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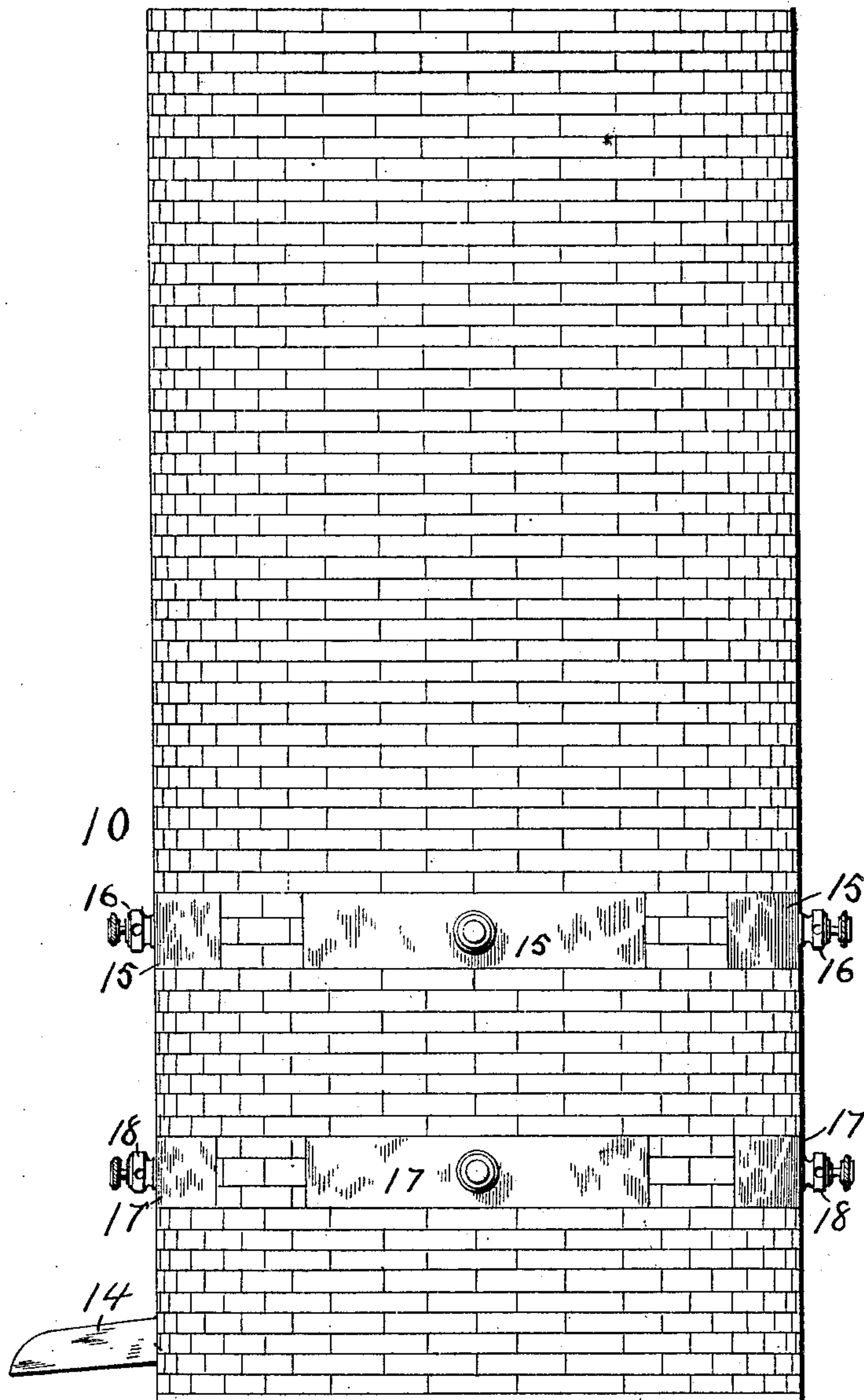
Patented Apr. 15, 1902.

M. R. CONLEY.
ELECTRIC FURNACE.

(Application filed Dec. 5, 1901.)

(No Model.)

4 Sheets—Sheet 1



WITNESSES:

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Fig. 1

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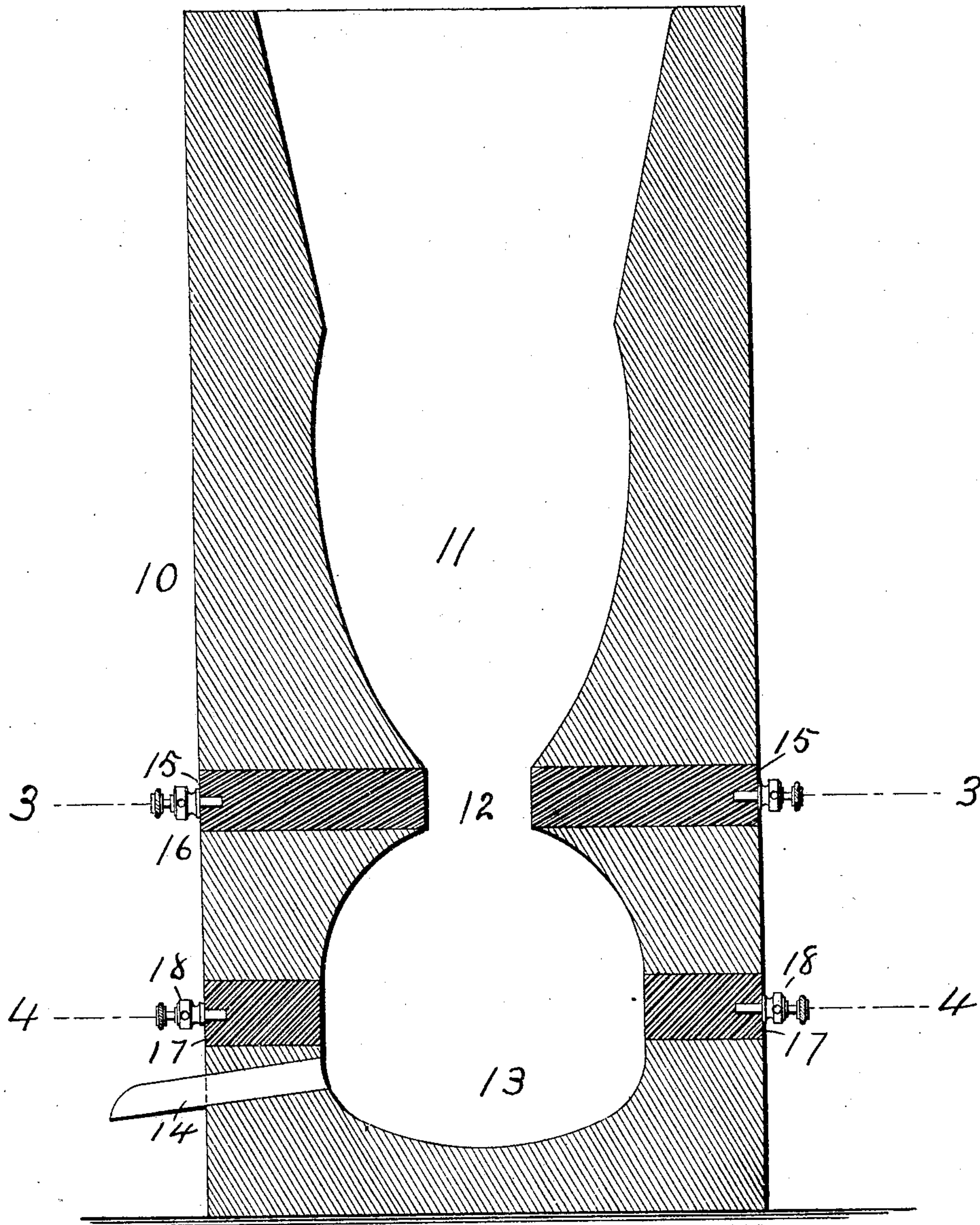
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Fig. 2

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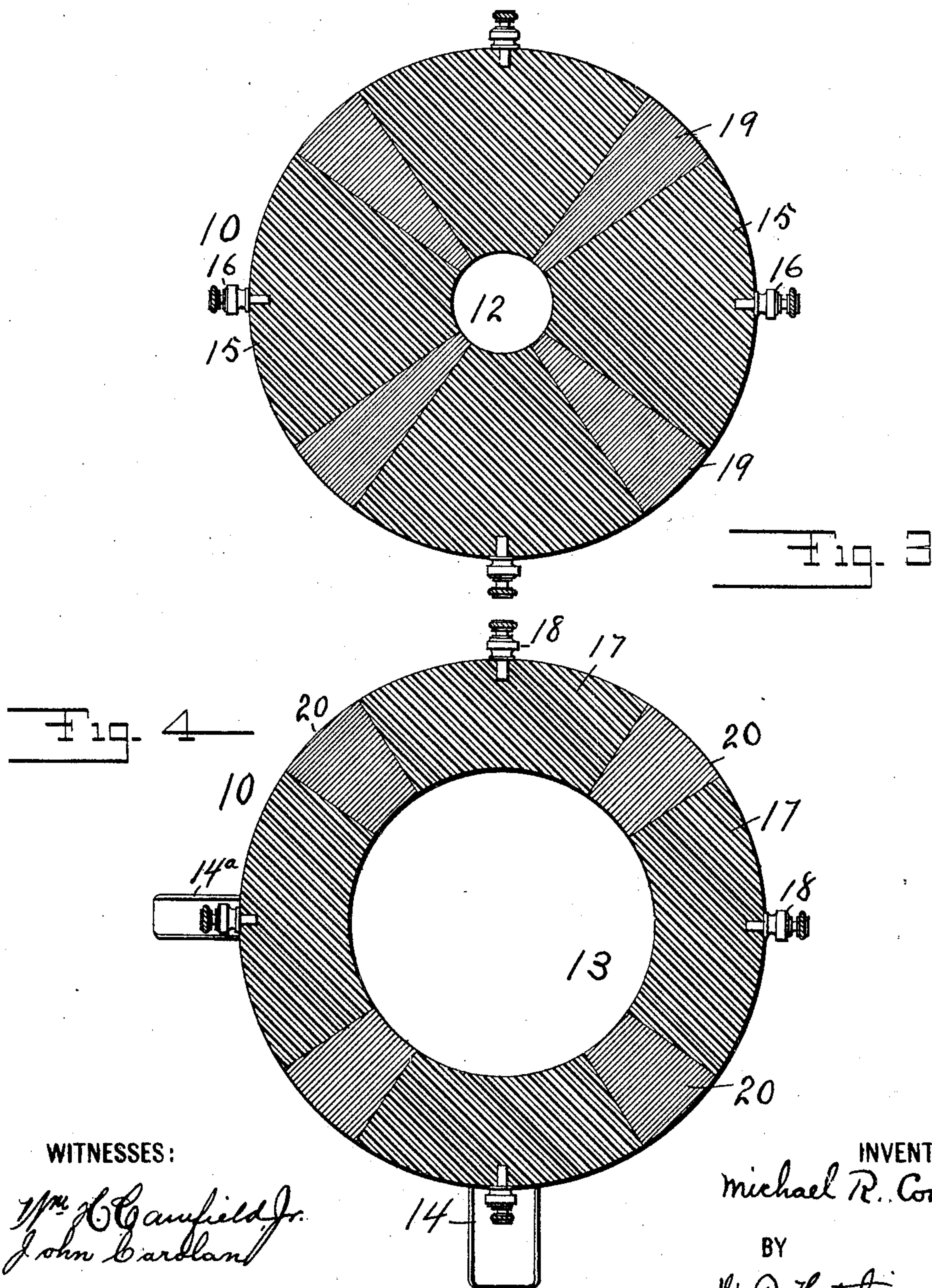
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Fig. 5

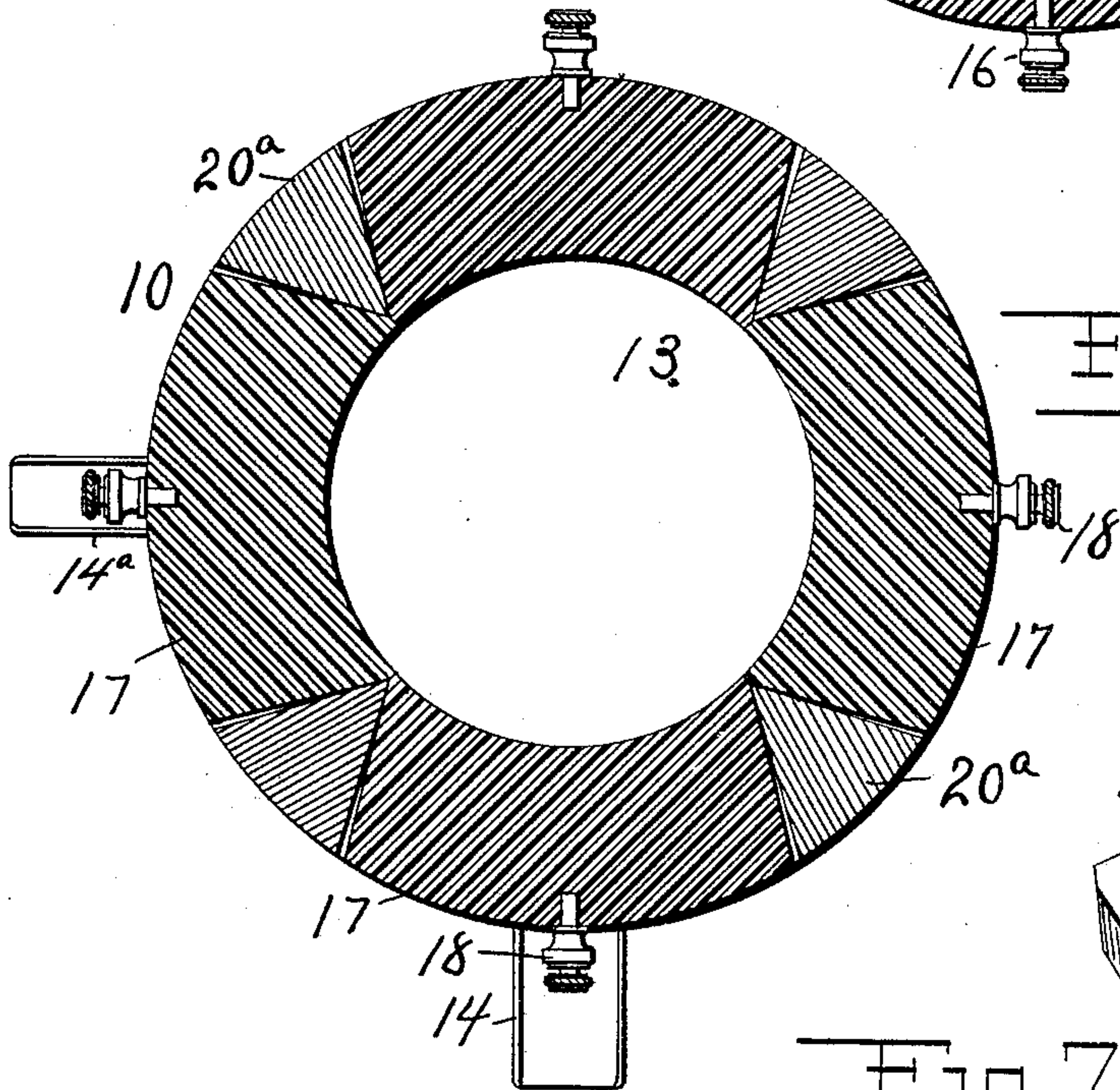
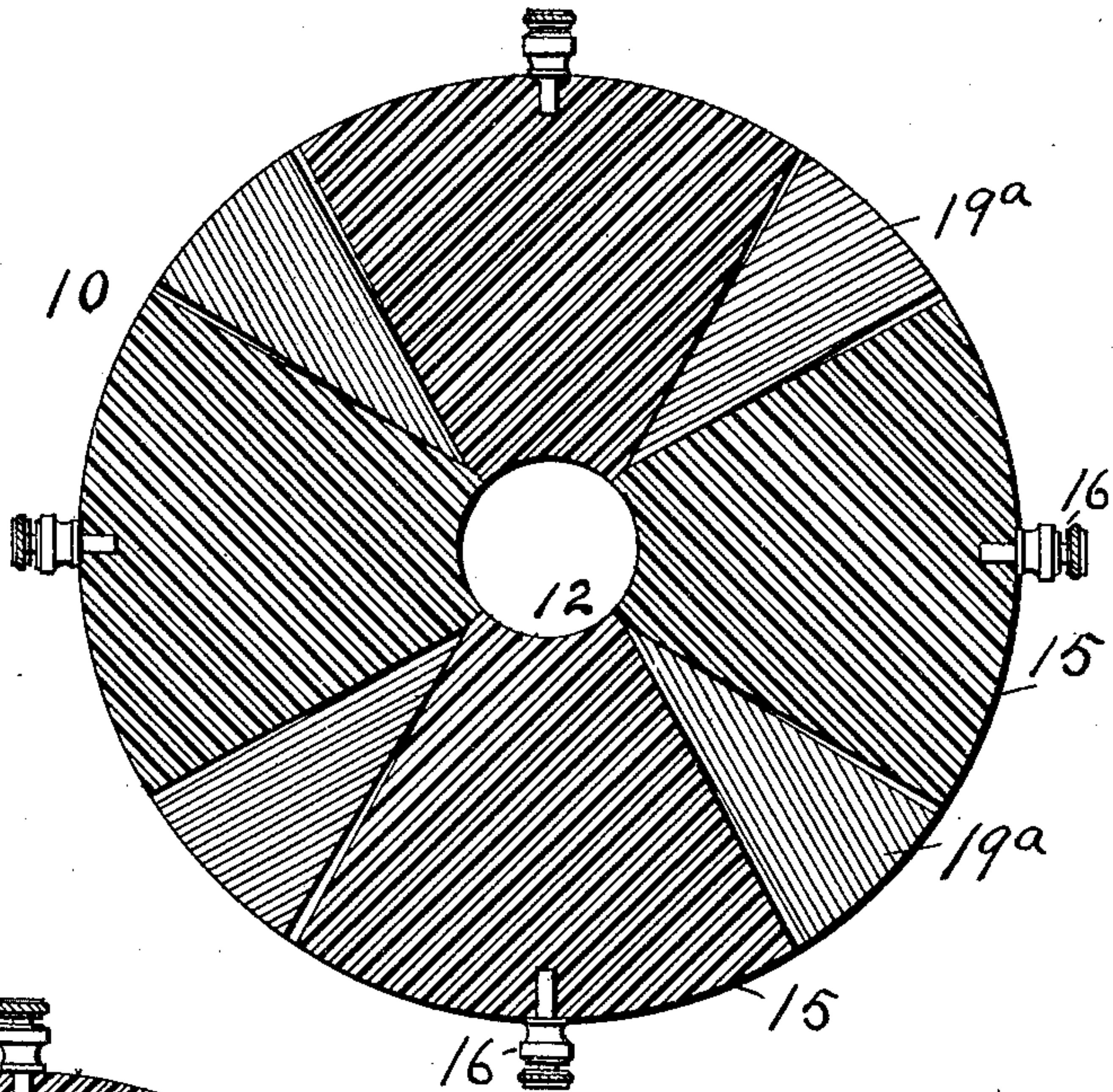


Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE.

MICHAEL R. CONLEY, OF NEW YORK, N. Y., ASSIGNOR TO ELECTRIC FURNACE COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 697,810, dated April 15, 1902.

Application filed December 5, 1901. Serial No. 84,764. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL R. CONLEY, of New York, Kings county, New York, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a full, clear, and exact description.

My invention relates to improvements in that class of electric furnaces which are adapted to reduce iron ores; and the object of my invention is to make a furnace by which the ore can be reduced and ingot-steel or metallic iron can be produced from the furnace at one operation and to produce a furnace which is very cheap and which can have the heating parts adjusted as they wear.

In many electric furnaces the electrodes protrude into the furnace, and if such furnaces are used for reducing iron ore the electrodes burn out very quickly, because of the oxygen in the ore, which promotes a combustion and attacks the carbon in the electrode.

In carrying out my invention I produce a heating or incandescent zone in a relatively narrow part of the furnace and make no attempt to produce an arc in the furnace, and the ore as it melts passes down to the hearth, where other electrodes are arranged to keep the metal liquid until it is tapped. I also provide means for taking up the wear of the electrodes, all to the end that iron and steel can be cheaply produced, and especially where electricity is cheap—as, for instance, near a water-power.

To these ends my invention consists of certain features of construction and combinations of parts, which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference refer to similar parts throughout the several views.

Figure 1 is a side elevation of my improved furnace. Fig. 2 is a vertical section thereof. Fig. 3 is a cross-section on the line 3 3 of Fig. 2. Fig. 4 is a cross-section on the line 4 4 of Fig. 2. Fig. 5 is a section similar to that in Fig. 3, but illustrating a slightly-modified arrangement of the electrodes. Fig. 6 is a section similar to that shown in Fig. 4, but with the electrodes arranged as in Fig. 5; and Fig. 7 is a detail of one of the electrodes.

The furnace 10 is built up in the main of fire-brick, being of a generally cylindrical shape, and interiorly the body portion 11 is gradually reduced to form a neck 12, which is much smaller in cross-section than any other part of the furnace and below which is the relatively large hearth 13. The furnace has the usual tap-hole 14 and can be provided with the ordinary openings for the removal of slag, a spout 14^a being shown in Figs. 4 and 6 for this purpose. The walls of the neck constitute a melting zone, being formed, essentially, of the electrodes 15, which are arranged on the same horizontal plane and are provided with binding-posts 16 in order that they may connect with wires carrying the electric current, and opposite the hearth 13 and forming practically a heating zone around the same are other electrodes 17, which are provided with binding-posts 18 or equivalent means of connecting with the electric wires. These electrodes 15 and 17 are formed of a material containing sufficient carbon to offer resistance to the current of such a nature as to heat the electrodes to incandescence. For instance, they may be made of a composition in which plumbago is a principal ingredient mixed with clay somewhat as plumbago crucibles have long been made.

The upper electrodes 15 fit into the sides of the furnace between legs 19 of the ordinary furnace-brickwork, and they should fit loosely, so that as the inner part wears away the electrodes may be forced inward to compensate for the wear. A better result can be obtained by forming the legs as shown at 19^a in Fig. 5, the inner edge of the legs being cut away, so that the inner portions of the electrodes meet, and thus a complete incandescent zone is formed around the neck of the furnace when the current is turned on.

The lower heating zone is formed in substantially the manner indicated above, the electrodes 17 being placed between supporting-legs 20 of the furnace-wall, so as to form a heating zone around the hearth 13; but preferably the legs are cut away on the inner side, as shown at 20^a in Fig. 6, so that the inner portions of the electrodes meet and form a continuous belt around the furnace-wall. It will be seen that the lower electrodes

will be covered by the bath, but that the oxid will be virtually destroyed at the neck 12 of the furnace, so that the electrodes 17 will not be eaten away rapidly, as they other-

5 wise would.

The ore is fed into the furnace as usual, is melted at the upper zone, while the lower zone serves to keep it in a liquid state and also to assist in the reduction, as the heat will of
10 course be radiated inwardly to a certain extent from both zones.

It will be clearly seen from the foregoing description that I do not rely on an arc for heating, and while the current will undoubtedly
15 pass through the charge in the furnace, still I get the heat chiefly from the incandescence of the electrodes.

In using the furnace the nature of the ores can be ascertained in the usual way and the
20 right quantity of carbon, such as coke or charcoal, mixed with the ore as it is fed to the furnace, so that the ingots as they are cast will contain the right percentage of carbon, and this can be so accurately determined as to
25 produce a good quality of steel, sufficiently good, at any rate, to make ordinary commercial ingots.

It will be seen that the structure described provides for melting ore or metal without the
30 disturbing influence of the arc and that where the ore is decarburized at the upper heating zone—that is, in the neck of the furnace—it can be recarburized or treated with manganese or other ingredients, if desired, in the bath.

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

1. An electric furnace having its body portion made of refractory non-conducting materials and formed with a main inner chamber, a
40 neck at the bottom of said inner chamber, a hearth below the neck, a heating zone forming

substantially the wall of the neck and made up of a series of plates or parts adapted to be heated to incandescence by the passage of an
45 electric current through them, and a second heating zone in the hearth formed also of plates or parts which are adapted to be substantially flush with the furnace-wall and incandesce under the influence of a strong elec- 50 tric current.

2. The herein-described electric furnace, comprising a body made of refractory non-conducting materials and having its inner portion closed to exclude the ingress of air
55 and provided in its walls with a plurality of heating zones arranged on different horizontal planes, the inner parts of the heating zones lying substantially flush with the furnace-walls and the said zones being made
60 of material of low electrical conductivity adapted to grow incandescent under the influence of an electric current.

3. An electric furnace, comprising a body portion formed of refractory non-conducting
65 material and closed to prevent the ingress of air while the furnace is in operation, the said body being reduced interiorly to form a comparatively small neck with a hearth below the neck, the hearth, neck and chamber of the
70 body forming one connected inclosure, and a heating zone or belt forming the wall of the neck, said belt or zone being made of material of low electrical conductivity adapted to grow incandescent on the passage of an electric
75 current through it.

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

MICHAEL R. CONLEY.

In presence of—

THOMAS T. SEELYE,
THERON DAVIS.