

L. D. CHAPIN.
Metallurgic Furnace.
No. 223,480. Patented Jan. 13, 1880.

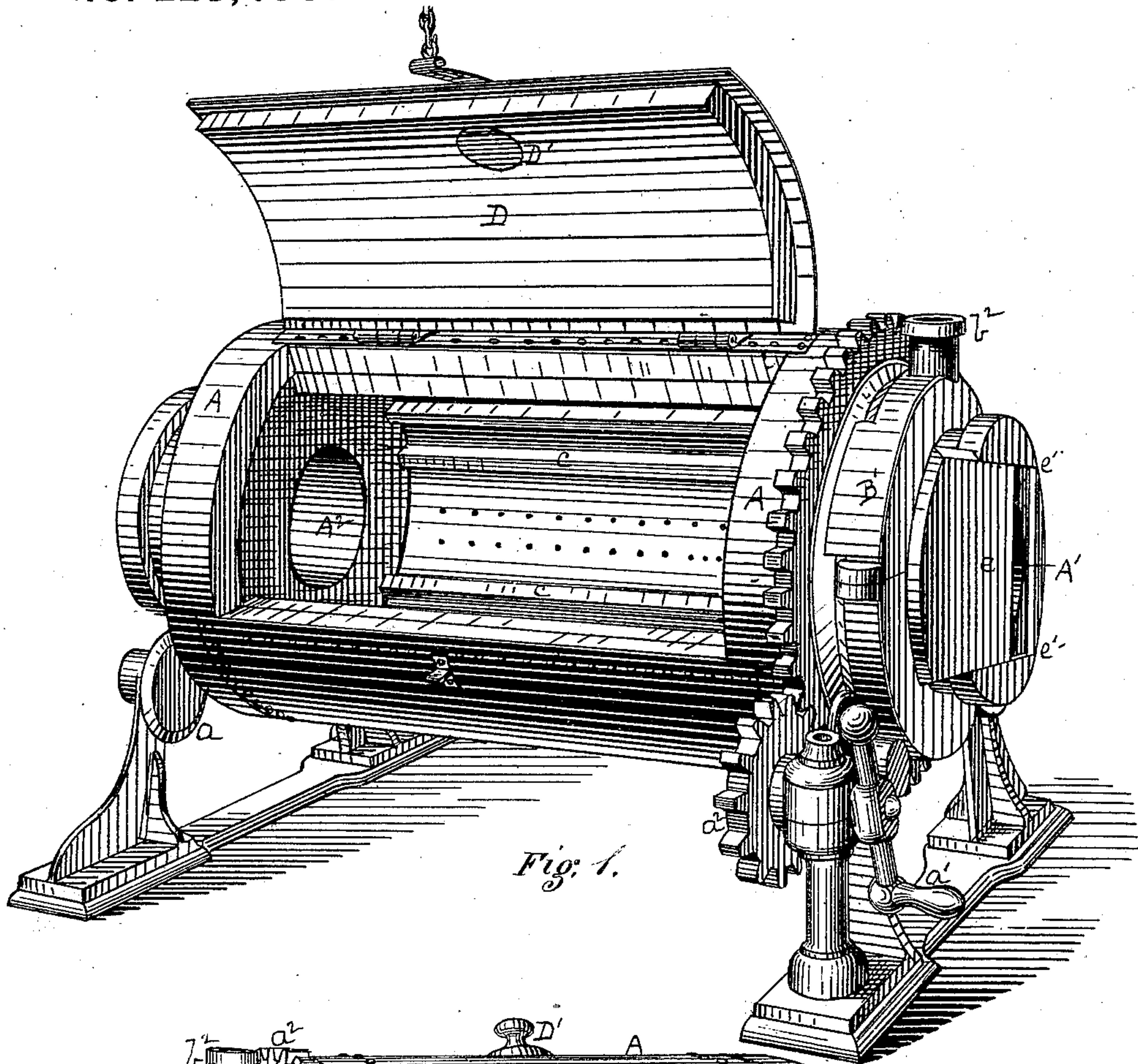


Fig. 1.

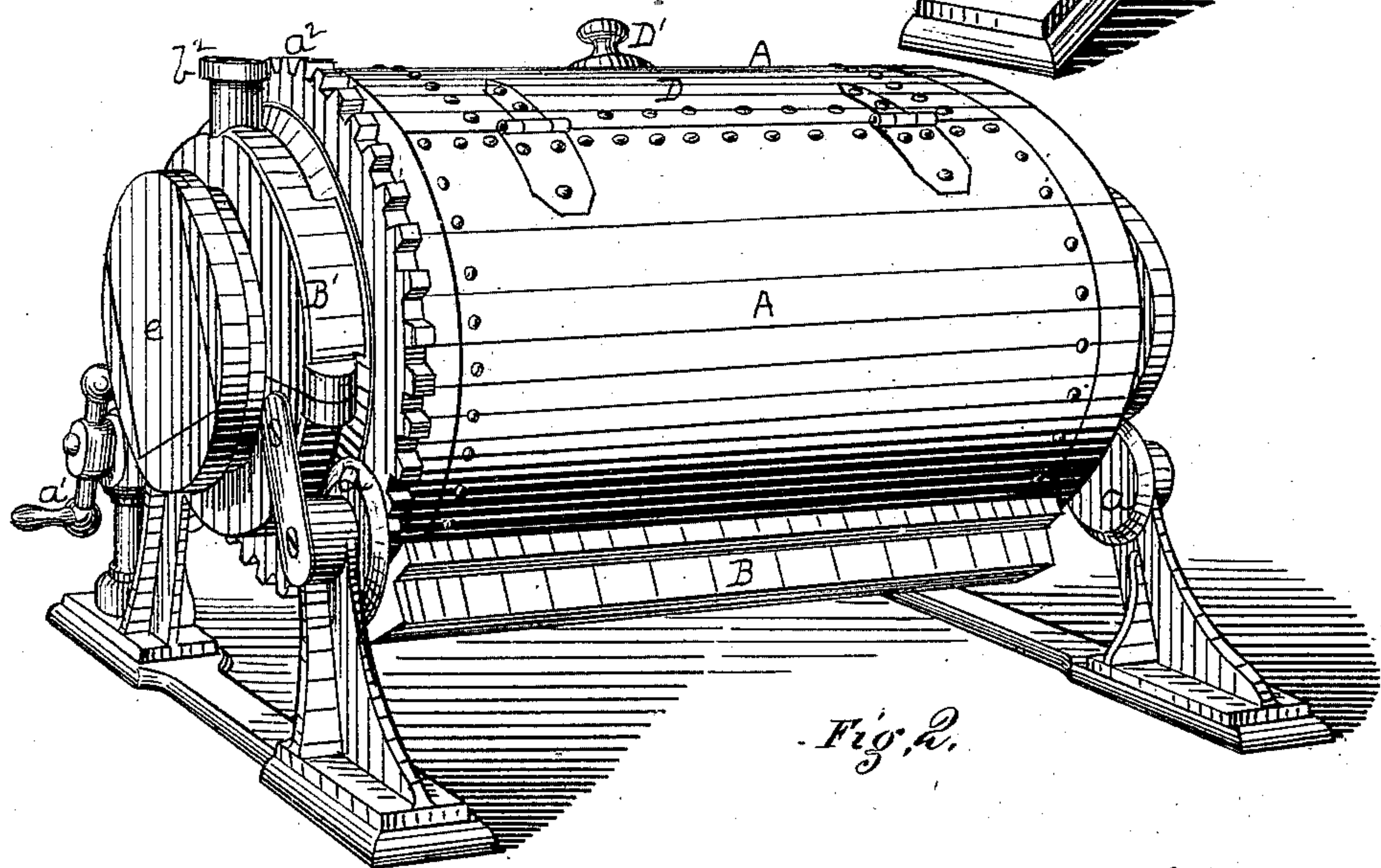
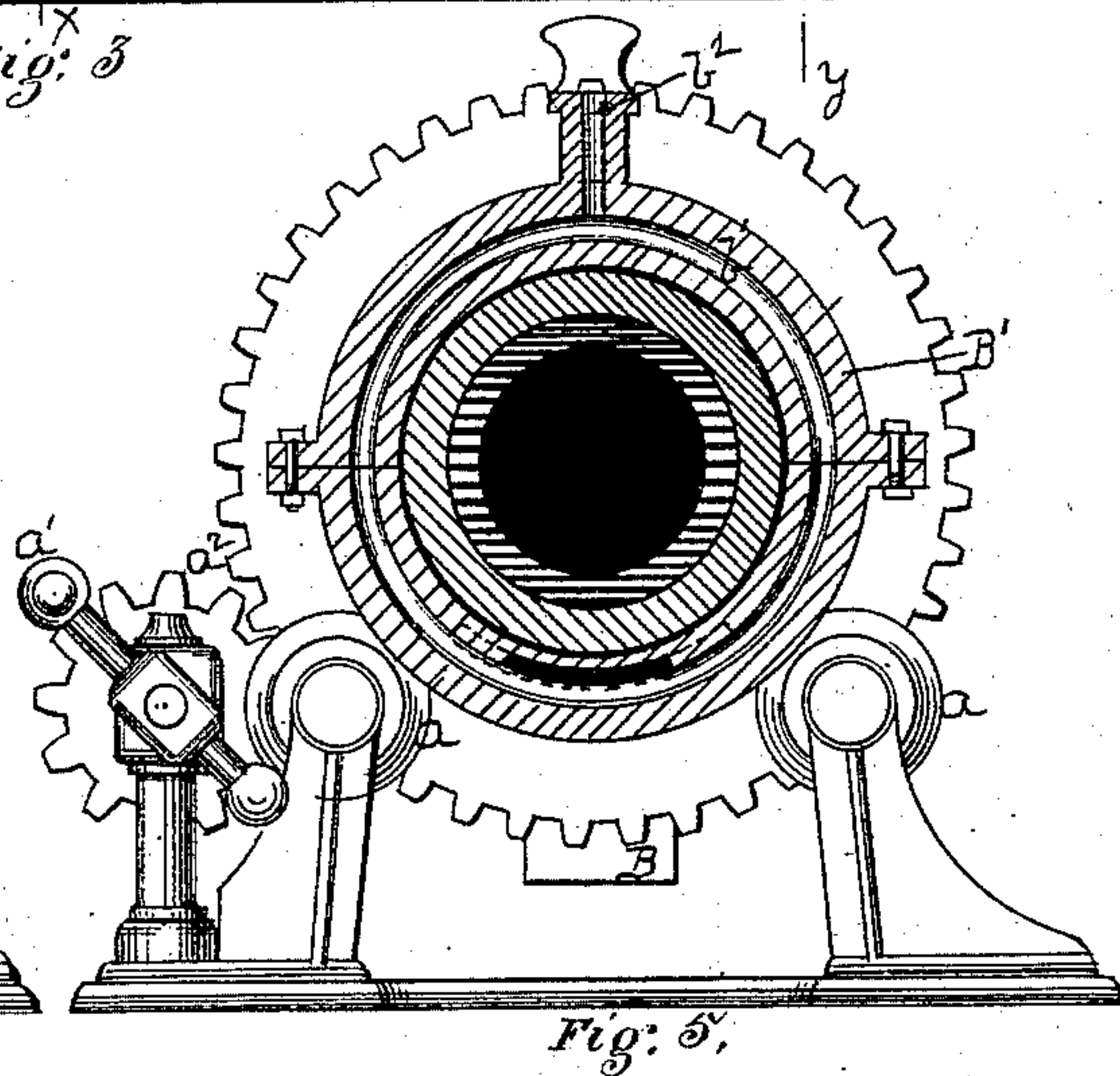
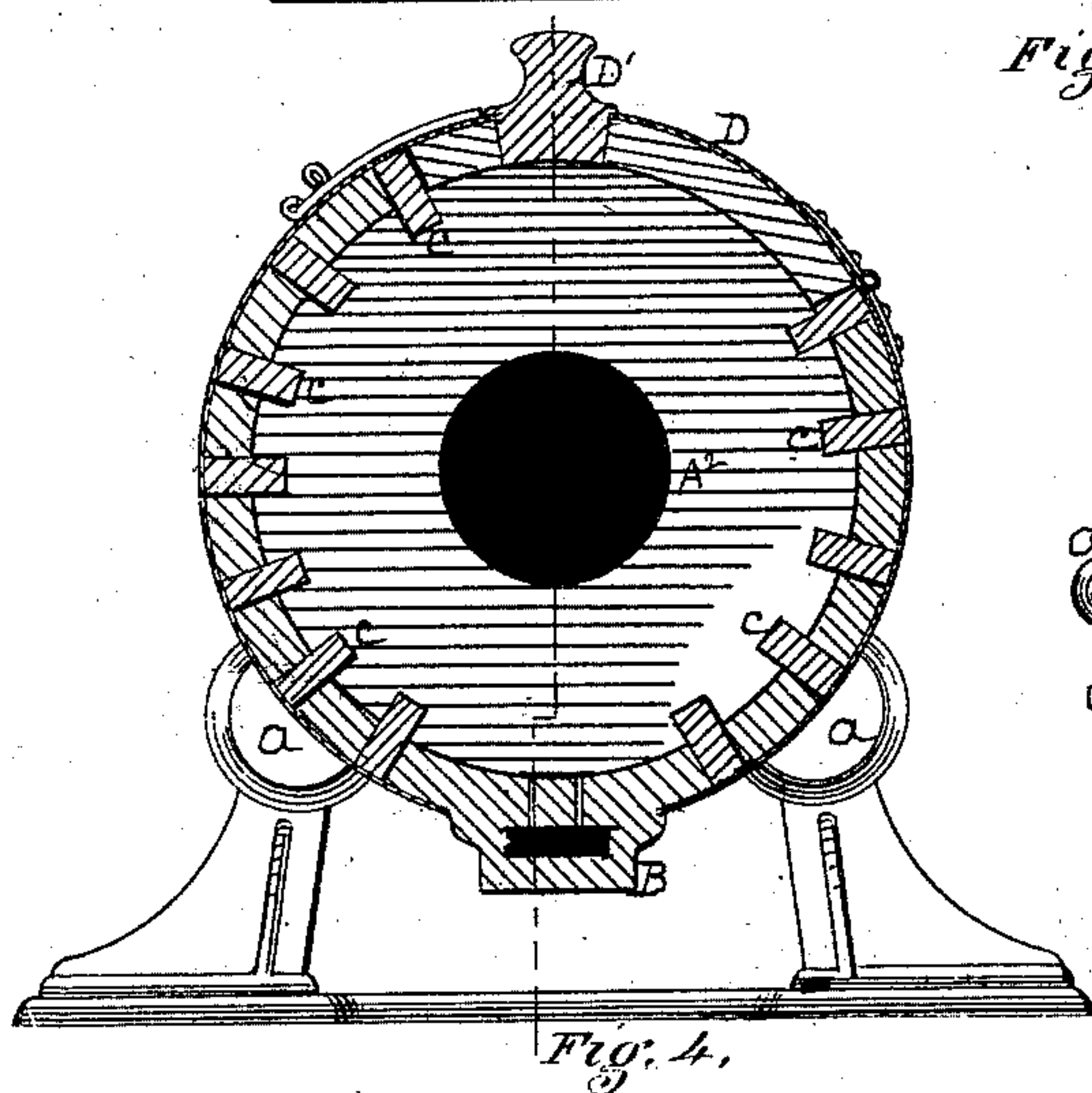
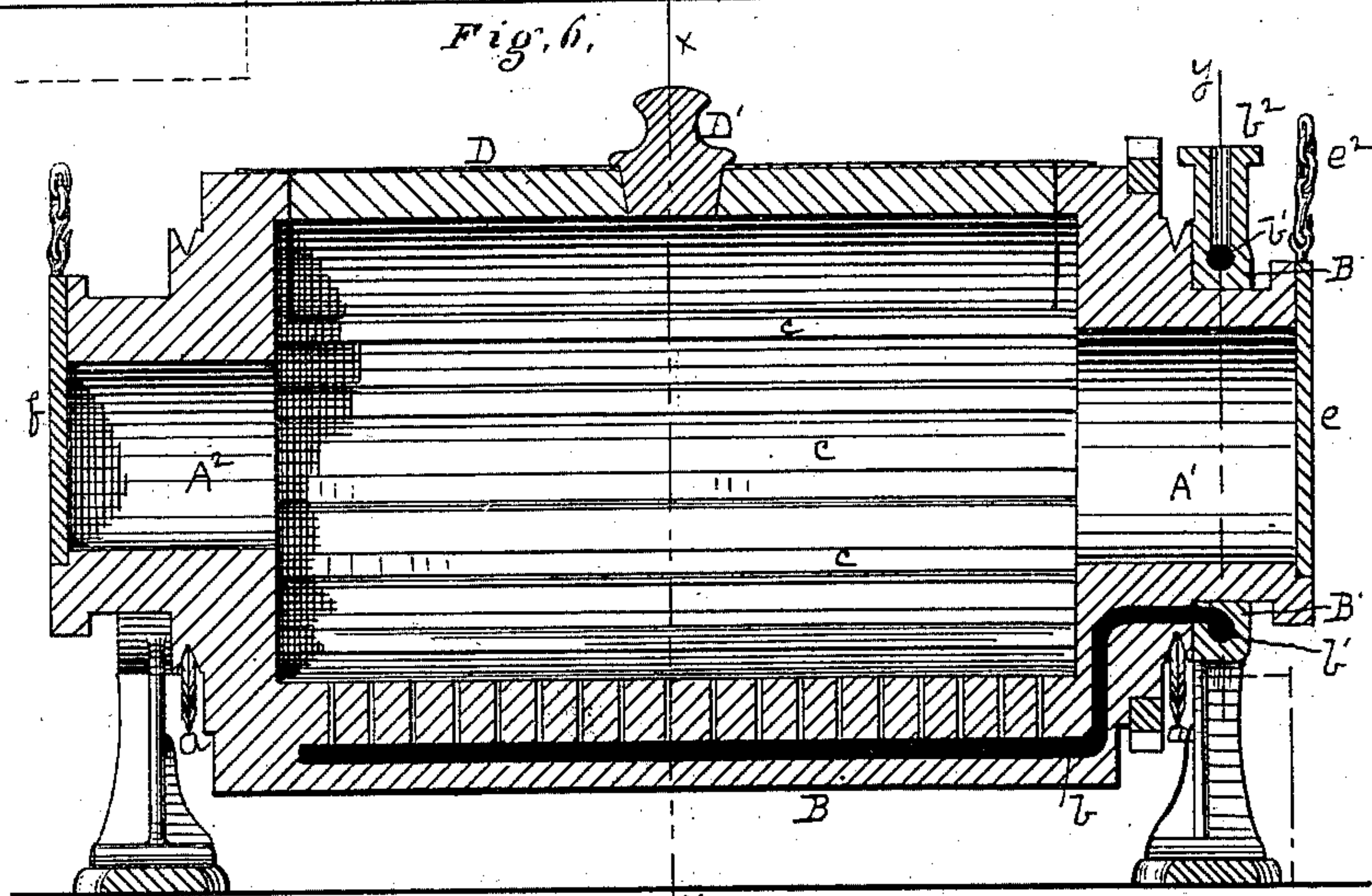
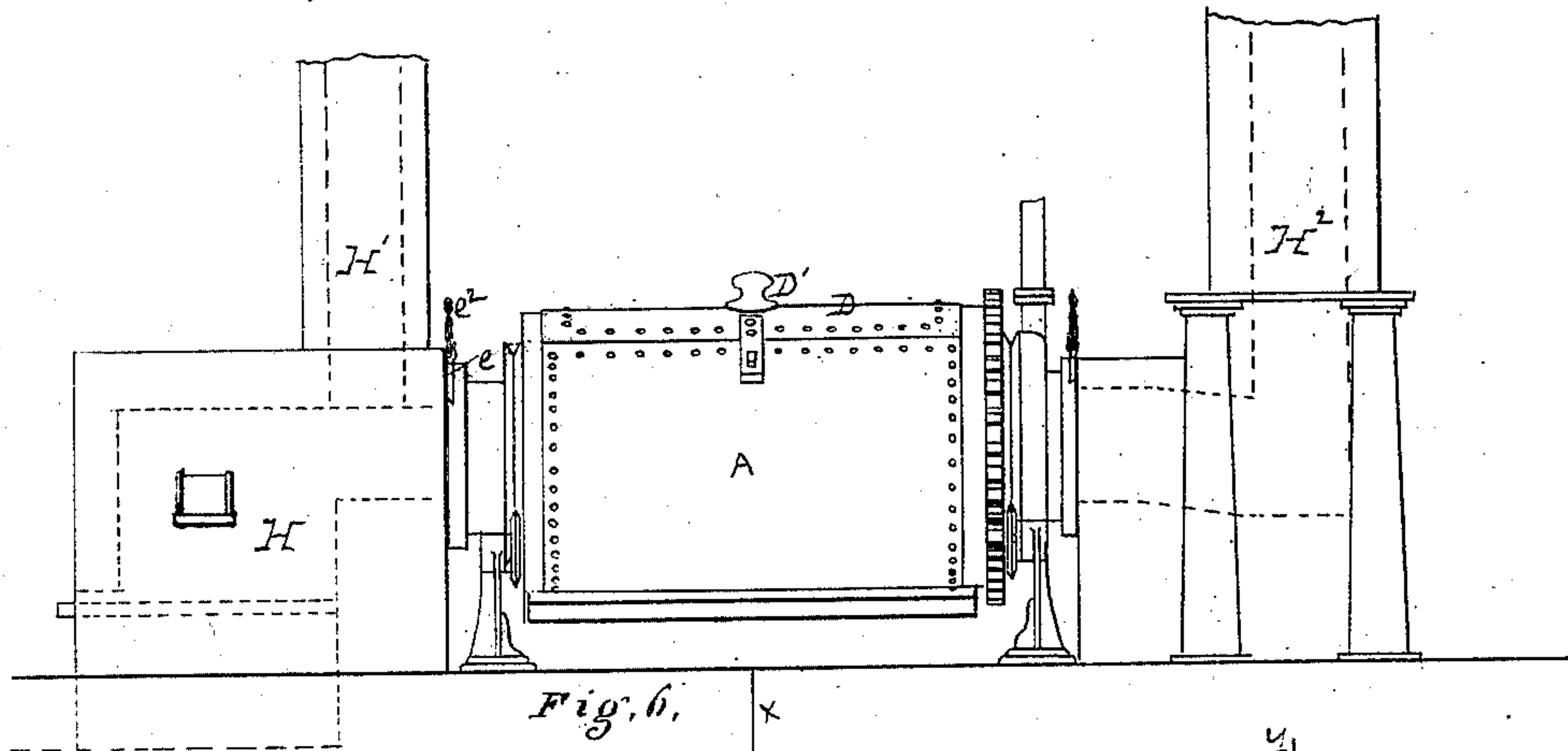


Fig. 2.

Witnesses
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Inventor Lucius D. Chapin,
By Attorney George W. Christy.

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UNITED STATES PATENT OFFICE.

LUCIUS D. CHAPIN, OF CHICAGO, ILLINOIS.

METALLURGIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 223,480, dated January 13, 1880.

Application filed April 14, 1879.

To all whom it may concern:

Be it known that I, LUCIUS D. CHAPIN, of Chicago, county of Cook, State of Illinois, have invented or discovered a new and useful Improvement in Metallurgic Furnaces; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

10 like letters indicating like parts—
Figure 1, Sheet 1, is a view in perspective of my improved converter with the cover or door open and one of the slides for regulating the application of the heat partially open. Fig. 2 is a like view of the same, but with the cover or door and slides closed. Fig. 3, Sheet 2, is a longitudinal sectional view of the same converter. Fig. 4, Sheet 2, is a transverse vertical section through the line xx of Fig. 3. Fig. 5, Sheet 2, is a like transverse vertical section through the line yy of Fig. 3. Fig. 6, Sheet 2, illustrates by outline elevation the manner of using the said converter in connection with a fire-chamber and flue-stack of a reverberatory furnace.

25 In application for Letters Patent filed previous to the execution hereof I have described a process for purifying and balling iron, in which the iron was first purified and brought nearly to nature by the use of an air-blast blown into the molten mass while the same was kept in motion by the oscillation or rotation of the converter, and afterward was balled under or in connection with reverberatory heat and motion imparted to the iron while being so treated.

35 In said application I describe different modes of applying reverberatory heat and motion for the purpose of balling.

40 The present invention relates to the construction and operation of an apparatus suitable for doing such work when the purifying and balling operations are both performed in the same converter; and the nature of it consists, first, 45 in the construction of a rotary or oscillatory converter having lateral air-blast appliances, a hollow or open neck at each end, and suitable means in the line of draft through said necks for closing and opening either or both 50 said necks, substantially as hereinafter set forth; and, secondly, in the combination of a

stationary or non-rotary ring (hereinafter lettered B') provided with an air-passage and encompassing one neck of an oscillatory or rotary converter with air-passages leading to the tuyeres and ports for registering, substantially as hereinafter set forth. 55

In the present improvement the converter is represented at A . It is made substantially of a cylindrical or barrel shape, and mounted on bearing wheels or rollers a , substantially as already practiced in connection with the Danks furnace and other apparatus where rotation is sought without the intervention or use of trunnions, so as to be capable of an oscillatory or rotary motion under power applied by means of a hand wheel or crank, a' , and gearing a'' , or by means of power in any way known to the art. This converter is made open at its ends, as represented at $A'A^2$. On what may be termed its under side I make a tuyere-box, B , supplying the same with tuyeres of any suitable form, and extending along the operating-chamber, supplying such tuyeres with air by means of a pipe-connection, b , and tubular passages b' , made in a ring, B' , which ring surrounds a neck, A' , of the converter, the said ring taking air from any suitable source of supply at b^2 . Ports of any desired size and lap or extent of registering may be made for communication from the passages in the ring B' with the passages leading to the tuyeres, such ports in one form being represented in dotted and full lines in Fig. 5. These ports, however, should so communicate that the supply of air will blow into the converter whenever the openings of the tuyeres may be below the level of the iron to be treated. 80 85 90

The converter itself may be made of any suitable material, such as an iron casing lined with fire-brick or other refractory substance capable of sustaining a high heat; but in making such lining I prefer to arrange the brick alternately flatwise and edgewise, as shown in Fig. 4, so as to give a series of inwardly-projecting ribs, c , which, by projecting more or less into the molten fluid mass of iron, will facilitate the agitation and stirring or other treatment of the same. 95

In the balling operation the ball necessarily will be formed as long, or about as long, as the inside of the converter, and hence, to remove 100

it with facility and ease, a cover or door, D, should be made on one side or what may be considered the top of the converter, or on either side of it, not opposite the tuyeres, if so preferred, and should be as long or nearly as long as the chamber within, and have sufficient breadth for the ball to be turned out or to fall out when the converter is rotated downward, as illustrated in Fig. 1. When the converter is in operation this door or cover is to be closed and secured by any suitable fastening device; but the stopper-hole, by means of which also the molten iron is introduced, (represented as closed by means of the stopper D',) should be made in it or on either side of it, so that as the work progresses the operator may be able to judge from the color or appearance of the escaping flame the extent or rapidity of the progress of the work. The converter so made I combine with a fire-chamber such as or like the fire-chamber of a reverberatory furnace substantially as represented in Fig. 6, in which the fire-chamber is represented at H with a flue opening into one of the open necks of the converter, and with a top flue opening into the stack or pipe H'. The other neck of the converter opens into the flue which leads to another stack, H², the lines of flues and stack-openings being represented by dotted lines. Preferably, the neck-opening next to the fire-chamber should be made a little larger than the other.

My present process contemplates, primarily, the use of the air-blast for the conversion and purification of molten iron in the converter, and as soon as the iron approaches nature the cessation of the air-blast wholly (or except so far as may be necessary to protect the tuyeres) and the use of the reverberatory heat or flame, for the purpose of completing the conversion and for the balling of the iron. To this end the usual means are to be employed for regulating and controlling the force of the air-blast. In addition thereto, the sliding door *e* is to be employed at any desired point between the fire-chamber H and the converter itself while the blast is blowing, for the purpose of purifying the iron, so that communication from the fire-chamber to the converter may be cut off partially or wholly, and also so that when the iron has become sufficiently purified the slide may be removed and the reverberatory flame or heat from the furnace or fire-chamber H may be allowed to play on the iron in the converter. As represented in the drawings, the slide *e*, used for this purpose, is placed in dovetailed guides *e'* over the mouth or entrance of the open neck A', and may be raised or lowered by any suitable power applied through a chain, *e*², for the purpose of more perfectly controlling the heat and flame.

A like slide, *f*, may be employed to open and close the other neck, A², though this slide I do not consider absolutely essential.

A like slide or the usual damper should also be added to the stack H', so as at the proper time to cast the heat or flame from the rever-

beratory-furnace fire-chamber through the entire converter, or part up and out the stack H'.

Instead of slides described, other suitable means may be employed for opening and closing the communications described; also, various modifications—such, for example, as are used in the construction of rotary or oscillatory converters—may be employed; nor do I confine myself in the present invention to any particular kind or class of furnaces or heating apparatus for producing the heat or flame which is to be employed in the balling operation, it only being essential in this respect that the same shall be introduced into the converter so as to operate with a reverberatory action on the material to be treated.

The operation of melting and purifying the iron is substantially such as is described in the application above referred to. As the iron approaches nature the air-blast is to be turned off or turned down, preferably until it is sufficient in amount merely to protect the tuyeres, and then the slide or slides on the converter-neck are to be opened and the slide in the stack H' to be closed, and the reverberatory flame from the furnace H plays through the converter, (it now becomes a baller,) and thus acts on the iron in such a manner as to bring it to a condition for balling, and at the same time the converter, (now a baller,) the stopper and door being closed, is to be rotated continuously and, by preference, somewhat rapidly. The iron is thus brought quickly to nature and balled well and expeditiously, and the ball is removed in the manner already stated and further worked in the manner known in the art.

Excess of cinder, if any, may be run off through the stopper-hole or cinder-taps introduced at any suitable places, and when desired scrap-iron, manganese, or other material which it may be desired to introduce into the iron may be charged in at any desired stage of the operation through the door or stopper-hole.

Under the term "reverberatory heat or flame," as herein used, I include such heating agencies as are known to be suitable for the purpose of bringing iron to nature under the conditions stated, when the same are generated or produced outside of the converter and introduced through the open neck, so as to have the reverberatory action described on the contents of the converter; but I make no claim herein to the process described, such process, so far as it is new, being included in the subject-matter of a separate application.

I am aware that it is not new to combine with an oscillatory puddling-furnace chamber a lateral air-blast and a fire-place for supplying a reverberatory heat through the furnace-neck; but I am not aware of the prior existence of any such structure in combination with a gate or damper or equivalent device introduced between the heat-generating chamber and the oscillatory working-chamber, whereby the reverberatory heat or flame in-

tended to be introduced through the furnace-neck for use in the balling process can be shut off during the operation of the laterally-introduced air-blast in the operation of purifying, and be let on immediately on the completion of the latter. Such feature I believe to be essential to the invention herein claimed.

I claim herein as my invention—

1. A rotary or oscillatory converter having lateral air-blast appliances, a hollow or open neck at each end, and suitable means in the line of draft through said neck for closing and opening either or both said necks, substantially as set forth.

2. The stationary or non-rotary ring B', provided with air-passage, and encompassing one neck of the converter, in combination with air-passages leading to the tuyeres and ports for registering, substantially as described.

In testimony whereof I have hereunto set my hand.

LUCIUS D. CHAPIN.

Witnesses:

WILLIAM F. POOLE,
L. E. VOELLING.