

No. 777,577.

PATENTED DEC. 13, 1904

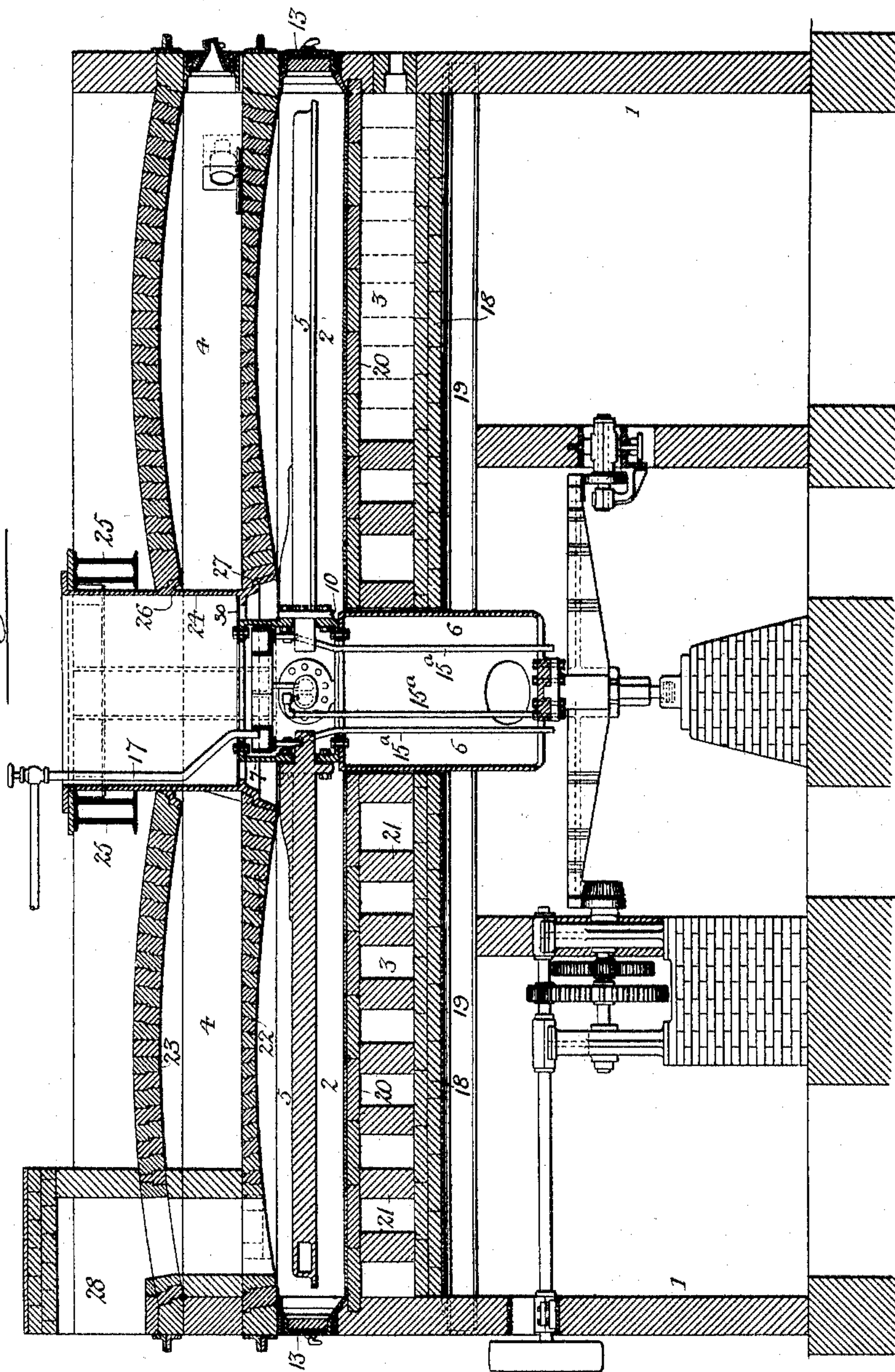
U. WEDGE.
FURNACE FOR ROASTING, SMELTING, &c.

APPLICATION FILED AUG. 10, 1903.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Titus H. Irons.

Herman E. Mettles

Inventor
Utey Wedge,

by his Attorneys;

Howson & Howson

No. 777,577.

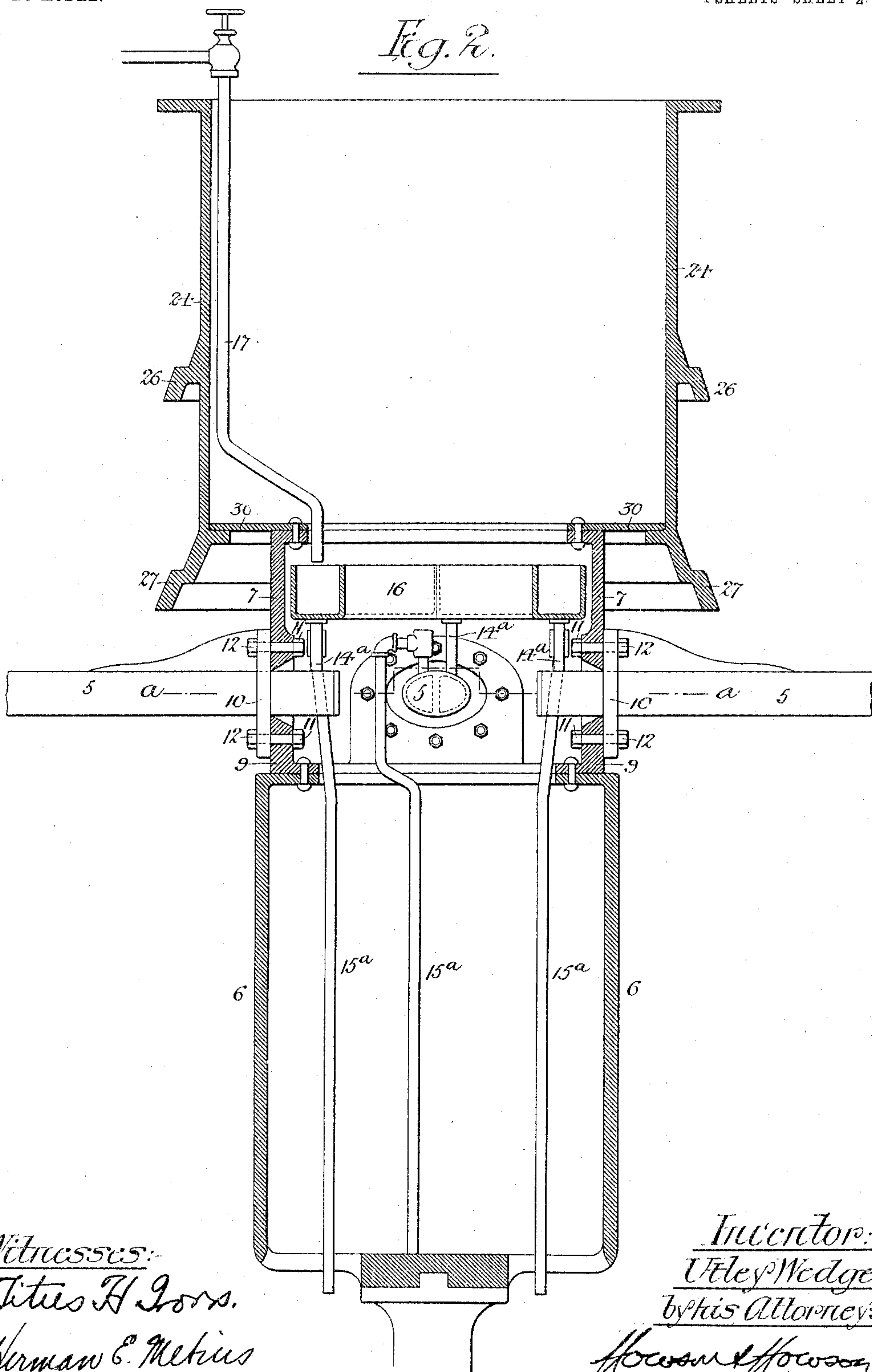
PATENTED DEC. 13, 1904.

U. WEDGE.
FURNACE FOR ROASTING, SMELTING, &c.

APPLICATION FILED AUG. 10, 1903.

NO MODEL.

4 SHEETS—SHEET 2.



No. 777,577.

PATENTED DEC. 13, 1904.

U. WEDGE.
FURNACE FOR ROASTING, SMELTING, &c.
APPLICATION FILED AUG. 10, 1903.

NO MODEL.

4 SHEETS—SHEET 3.

Fig. 5.

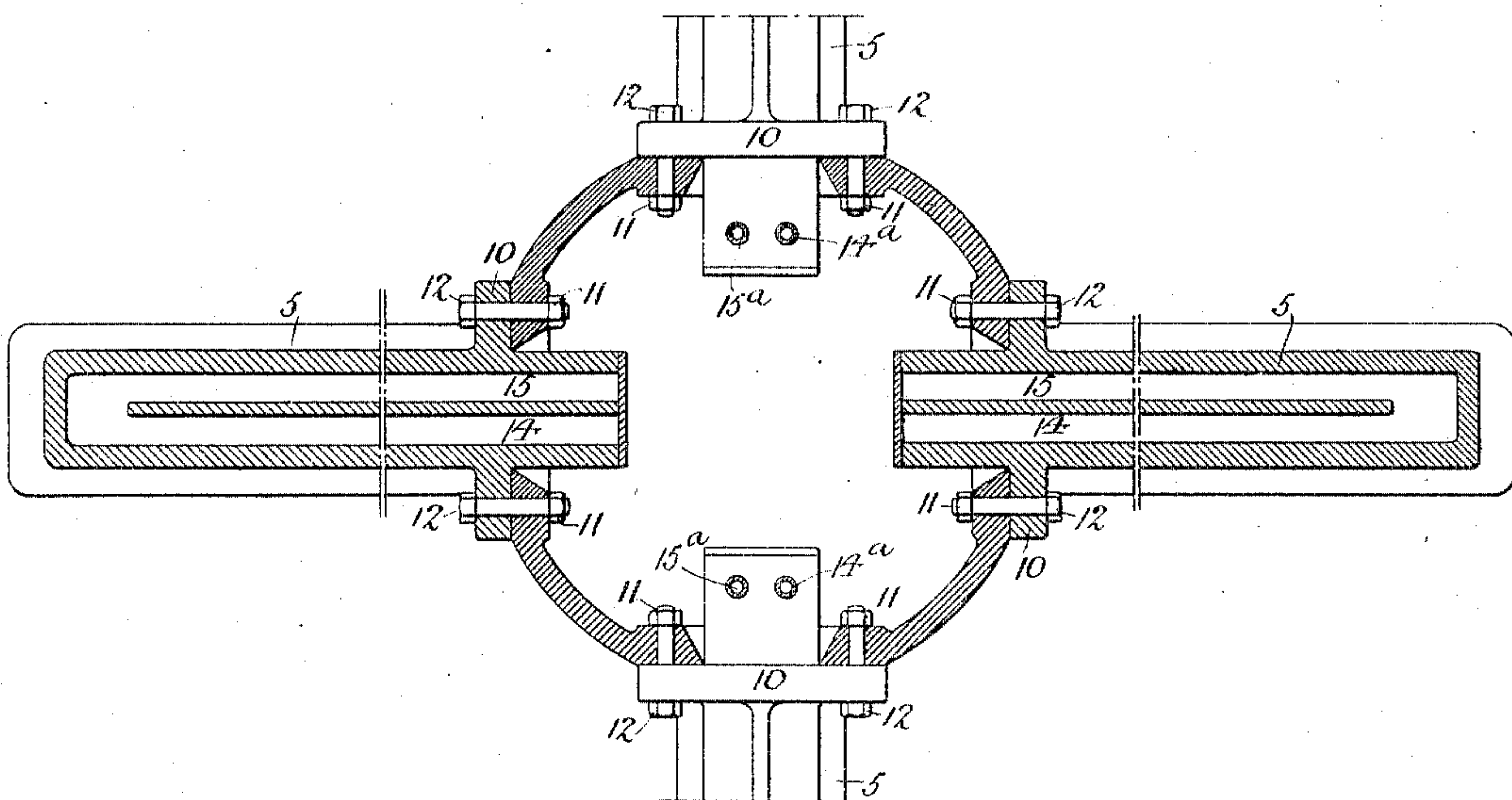
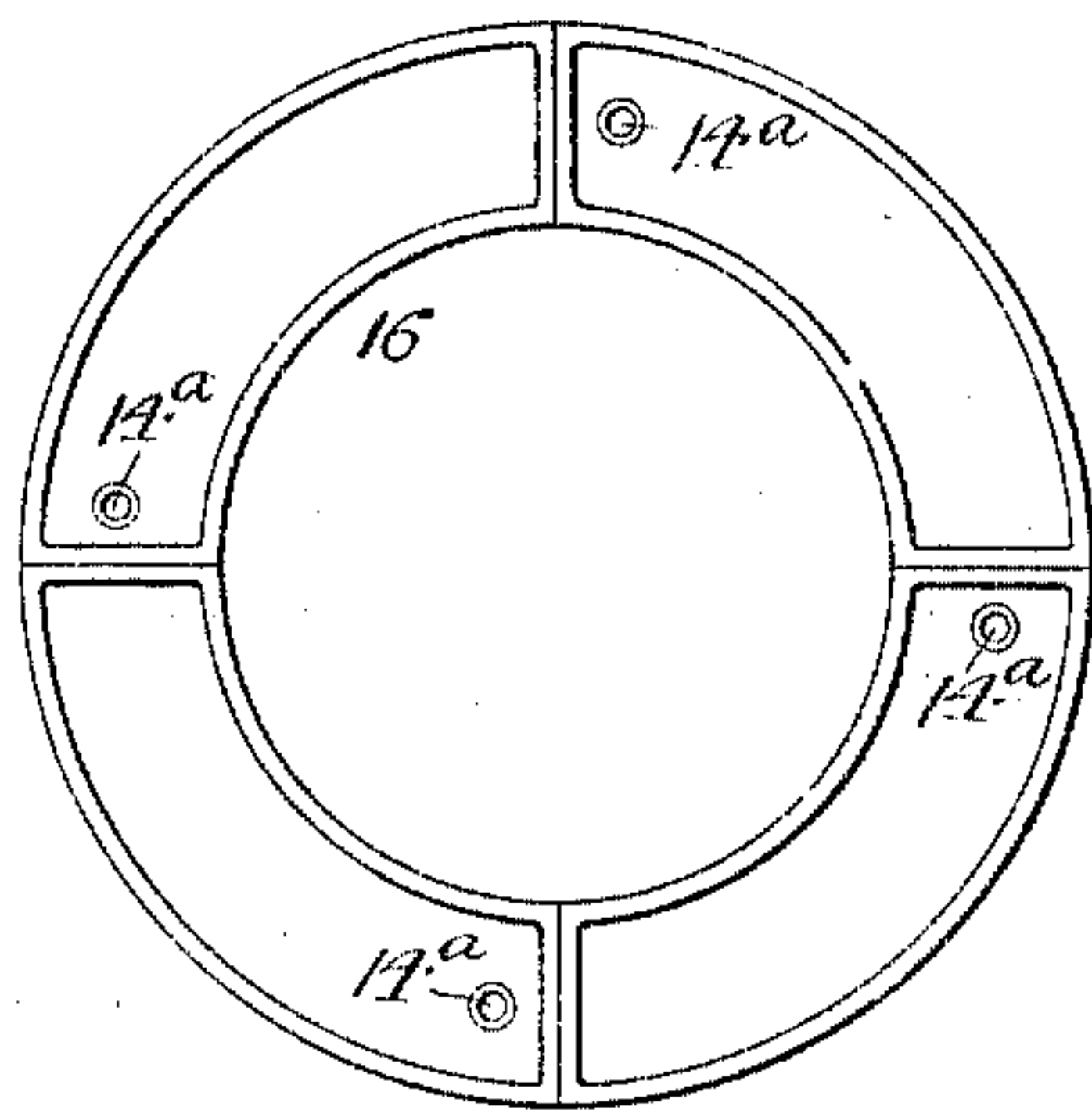


Fig. 1.



Witnesses:

Titus F. Jones.
Herman E. Metrus

Inventor.
Utey Wedge,
by his Attorneys

Howson & Howson

No. 777,577.

PATENTED DEC. 13, 1904.

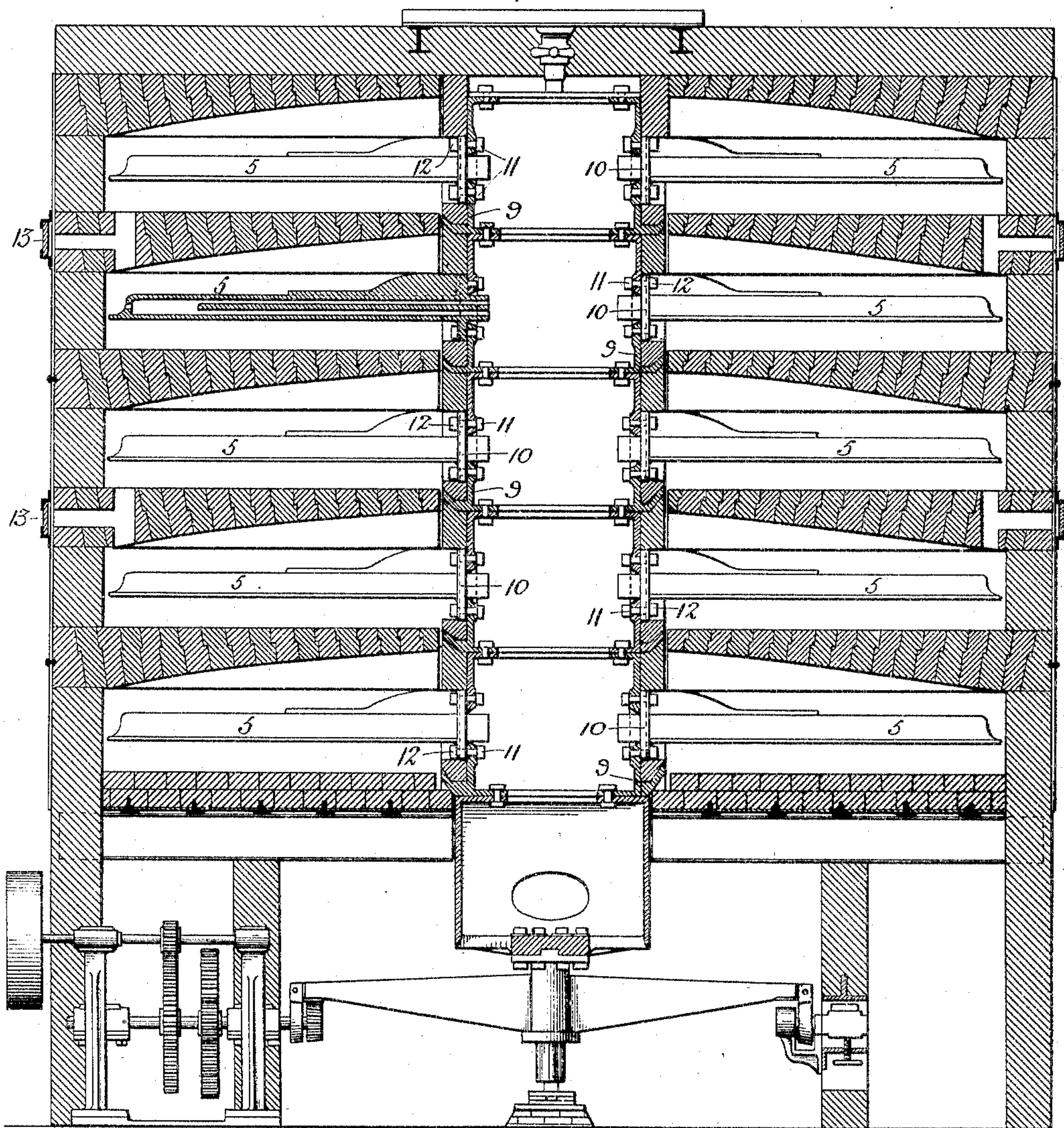
U. WEDGE.
FURNACE FOR ROASTING, SMELTING, &c.

APPLICATION FILED AUG. 10, 1903.

NO MODEL.

4 SHEETS—SHEET 4.

Fig. 5.



Witnesses:

Titus H. Lons.
Herman E. Metius

Inventor:

Utley Wedge,
by his Attorneys;
Howson & Howson

UNITED STATES PATENT OFFICE.

UTLEY WEDGE, OF ARDMORE, PENNSYLVANIA.

FURNACE FOR ROASTING, SMELTING, &c.

SPECIFICATION forming part of Letters Patent No. 777,577, dated December 13, 1904.

Application filed August 10, 1903. Serial No. 168,941. (No model.)

To all whom it may concern:

Be it known that I, UTLEY WEDGE, a citizen of the United States, residing in Ardmore, Pennsylvania, have invented certain Improvements in Furnaces for Roasting, Smelting, &c., of which the following is a specification.

My invention relates to improvements in furnaces for roasting, oxidizing, reducing, smelting, desulfurizing, drying, melting, or other analogous uses, one object of my invention being to permit of the ready application or removal of the arms carrying the blades or other devices, whereby the stirring or feeding of the material in the roasting, heating, or melting chamber or chambers is accomplished and the ready insertion or removal of the shaft which carries said arms, a further object being to provide simple and effective means for cooling said arms, and a still further object being to insure the proper support of the roof of a roasting or treating chamber and of a heating-chamber above the same.

In the accompanying drawings, Figure 1 is a transverse vertical sectional view of a roasting-furnace constructed in accordance with my invention. Fig. 2 is an enlarged vertical section of part of the same. Fig. 3 is a sectional plan view on the line *aa*, Fig. 2. Fig. 4 is a plan view of the water-pan used in connection with the stirrer-arms of the furnace; and Fig. 5 is a view similar to Fig. 1, but illustrating the adaptation of my invention to another form of furnace.

The furnace shown in Fig. 1 is of that type which has annular chambers and a central shaft, 1 representing the outer supporting-wall of the furnace, 2 a roasting-chamber, and 3 and 4 heating-chambers, one beneath and one above said roasting-chamber. The furnace has a central tubular shaft which in the present instance is mounted in a bearing upon a pier disposed centrally beneath the heating and roasting chambers of the furnace, said shaft being driven by mechanism beneath said chambers in a manner substantially similar to that set forth in my Patent No. 648,183, dated April 28, 1900. Projecting from the central shaft into the roasting-chamber 2 of the furnace are a series of arms 5, upon which are intended to be cast or mounted the flights,

vanes, teeth, rabbles, scrapers, or other devices whereby the stirring or feeding of the ore in the chamber 2 is effected. Hitherto such arms have either been hooked onto bars projecting from the central vertical shaft or bolted to projecting studs or bosses thereon. The objection to the first plan is the insecure attachment of the arm and the consequent impossibility of cooling the same by maintaining a flow of water or other cooling fluid through it. While the second plan permitted of such cooling of the arm, it rendered difficult the replacing of a defective arm, since owing to the fact that the fastenings were within the roasting-chamber, and therefore subjected to the high degree of heat maintained therein and also to the action of the gases or vapors driven off from the material under treatment, such connections soon became burned, rusted, or otherwise so affected by such conditions that the arm could not be removed except by cutting it away from the shaft, which operation was not only a difficult one in itself, but was rendered more difficult still by the inaccessibility of the connection. When, moreover, the passages for the cooling fluid are formed partly in the arm and partly in the shaft or in the boss or projection thereon, any loosening or opening of the joint between the arm and shaft such as might be caused by strain upon the arm or other condition met with during the operation of the furnace will result in leakage of the cooling fluid into the treating-chamber of the furnace, which of course is highly objectionable. In carrying out my invention, therefore, I make the central shaft of the furnace of such diameter that an attendant can freely enter the same, and I secure the arms to this shaft by means of bolts and nuts, cotter-pins, or other equivalent fastenings which are accessible from the inside of the shaft. Hence these fastenings are in great measure removed from the influence of the heat maintained in the roasting-chamber and are not affected by the gases or vapors driven off from the material under treatment. The arms can therefore be applied to or removed from the shaft with facility, and the expense and time of making repairs to these portions of the furnace are

consequently very materially reduced, and facilities are afforded for circulating water or other fluid through the arms for cooling purposes.

5 The central shaft of the furnace shown in Fig. 1 is made in two sections, the lower section 6 carrying the supporting and driving devices for the shaft and the upper section 7 carrying the arms 5. The upper section of the
10 shaft has formed in it as many openings as there are arms, each of these openings being surrounded by a boss or enlargement 9, whose outer face presents a seat for a hub or flange 10, formed upon an arm 5, the inner face of
15 the boss providing a seat for nuts 11, which are applied to the bolts 12, whereby the flange 10 is secured to said boss on the shaft, the nuts being therefore readily accessible from the interior of the shaft both for application
20 and removal of the arms 5, the latter being introduced into or removed from the roasting-chamber 2 through openings in the outer wall of the same, which openings are normally closed by doors or covers 13. Cotter-
25 pins or other equivalent fastening devices may, as will be evident, replace the nuts 11, if desired.

Each of the arms 5 has formed in it passages 14 and 15, communicating with each
30 other at the outer end of the arm and terminating in a portion of the arm which projects inwardly beyond the wall of the tubular shaft, this inwardly-projecting portion of the arm carrying two pipes 14^a and 15^a, the pipe
35 14^a communicating with the passage 14 of the arm and the pipe 15^a communicating with the passage 15. The pipes 14^a of the various arms support a water-pan 16, which is open at the top and is separated into compartments,
40 one for each arm, the preferable method of accomplishing this result being to construct the pan of four sections or segments bolted or otherwise secured together, as shown in Fig. 4. The water-pan 16 rotates with the
45 hollow shaft of the furnace, and the compartments of the same are successively supplied with water or other cooling fluid from a suitable valved pipe 17. The cooling fluid will therefore flow from each section of the pan
50 into and through the passages 14 and 15 of its corresponding arm and will escape through the pipe 15^a, which may discharge into any suitable receptacle at the lower end of the hollow shaft. By the use of the water-pan
55 and supply and discharge pipes rotating with the hollow shaft the proper supply of water or other cooling fluid to the arms of the shaft is effected without the necessity of employing stuffing-boxes or other joints requiring attention or likely to be injured by
60 heat. As the passages 14 and 15 are formed wholly within the arm, their continuity is not affected by the integrity of the joint between the arm and shaft. Hence any defect in this
65 joint will not cause leakage of cooling fluid,

and even if there should be leakage of such fluid at the inner end of the arm such leakage cannot gain access to the treating-chamber of the furnace, and is therefore harmless.

The floor 18 of the lower heating-chamber 70 3 of the furnace is supported upon transverse beams or girders 19, and the roof 20 of said heating-chamber, which constitutes the floor of the roasting-chamber, is supported upon
75 suitable blocks, piers, or partitions 21 in said heating-chamber.

The roof 22 of the roasting-chamber, which constitutes the floor of the upper heating-chamber 4, and the roof 23 of said upper
80 chamber are supported centrally upon a cylindrical shell 24, which is supported by and depends from beams or girders 25, suitably mounted upon the annular wall of the furnace and extending transversely across the
85 top of the same, said cylindrical shell having annular flanges 26 and 27, forming skewbacks for the support of the inner blocks of said structures 22 and 23, which are in the form of arches composed of notched and interlocking
90 blocks, the outer blocks of each arch bearing against a suitable abutment in the annular wall of the furnace. The cylindrical shell 24 is of somewhat greater diameter than the upper
95 section 7 of the central shaft of the furnace, so that it serves not only to support the roof of the roasting-chamber and that of the heating-chamber above the same, and thus entirely relieve the shaft of any such duty, but
100 it also provides space for the introduction or removal of the sections of the central vertical shaft of the furnace. The shaft has an annular flange 30 overlapping an internal flange
105 on the shell 24, so as to close the space between them, and thus prevent flow of gases or other products of combustion up into said shell, the upper end of the shaft being open, so that ready access to the interior of the shaft through the shell 24 is permitted.

Any desired means for feeding the material to and discharging it from the treating-chamber 110 may be adopted. In the present instance escape of gases or vapors from the chamber 2 is provided for by an outlet-flue 28 at one side of the furnace, and the heating of the chambers 3 and 4 can be effected by gaseous products of combustion conducted into, through,
115 and from the same in any suitable manner, preference being given to burners using hydrocarbon oil or gas as fuel. So far as regards the main features of my invention, however, they are not restricted to the muffle-furnace shown, but are applicable to furnaces
120 generally for any purpose in which a rotating shaft is provided with arms projecting into the treating chamber or chambers of the furnace. In Fig. 5, for instance, I have shown my invention as applied to a furnace having
125 a series of treating-chambers mounted one above another, and in this furnace the hollow shaft is protected by an external sheathing of
130

fire-brick or other refractory, incombustible, or non-conducting material, such sheathing being applied to the shaft in the form of segmental blocks and being supported upon suitable annular flanges projecting from the shaft. My invention is, moreover, not limited to the particular means shown for effecting flow of cooling fluid through the arms of the furnace, as the cooling agent may be in other than liquid form and may be caused to circulate either by natural draft or by means of a blast or exhaust-fan.

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

1. A furnace having a central hollow shaft with one or more arms projecting therefrom into the treating chamber or chambers of the furnace, and fastenings for said arms accessible from the interior of the shaft, substantially as specified.

2. A furnace having a hollow shaft with one or more external bosses thereon, and one or more arms projecting from the shaft into the treating chamber or chambers of the furnace, each arm having a flange bearing upon the boss of the shaft, and bolts passing through said flange and boss and having nuts or other fastenings located on the inside of the hollow shaft, substantially as specified.

3. A furnace having a central hollow shaft with one or more arms projecting therefrom into the treating chamber or chambers of the furnace, fastenings for said arms accessible from the interior of the shaft, and driving and supporting devices for the shaft located at the lower end of the same, substantially as specified.

4. A furnace having a central hollow shaft with one or more arms projecting therefrom into the treating chamber or chambers of the furnace, fastenings for said arms accessible from the interior of the shaft, and driving and supporting devices for the shaft located at the lower end of the same, the shaft being open at the top, substantially as specified.

5. A furnace having a central hollow shaft with one or more arms projecting therefrom into the treating chamber or chambers of the furnace, fastenings for said arms accessible from the interior of the shaft, and driving and supporting devices for the shaft located at the lower end of the same, the shaft being removable vertically through an opening in the top of the furnace, substantially as specified.

6. A furnace having a central hollow shaft with one or more arms projecting therefrom into the treating chamber or chambers of the furnace, fastenings for said arms accessible from the interior of the shaft, and driving and supporting devices for the shaft located at the lower end of the same, and a shell contained in the upper portion of the furnace, and of greater diameter than the shaft, through which shell the shaft is accessible and removable, substantially as specified.

7. A furnace having a central hollow shaft with one or more arms projecting therefrom into the treating chamber or chambers of the furnace, fastenings for said arms accessible from the interior of the shaft, and driving and supporting devices for the shaft located at the lower end of the same, a shell contained in the upper portion of the furnace, and of greater diameter than the shaft, and a flange closing the space between the shaft and shell, substantially as specified.

8. A furnace having a hollow shaft and one or more arms projecting therefrom into the treating chamber or chambers of the furnace, said shaft being composed of superposed sections secured together, and the arm or arms being secured to the shaft by means of fastenings accessible from the interior of the shaft, substantially as specified.

9. A furnace having a hollow shaft and one or more arms mounted thereon and projecting therefrom into the treating chamber or chambers of the furnace, each arm projecting inwardly beyond the joint between the shaft and arm, and having passages for the flow of cooling fluid, which passages communicate with the supply and discharge at said inwardly-projecting end of the arm but have no communication with the joint between the arm and the shaft, substantially as specified.

10. A stirring-arm for a furnace, said arm having therein passages for the flow of a cooling fluid and having in advance of its inner end external means not exposed to fluid in either passage for securing it to a supporting-shaft, the flow-passages communicating with the supply and discharge at the inner end of the same, substantially as specified.

11. The combination in a furnace, of a hollow shaft carrying an arm or arms having pipes for supplying cooling fluid to and discharging it from the arm or arms, a pan mounted upon and rotating with said pipes, and a stationary pipe for supplying cooling fluid to said pan, substantially as specified.

12. The combination in a furnace, of a hollow shaft having a series of projecting arms thereon, pipes for supplying cooling fluid to and discharging it from each of the projecting arms, a pan mounted upon and rotating with the supply-pipes and separated into sections, one for each pipe, and means for feeding cooling fluid to said pan as it rotates, substantially as specified.

13. The combination in a furnace, of a treating-chamber, a stirrer arm or arms therein, and a central hollow shaft comprising two sections, the lower section carrying the supporting and driving devices, and the upper section carrying the stirrer arm or arms and having fastenings therefor accessible from the interior of the shaft, substantially as specified.

14. A furnace having a hollow shaft and one or more stirring-arms supported thereon and communicating therewith at the supporting

point or points thereof, said arm or arms projecting from the shaft into the treating chamber or chambers of the furnace, each arm having passages for the flow of cooling fluid, which
5 passages have no communication with the joint between the arm and shaft, substantially as specified.

15. The combination in a furnace, of a treating-chamber, a heating-chamber above the
10 same, a central shaft having projecting stirrer arm or arms secured thereto, a single structure above said shaft providing for the support of the inner portion of the roof of the treating-chamber and of the roof of the heating-chamber, substantially as specified.

16. The combination in a furnace, of a treating-chamber, a heating-chamber above the same, a central vertical shaft, projecting stirrer arm or arms secured thereto, and a cylindrical shell supported on beams above the top
20 of the furnace and depending so as to provide supports for the inner ends of the arches constituting the roof of the treating-chamber and the roof of the heating-chamber, substantially
25 as specified.

17. The combination in a furnace, of a central hollow shaft having an arm or arms projecting into the treating chamber or chambers of the furnace, fastenings for said arm or arms accessible from the interior of the
30 hollow shaft, and a refractory or non-conducting external sheathing for said shaft, substantially as specified.

18. The combination in a furnace, of a central hollow shaft having an arm or arms projecting into the treating chamber or chambers of the furnace, fastenings for said arm or arms accessible from the interior of the hollow shaft, and a refractory or non-conducting
35 external sheathing for said shaft, said sheathing being composed of blocks mounted upon externally-projecting flanges on the hollow shaft, substantially as specified. 40

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

UTLEY WEDGE.

Witnesses:

WILL. A. BARR,
JAMES C. MAYER.