

No. 749,461.

PATENTED JAN. 12, 1904.

LE ROY W. STEVENS & B. TIMMERMAN.

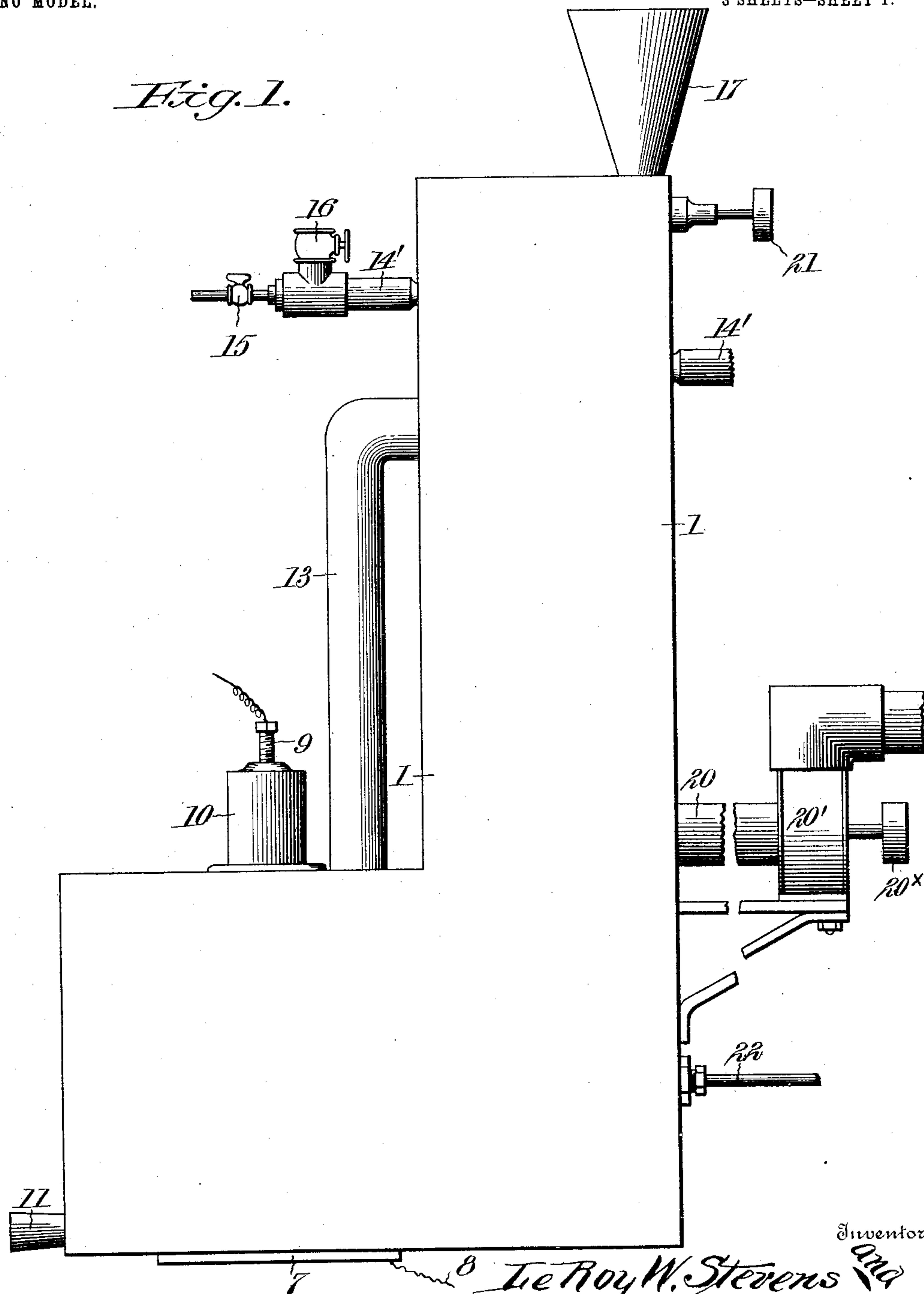
ELECTRIC FURNACE.

APPLICATION FILED OCT. 29, 1902. RENEWED JUNE 17, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

C. H. Walker.
H. E. Montague.

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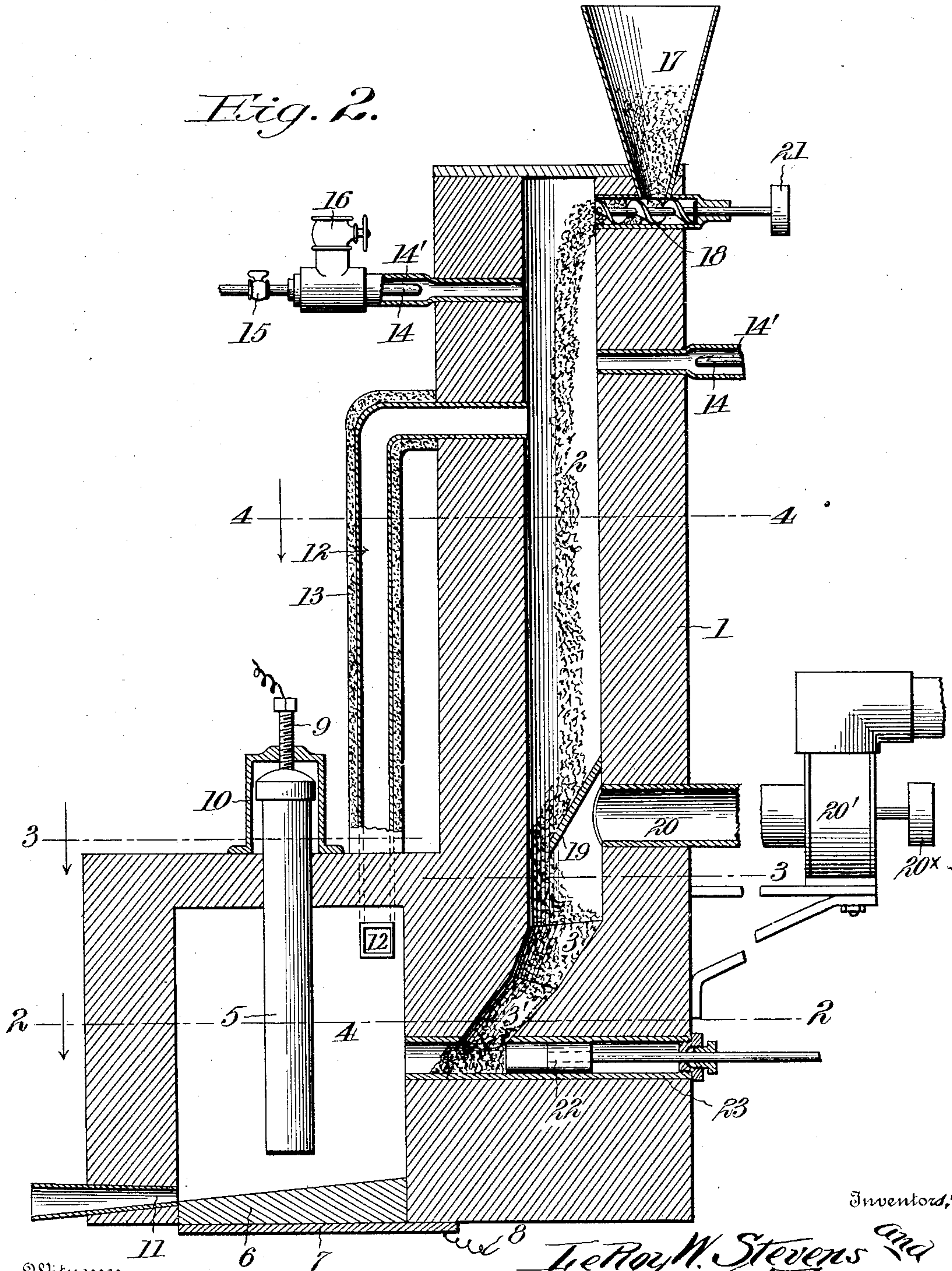
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

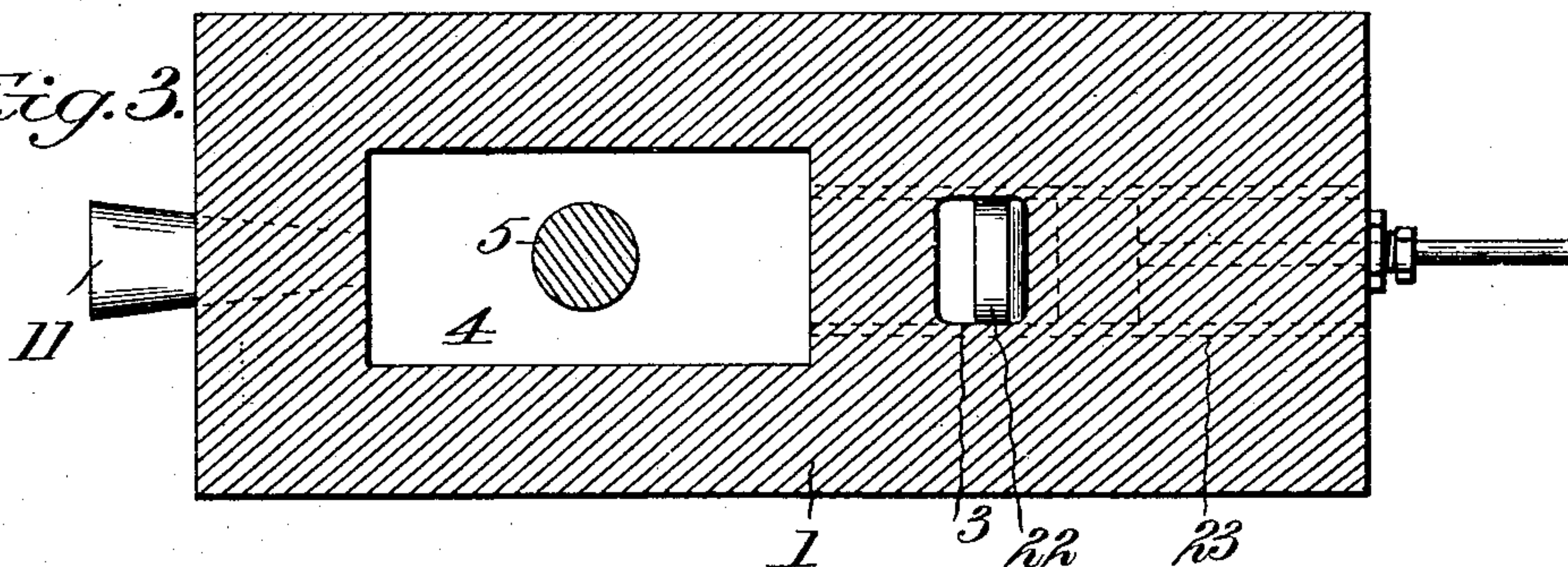


Fig. 4.

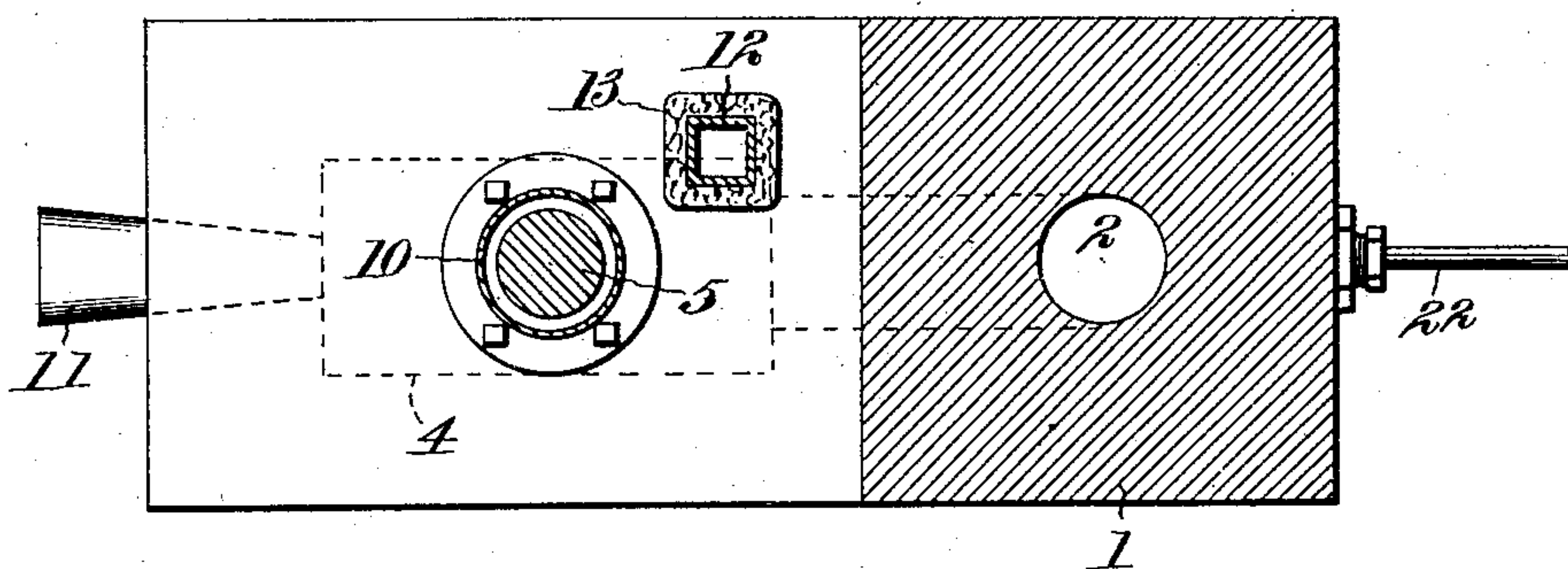
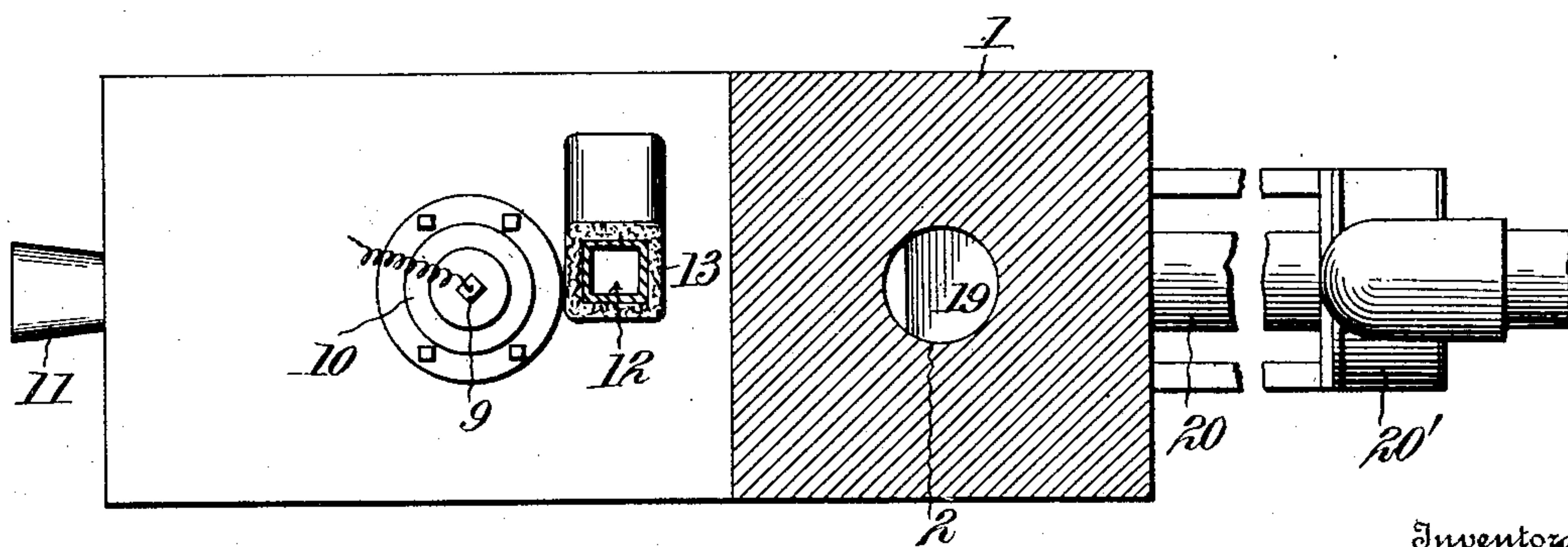


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 749,461, dated January 12, 1904.

Application filed October 29, 1902. Renewed June 17, 1903. Serial No. 161,921. (No model.)

To all whom it may concern:

Be it known that we, LE ROY W. STEVENS and BERNARD TIMMERMAN, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to an improvement in furnaces, and has for its object the production of a simple, economical, and effective apparatus for obtaining metals from their ores or obtaining compounds thereof or their ele-
15 ments—such, for example, as borids, silicids, carbids, cyanids, and the like—and the manufacture of various other materials for which an apparatus of this character may be employed, as will be apparent to persons skilled in the art.

20 The invention contemplates the provision of a furnace provided with a treating-chamber having associated therewith an auxiliary treating-chamber and a conductor leading from said auxiliary treating-chamber to con-
25 duct the gases therefrom to the first-mentioned chamber, where the same may be ignited to preheat or treat the material therein, also with means for creating a downdraft within the first-mentioned treating-chamber and for ex-
30 hausting said gases therefrom.

The invention further contemplates the provision of means for feeding the material to be treated into the treating-chamber in a relatively small stream, so that the same will fall
35 as a shower therethrough, as distinguished from filling said treating-chamber with the material in a concentrated or approximately solid mass.

Novel details in the construction and ar-
40 rangement of the several parts of the apparatus will be apparent from an inspection of the detailed description hereinafter when read in connection with the accompanying drawings, forming part hereof, and wherein a pref-
45 erable embodiment of the invention is shown for the purpose of illustration.

In the drawings, Figure 1 is a side elevation of the furnace complete. Fig. 2 is a central

vertical section of the same. Fig. 3 is a cross-section on the line 2 2 of Fig. 2. Fig. 4 is a similar view on the line 3 3 of Fig. 2. Fig. 5 is a similar view on the line 4 4 of Fig. 2.

Referring more specifically to the drawings, wherein like reference characters refer to corresponding parts in the several views, 1 1 designate inclosing walls for the substantially vertical treating chamber or flue 2, into the upper portion of which the material is charged, so as to fall by force of gravity therethrough. The lower end 3 of the flue receives the fall-
60 ing material and directs the same to an auxiliary treating-chamber 4, with which it connects. The chamber 4 is constructed to secure the reduction, smelting, refining, or other desired treatments of material delivered to it.
65 In the treatment of some materials this chamber 4 is equipped with electrical heating means to form an electric furnace of any preferred form which will be applicable for the purposes. As shown, an electrode 5 is suitably supported
70 in the walls of the chamber 4, with its inner end extending to a point near the floor of the chamber 4. 6 designates the floor of the said chamber 4, which is composed of any suitable material, preferably carbon, supported upon
75 a base 7, forming a conductor between the carbon floor and the electric wire 8. While but one electrode is shown, it is obvious that any number may be utilized, according to the work to be accomplished. The base 7 may
80 be of cast-iron or any other material suitable for the purpose. It is desirable that the electrode be adjustable and any means may be employed therefor, that shown being a screw-threaded rod or bolt 9, connected to the elec-
85 trode and engaging the brace or frame 10.

11 is a discharge-opening of the chamber 4, which may be plugged and controlled in any usual or convenient manner.

12 designates a gas flue or conductor ex-
90 tending from the chamber 4 upward to and communicating with the flue 2, preferably connected with the latter at a point near its top. This flue or conductor may be incorporated and inclosed within the walls of the fur-
95 nace, (not shown,) or it may be supported on

the outside of the furnace, the latter being the preferred form. When the flue is outside the furnace, a suitable jacket 13 or equivalent means may be employed to prevent the escape
5 of heat radiation.

It will be observed that the connection of the main flue 2 with the chamber 4 and the connection of the latter again with the main flue 2 through the medium of the conductor
10 12 complete the circuit of the several parts. Thus the material charged into the main flue 2 is conducted to the chamber 4 and there treated. The flue 12 then conducts the resultant hot and usually combustible gases to
15 the main flue 2 and delivers the same in contact with the passing materials for the purpose of utilizing the heat for preheating and acting upon said passing material, thus rendering them much more easily and econom-
20 ically smelted or otherwise converted into finished product when reaching the chamber 4. The solid material may be tapped or otherwise discharged by means of the opening 11. A circulation or draft within the flue and cham-
25 ber 4 may be maintained in any preferable manner, as hereinafter pointed out.

14 14 indicate oil or gas burners arranged near the top of the flue 2 in such a manner that the flame therefrom extends across and
30 substantially fills the flue, so that whatever material is deposited therein and falls there-through necessarily passes through a flame zone. Arrangement is made for the admission of oxygen to maintain the flame from the
35 burners, pipes 14' being shown for this purpose. Suitable valves 15 control the flow of oil or gas through the pipes 14, while valves 16 control the admission of air.

17 is a hopper or equivalent means in which
40 the prepared material may be placed, and 18 is a screw conveyer or its equivalent for conveying the material from the bottom of the hopper and discharging the same into the upper portion of the flue or chamber 2. This
45 screw conveyer or feeder is designed to be operated at a speed sufficient to discharge the material to be treated into the chamber 2 in a relatively small stream, so that said material will fall through said chamber as a shower
50 to facilitate the treating of every particle thereof.

19 is a baffle or deflector plate arranged in the flue 2 and adapted to direct the falling material to the side of the flue in order that
55 the gases may be separated therefrom and drawn out of a flue 20, provided for this purpose. Any preferred means may be employed for drawing off the gases through the flue 20 to create a downdraft in the furnace and an
60 updraft in the flue 12, thereby causing a circulation through these parts. A fan, pump, exhaust, blast, or stack may be employed in this connection, as found desirable, a fan 20' being shown in the present instance, the same
65 having an operating-pulley 20^x. Of course

the details of this fan are unimportant, so the same is simply shown in a conventional manner. The gases withdrawn through the flue 20 may be treated as desired and employed
70 for any purpose for which they may be useful.

The feed-screw 18 may be driven by any suitable means, a pulley 21 being shown, which may derive its power from any convenient source.

In the successful operation of the furnace it
75 is necessary that the material to be treated be fed into the chamber 2 at the same rate of speed as the material is fed from said chamber to the auxiliary treating-chamber 4, so that
80 in operation the material cannot become concentrated or packed in the chamber 2 to destroy the desirable characteristics incident to feeding the same in a shower therethrough. It is also desirable that a certain portion of the
85 material shall fill the lower portion 3 of the chamber or flue 2 to constitute a baffle whereby any gas which might otherwise be withdrawn directly from the auxiliary chamber 4 through said portion 3 and out of the flue 20
90 will be prevented from taking such a course, but will be drawn upwardly by the current through the flue 12 into the upper portion of the treating-chamber 2. We therefore provide at the discharge end of the flue 2 a pusher
95 22, mounted within a slideway 23 and arranged to shove material into the auxiliary chamber 4. This pusher is adapted to operate at the required speed to feed material from the chamber 2 into the auxiliary chamber 4 at the same
100 speed and in the same quantities as such material is fed into the chamber 2 by its spiral feeder 18. Any convenient mechanism for operating the pusher may be coupled up therewith; but inasmuch as the same constitutes no
105 part of the present invention further description or showing of the same is thought unnecessary.

The operation may now be described as follows: If, for example, it is desired to make
110 a carbid, proper proportions of materials capable of producing the same are placed in the hopper 17 at the top of the furnace. The oil or gas burners are then lighted and the fan operated to induce a draft through the flue 12 and chamber 2. When the furnace has
115 become properly heated to constitute a baffle, as before mentioned, at the lower end of the flue or chamber 2, the pusher 22 is moved across the opening 3' therein to constitute a valve. The feeder 18 is started and operated
120 sufficiently to fill the portion 3 with material up to a point, say, approximately to the section-line 3 of Fig. 2. The feeder and pusher are then simultaneously actuated to feed and
125 discharge material in equal quantities, whereby a relatively small stream may constantly fall through the chamber 2 as a shower, material passing through the flame zone being subjected to the action of the same and preheated, whence it passes the baffle or deflecting plate
130

19 and is delivered to the chamber 4 for treatment. The chemical reaction causes the release of large quantities of gases in the chamber 4, and these gases, which are usually
 5 combustible, are conducted through the flue 12 and delivered into the flue 2, when, coming in contact with sufficient quantities of oxygen supplied through the pipes 14', the gases ignite and burst into flame which will practically
 10 fill the chamber 2 from the gas inlet to the outlet 20 therefrom and greatly increase the temperature and intensity of the flame zone, which facilitates the treatment of the material, in that the latter being supplied in a small stream
 15 or shower, as aforesaid, which moves freely downward, as distinguished from a mass in a static or stored condition, subjects every particle thereof to the action of said flame zone. The furnace will now be in full operation.
 20 The gases received from the chamber 4 and the gases released from the passing raw materials under the influence of the heat, together with the resultant chemical actions, being ignited, said raw materials are not only
 25 preheated to a high temperature, but are also so changed in their physical and chemical compositions within the chamber 2 as to require vastly less heat in the chamber 4 than would ordinarily be required had such materials not been first preliminary heated, as
 30 described. The falling materials are, as stated, deflected to one side of the flue 2 by the baffle-plate 19, and the gases therewith being subjected to the influence of the draft through the flue 20 are drawn off, allowing the heavy
 35 materials to fall farther downward into the flue 2, thence into the part 3, whence the same is finally delivered to the treating-chamber 4. Here further chemical actions are brought
 40 about, resulting in the release of great quantities of gases which are conducted to the flue 2 and utilized, as hereinbefore pointed out.

The operation is substantially continuous and is very economical and effective. The
 45 construction and operation of the parts is such that perfect control of the entire furnace may be maintained.

While in the drawings a particular embodiment of the invention is described, it is not
 50 our intention to be limited to the details shown except in so far as such details may be specifically pointed out in the appended claims, because it is obvious that many minor changes and alterations may be made without in the
 55 least departing from the spirit of the invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

60 1. In an apparatus for making carbid and the like, a treating-chamber through which material freely passes, means for feeding a relatively small stream of said material into said chamber, an auxiliary treating-chamber

in which the carbid is formed, and means for
 65 conducting gases from said auxiliary chamber to said first-mentioned chamber within the zone of the freely-passing material; substantially as described.

2. In an apparatus for making carbid and
 70 the like a treating-chamber through which material freely passes, means for feeding a relatively small stream of said material into said chamber, an auxiliary treating-chamber in which the carbid is formed, means for con-
 75 ducting gases from said auxiliary chamber to said first-mentioned chamber within the zone of the freely-passing material, and means for drawing off the gases from the first-mentioned chamber to create a draft therein and through
 80 the conductor; substantially as described.

3. In an apparatus for making carbid and the like, a treating-chamber through which material freely falls, means for feeding a rela-
 85 tively small stream of said material into said chamber, an auxiliary treating-chamber in which the carbid is formed, means for conducting gases from said auxiliary chamber to said first-mentioned chamber within the zone
 90 of the freely-falling material, and means for creating a downdraft in the first-mentioned chamber; substantially as described.

4. In an apparatus for making carbid and the like, a treating-chamber through which material is passed, means for feeding a rela-
 95 tively small stream of said material into said chamber, an auxiliary treating-chamber in which the carbid is formed, means for feeding the material from the first-mentioned chamber to the auxiliary chamber, and means for con-
 100 ducting gases from said auxiliary chamber to said first-mentioned chamber within the zone of the falling material, substantially as described.

5. In an apparatus for making carbid and
 105 the like, a treating-chamber through which material is passed, means for feeding a relatively small stream of said material into said chamber, an auxiliary treating-chamber in which the carbid is formed, and a pusher for
 110 feeding material from the first-mentioned chamber to the auxiliary chamber, said pusher being arranged to constitute a valve at the lower portion of said first-mentioned chamber;
 115 substantially as described.

6. In an apparatus for making carbid and the like, a treating-chamber through which material is passed, means for feeding a rela-
 120 tively small stream of said material into said chamber, an auxiliary treating-chamber in which the carbid is formed, and a valve at the lower portion of said first-mentioned chamber; substantially as and for the purpose described.

7. In an apparatus for making carbid and the like, a treating-chamber through which
 125 material freely falls, means for feeding a relatively small stream of said material into said chamber, an auxiliary treating-chamber in

which the carbid is formed, means for conducting gases from said auxiliary chamber to said first-mentioned chamber within the zone of the freely-falling material, a valve at the lower portion of said first-mentioned chamber, and means for creating a downdraft in the first-mentioned chamber; substantially as described.

8. In an apparatus for making carbid and the like, a treating-chamber through which material freely passes, an auxiliary treating-chamber in which the carbid is formed, means for conducting gases from said auxiliary chamber to said first-mentioned chamber within the zone of the freely-passing material, means for creating a downdraft in the first-mentioned chamber, and feeding instrumentalities whereby a supply of material is initially fed to the lower portion of the first-mentioned chamber to form a baffle therein and subsequently fed through said chamber at a speed and in quantities equal to the discharge therefrom into the

auxiliary chamber; substantially as and for the purpose described.

9. In an apparatus for making carbid and the like, a treating-chamber through which material freely passes, means for feeding a relatively small stream of said material into said chamber, an auxiliary treating-chamber in which the carbid is formed, means for conducting gases from said auxiliary chamber to said first-mentioned chamber within the zone of the freely-passing material, and means whereby said gases are ignited in said first-mentioned chamber, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

LE ROY W. STEVENS.
BERNARD TIMMERMAN.

Witnesses:
L. M. GOTWALD,
JOS. H. MILANS.