during the burning or treat-  
 110 ing process, whereby an important conservation of the heated air therein is effected, as the temperature thereof can under these conditions be continuously maintained by a comparatively slight expenditure of electric en-  
 115 ergy. As the same body of air when once heated can thus be continuously circulated during the entire process by a comparatively slight reheating to compensate for the loss of heat by radiation from the walls of the kiln,  
 120 it is obvious that my invention secures a great economy of fuel and labor.

The use of my improved electric furnace not only saves a very high percentage of heat usually wasted and requires no stoking or re-  
 125 moval of ashes, particularly where the primary source of the electric energy is water-power, but it also obviates the injurious effects upon the wares, such as pottery and the like, by the admission of cold drafts of air into  
 130



the treating-chamber, which causes a warping and cracking of the more delicate wares.

When desired, the air of the kiln can readily be changed by means of the vents 15 and 17 and the chimneys 19, and, if desired, a very small amount of fresh air may be admitted to the circulating current at a point where it will be properly heated before it reaches the treating-chamber.

10 The parts through which the carbons are fed can be kept cool by a circulation of water or in other obvious manner.

What I claim as new, and desire to secure by Letters Patent, is—

15 1. In a kiln of the class described, the combination with the body thereof including a treating-chamber at its interior and a heating-chamber adjacent thereto, of an auxiliary floor spaced from the base of the kiln to form re-  
20 turn-flues communicating with the heating-chamber, a wall or partition extending upwardly from said auxiliary floor to form a flue leading from the heating-chamber and discharging into the treating-chamber, said  
25 wall or partition also separating the heating-chamber from the treating-chamber, and means for heating the gases within the heating-chamber to cause a circulation therefrom through the treating-chamber and back to the  
30 heating-chamber.

2. In a kiln of the class described, the combination with the body thereof including a treating-chamber at its interior and a heating-chamber adjacent thereto, of an auxiliary floor  
35 spaced from the base of the kiln to form return-flues communicating with the heating-chamber, said auxiliary floor extending into the heating-chamber, a wall or partition extending upwardly from said auxiliary floor to  
40 form a flue leading from the heating-chamber and discharging into the treating-chamber, said wall or partition also separating the heating-chamber from the treating-chamber, and means for heating the gases within the heat-  
45 ing-chamber to cause a circulation therefrom through the treating-chamber and back to the heating-chamber.

3. In a kiln of the class described, the combination with the body thereof including a  
50 treating-chamber at its interior and a heating-chamber adjacent thereto, of an auxiliary perforated floor spaced from the base of the kiln to form return-flues communicating with the heating-chamber, a wall or partition extend-  
55 ing upwardly from said auxiliary floor to form a flue leading from the heating-chamber and discharging into the treating-chamber, said wall or partition also separating the heating-chamber from the treating-chamber, and  
60 means for heating the gases within the heating-chamber to cause a circulation therefrom through the treating-chamber and back to the heating-chamber.

4. In a kiln of the class described, the com-  
65 bination with the body thereof including a

treating-chamber at its interior and a heating-chamber adjacent thereto, of an auxiliary floor spaced from the base of the kiln to form re-  
turn-flues communicating with the heating-chamber, a wall or partition extending up- 70  
wardly from said auxiliary floor to form a flue leading from the heating-chamber and discharging into the treating-chamber, said wall or partition also separating the heating-chamber from the treating-chamber, means for  
75 heating the gases within the heating-chamber to cause a circulation therefrom through the treating-chamber and back to the heating-chamber, and means for controlling such circulation.

5. In a kiln of the class described, the combination with the body thereof including a treating-chamber at its interior and a series of heating-chambers at its base, of an auxiliary floor spaced from the base of the kiln to  
85 form return-flues communicating with the heating-chamber, a wall or partition extending upwardly from said auxiliary floor to form a flue leading from the heating-chamber and discharging into the treating-chamber, said  
90 wall or partition also separating the heating-chamber from the treating-chamber, and means for heating the gases within the heating-chamber to cause a circulation therefrom through the treating-chamber and back to the  
95 heating-chamber.

6. In a kiln of the class described, the combination with the body thereof including a treating-chamber at its interior and a heating-chamber adjacent thereto, of an auxiliary  
100 floor spaced from the base of the kiln to form return-flues communicating with the heating-chamber, a wall or partition extending upwardly from said auxiliary floor to form a flue leading from the heating-chamber and  
105 discharging into the treating-chamber, said wall or partition also separating the heating-chamber from the treating-chamber, and electrodes arranged within the heating-chamber to produce an arc or arcs for heating the gases  
110 within the heating-chamber.

7. In a kiln of the class described, the combination with the body thereof including a treating-chamber at its interior and a series of heating-chambers at its base, of an auxiliary  
115 floor spaced from the base of the kiln to form return-flues communicating with the heating-chamber, a wall or partition extending upwardly from said auxiliary floor to form a flue leading from the heating-chamber and  
120 discharging into the treating-chamber, said wall or partition also separating the heating-chamber from the treating-chamber, and electrodes arranged within the heating-chamber to produce an arc or arcs for heating the gases  
125 within the chamber.

8. In a kiln of the class described, the combination with the body thereof including a treating-chamber at its interior and a series of heating-chambers at its base, of an auxiliary  
130



floor spaced from the base of the kiln to form return-flues communicating with the heating-chamber, a wall or partition extending upwardly from said auxiliary floor to form a flue  
 5 leading from the heating-chamber and discharging into the treating-chamber, said wall or partition also separating the heating-chamber from the treating-chamber, electrodes arranged within the heating-chamber to produce  
 10 an arc or arcs for heating the gases within the chamber, and means for recharging the heating-chambers with air.

9. In an apparatus of the character described, the combination of a chamber, a source  
 15 of heat energy independent of the said chamber but arranged in communication therewith, and return-flues from said chamber to said source of heat energy, all constructed to prevent the admission of air for the support of  
 20 combustion and to effect a continuous circulation through said several elements of the same atmospheric air or other fluid contents thereof, substantially as described.

10. In an apparatus of the character described, the combination of a chamber, electric heating means independent of said chamber but arranged in communication therewith, and  
 25 return-flues from said chamber to said electric heating means, all constructed to prevent the admission of air for the support of combustion and to effect a continuous circulation  
 30 through said several elements of the same atmospheric air or other fluid contents thereof, substantially as described.

11. In an apparatus of the character described, the combination of a chamber, a source  
 35 of heat energy, a flue leading from said source of heat energy to said chamber, and return-flues leading from said chamber and communicating with said source of heat energy at a  
 40 point below said first flue, all constructed to prevent the admission of air for the support of combustion and to effect a continuous circulation through said several elements of the  
 45 same atmospheric air, substantially as described.

12. In an apparatus of the character described, the combination of a chamber, a source  
 50 of heat energy, a flue leading from said source of heat energy to the upper portion of said chamber, and return-flues leading from the lower portion of said chamber and communicating with said source of heat energy at a  
 55 point below said first flue, all constructed to prevent the admission of air for the support of combustion and to effect a continuous circulation through said several elements of the same atmospheric air, substantially as described.

13. In an apparatus of the character described, the combination of a chamber, heating-boxes independent of said chamber, a flue  
 60 connecting the upper portion of each heating-box to said chamber, and a return-flue connecting the lower portion of said chamber

to the lower portion of each heating-box, all constructed to prevent the admission of air for the support of combustion and to effect a continuous circulation through said several elements of the same atmospheric air, substantially as described. 70

14. In an apparatus of the character described, the combination of a chamber, heating-boxes independent of said chamber, electric heating means positioned within the said  
 75 heating-boxes, a flue connecting the upper portion of each heating-box to said chamber, and a return-flue connecting the lower portion of said chamber to the lower portion of each heating-box, all constructed to prevent  
 80 the admission of air for the support of combustion and to effect a continuous circulation through said several elements of the same atmospheric air, substantially as described.

15. In an apparatus of the character described, the combination of a chamber, heating-boxes independent of the said chamber, a plurality of pairs of electrodes positioned within each heating-box, a flue connecting the  
 85 upper portion of each heating-box to said chamber, and a return-flue connecting the lower portion of said chamber to the lower portion of each heating-box, all constructed to prevent the admission of air for the support of combustion and to effect a continuous  
 90 circulation through said several elements of the same atmospheric air, substantially as described.

16. In an apparatus of the character described, the combination of a chamber, a source  
 100 of heat energy independent of said chamber but arranged in communication therewith, return-flues from said chamber to said source of heat energy, all constructed to prevent the admission of air for the support of combustion and to effect a continuous circulation  
 105 through said several elements of the atmospheric air or other fluid contents thereof, an adjustable inlet to said source of heat energy, and an adjustable outlet from said return-flue, whereby a portion of the circulating fluid may be displaced, substantially as described. 110

17. In an apparatus of the character described, the combination of a chamber, electric heating means independent of said chamber but arranged in communication therewith, return-flues from said chamber to said electric heating means, all constructed to prevent  
 115 the admission of air for the support of combustion and to effect a continuous circulation through said several elements of the atmospheric air or other fluid contents thereof, an adjustable inlet to said electric heating means, and an adjustable outlet from said return-flue, whereby a portion of the circulating fluid  
 120 may be displaced, substantially as described.

18. In an apparatus of the character described, the combination of a chamber, heating-boxes independent of said chamber, a plurality of flues arranged on the inner wall of  
 125

said chamber and communicating therewith  
at their tops, each flue arranged in communi-  
cation at its lower end with one of said heat-  
ing-boxes, and a return-flue connecting the  
5 lower portion of said chamber to the lower  
portion of each heating-box, all constructed  
to prevent the admission of air for the sup-  
port of combustion and to effect a continuous  
circulation through said several elements of

the same atmospheric air, substantially as de- 10  
scribed.

Signed by me at Kendallville, Noble county,  
State of Indiana, this 10th day of January,  
A. D. 1903.

FREDERICK E. DICKINSON.

Witnesses:

D. H. DRAKE,  
T. B. MAYBEE.