

(No Model.)

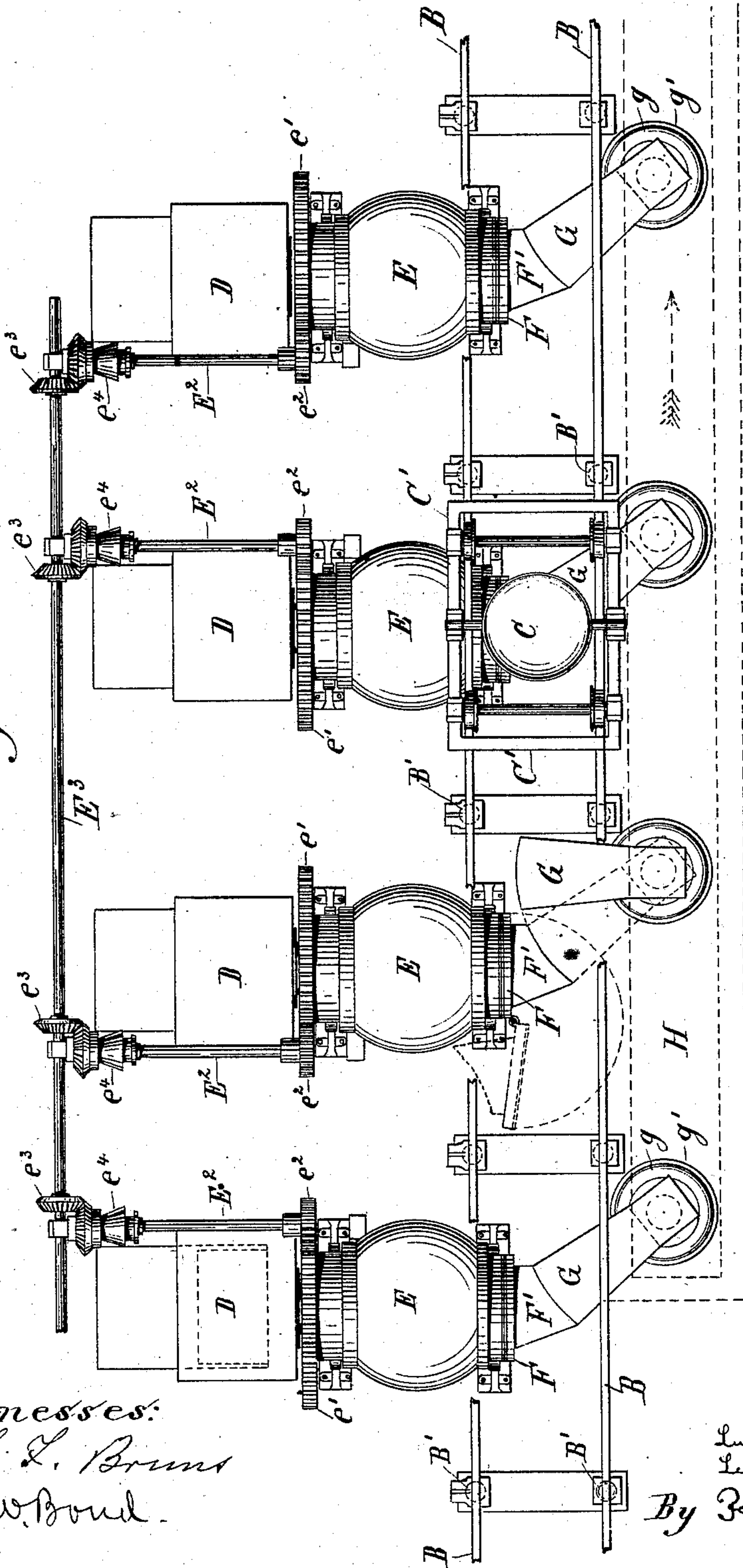
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L. D. & L. C. CHAPIN.
METALLURGIC FURNACE.

No. 283,075.

Patented Aug. 14, 1883.

Fig. 1



Witnesses:

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A. W. Bond.

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(No Model.)

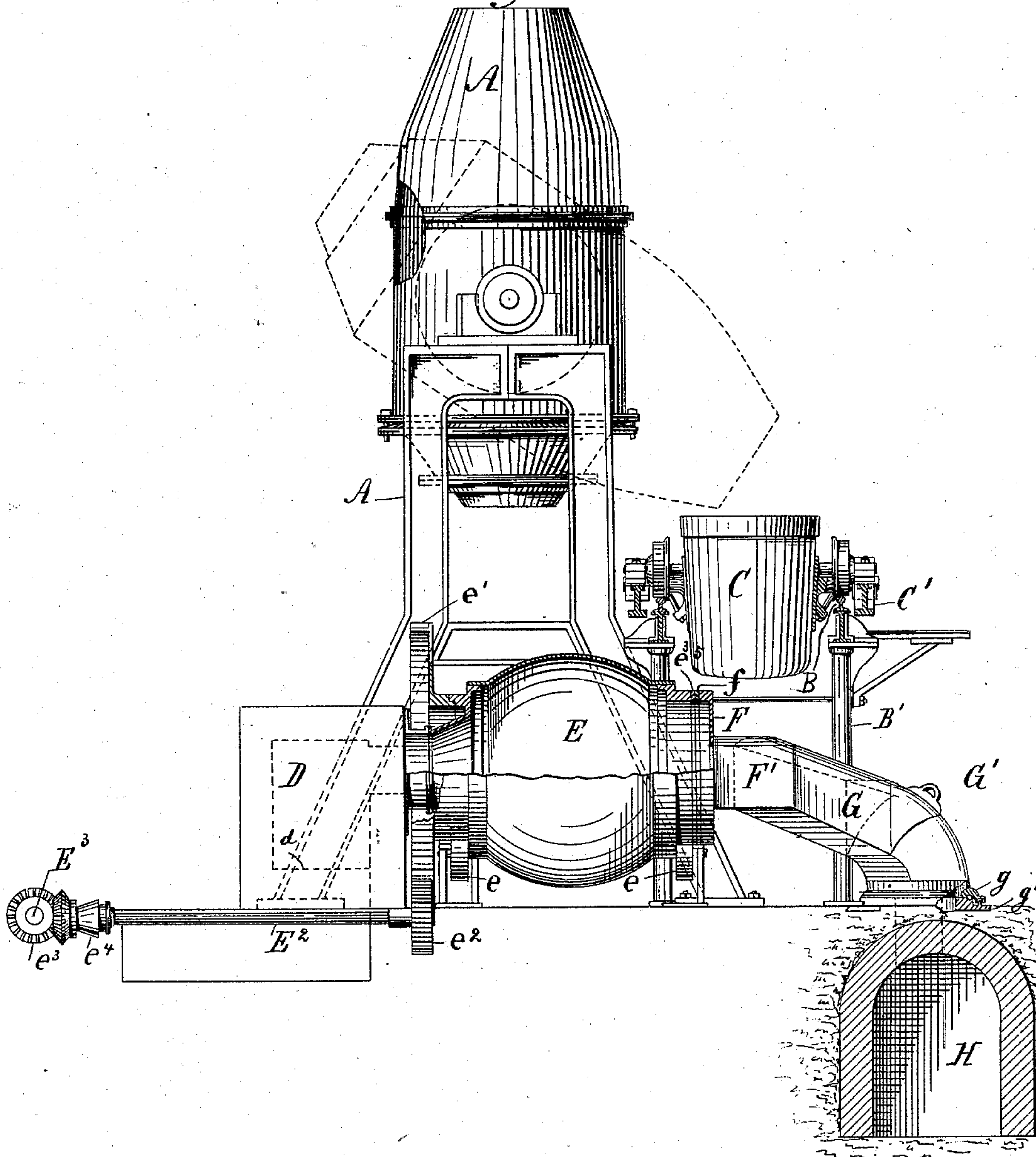
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Patented Aug. 14, 1883.

Fig. 2



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(No Model.)

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METALLURGIC FURNACE.

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Fig. 3

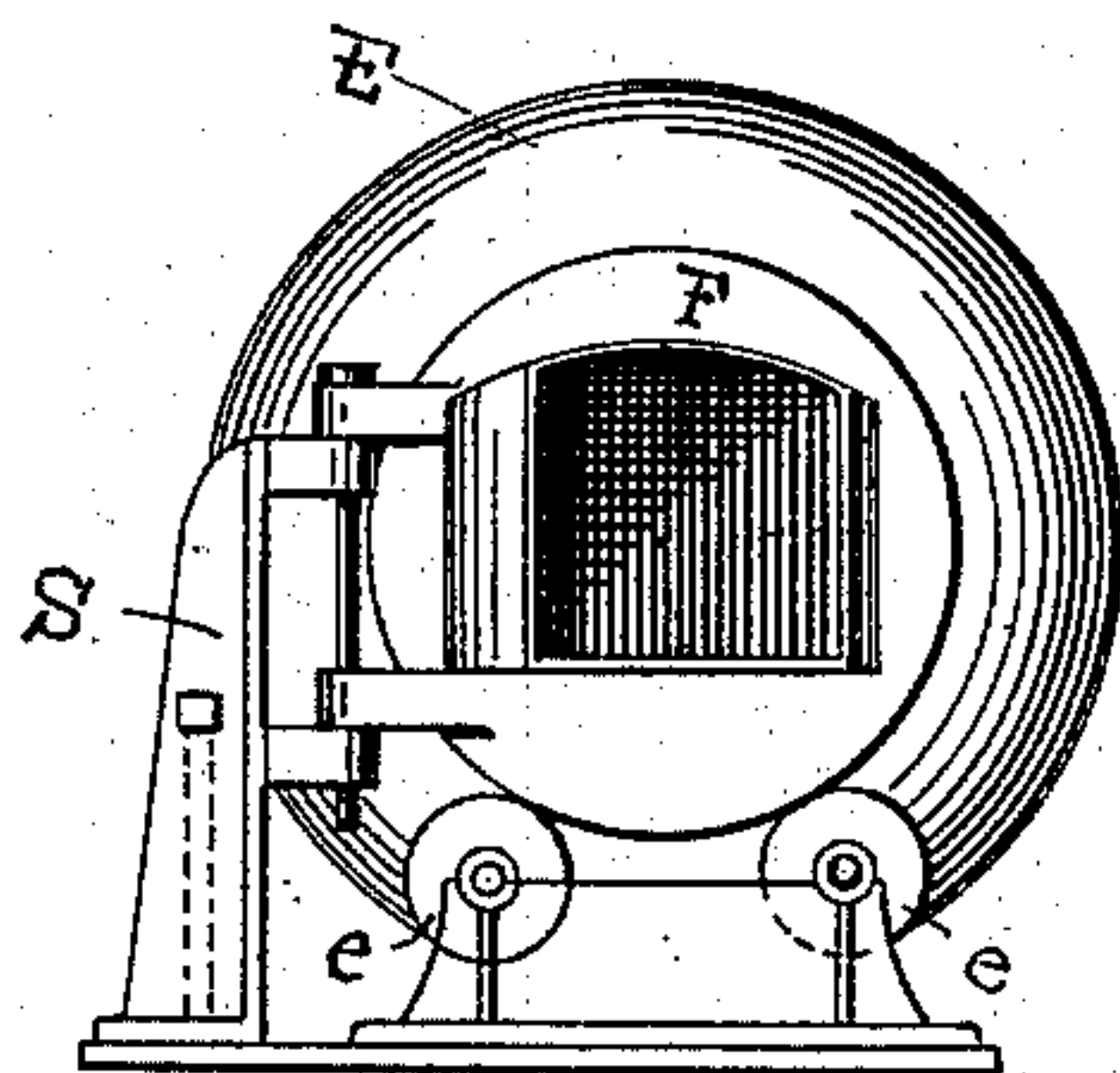


Fig. 5

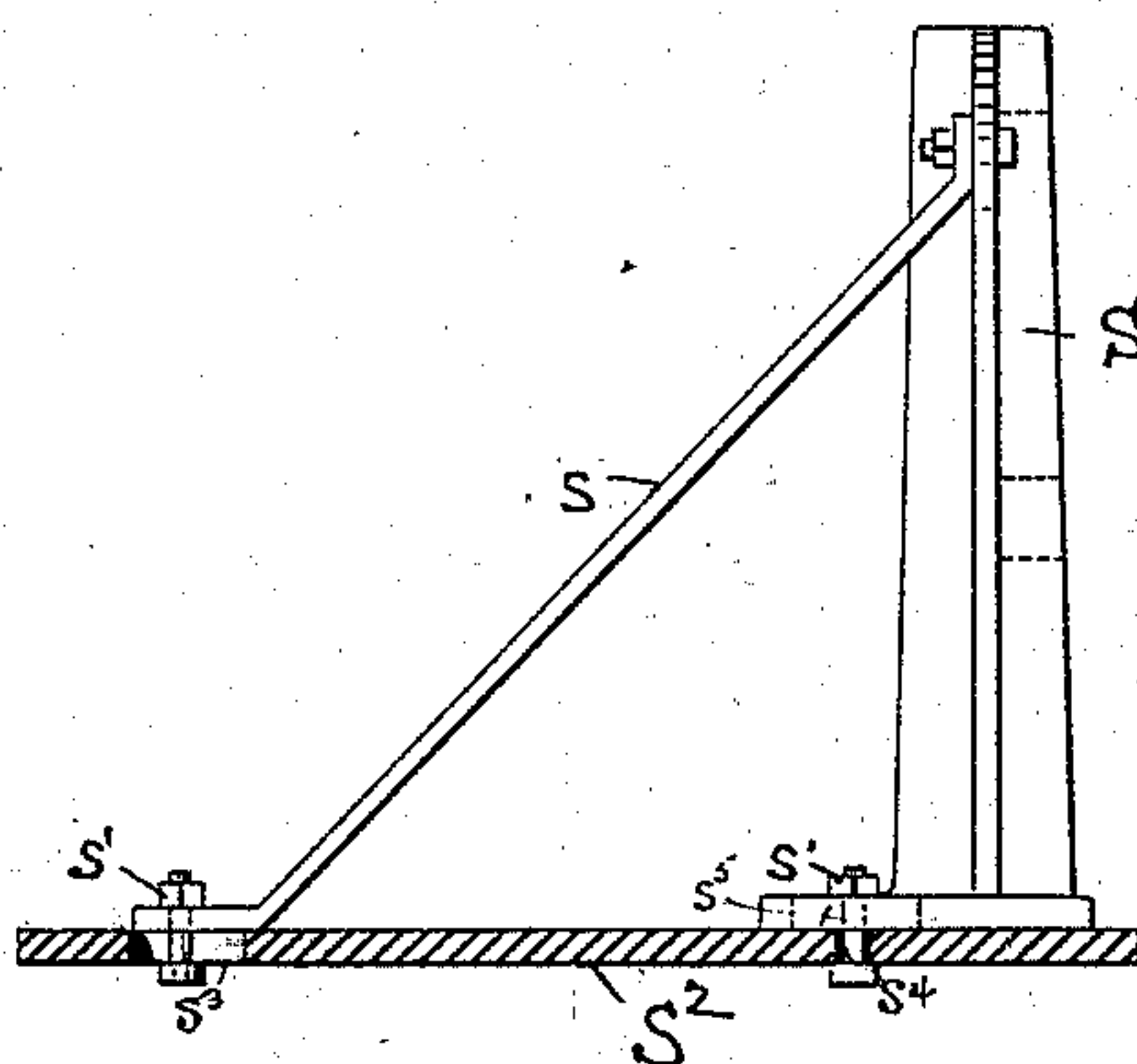
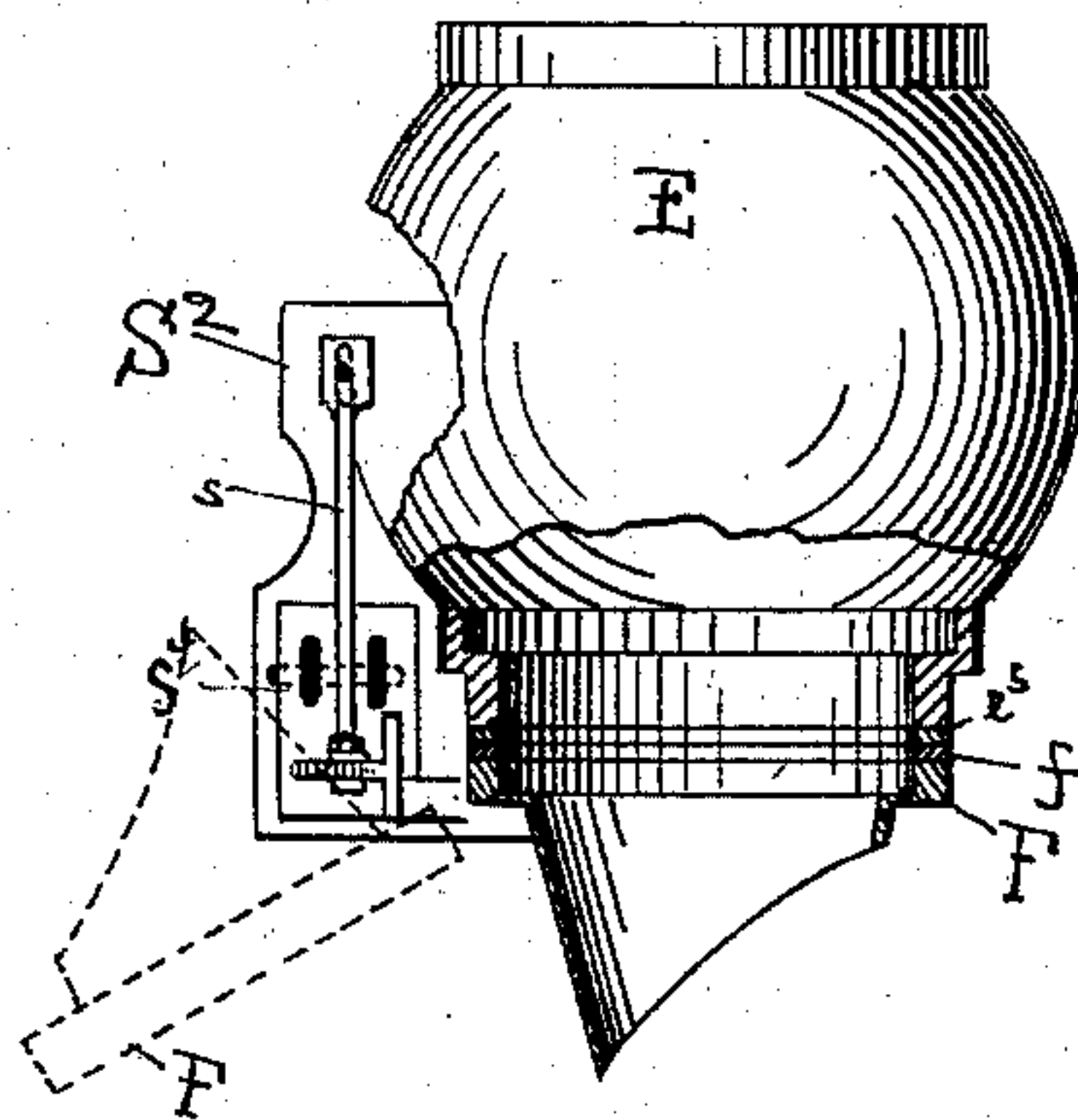


Fig. 4



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UNITED STATES PATENT OFFICE.

LUCIUS D. CHAPIN, OF CHICAGO, ILLINOIS, AND LEBEUS C. CHAPIN, OF KALAMAZOO, MICHIGAN.

METALLURGIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 283,075, dated August 14, 1883.

Application filed August 23, 1882. (No model.)

To all whom it may concern:

Be it known that we, LUCIUS D. CHAPIN, residing at Chicago, State of Illinois, and LEBEUS C. CHAPIN, residing at Kalamazoo, State of Michigan, have invented certain new and useful Improvements in Metallurgic Furnaces; and we do hereby declare the following to be a full, clear, and exact description of the invention, sufficient to enable others skilled in the art to which it appertains to practice the same.

Referring to the accompanying drawings, wherein like letters of reference indicate like parts, Figure 1 is a view in plan of a series of rotary balling-furnaces and their connections with a single main flue in accordance with our invention. Fig. 2 is a view in longitudinal central section through one of the rotary balling-furnaces, the converter, the elevated railway, and ladles mounted thereon to supply the several furnaces being shown in end elevation. Figs. 3, 4, and 5 are views in detail, showing the manner in which the swinging door may be hinged to a standard at front and upon one side of the balling-vessel.

Our invention relates to metallurgic furnaces; and it consists of certain improvements in the construction thereof, which will be hereinafter set forth, and particularly defined by claims.

The invention is shown in the drawings as applied to a series of rotary balling-furnaces used to make wrought-iron by a process which involves, first, the semi-conversion of a charge of cast-iron in a pneumatic converter of the Bessemer or like pattern, and, second, the transfer of said charge in suitable portions to a rotary balling-vessel, wherein the reduction of the metal to the condition of wrought-iron is perfected, the loop or ball resulting from the treatment being removed from the vessel to the squeezers and rolled into muck-bars in the usual way. It is to be understood, however, that the invention is not restricted in value to the practice of any special process, or to any special type of furnace, but that the peculiar features of construction which distinguish said invention make it applicable alike to a variety of processes and furnaces.

The converting-vessel A, sustained by trun-

nions between suitable standards, A', is of the ordinary patterns used in the Bessemer or pneumatic process for the conversion of cast-iron. Near the front of said vessel A is arranged an elevated railway, B, supported by posts or standards B' above the floor of the mill, upon which railway B there runs a wheeled truck-frame, C', that carries the ladle C. The ladle C is sustained upon trunnions within the truck-frame or carrier C' in a manner convenient to allow for its being tipped, and said ladle, as it travels upon the railway B', is so arranged with respect to the converter A as that when this latter is turned upon its trunnions by any of the usual means the mouth of said converter will stand above the ladle C and the contents of the converter be in part discharged into said ladle, as the operator desires.

Arranged side by side, in any number suitable to the capacity of the converter A, is a series of rotary balling-furnaces, which, with the converter and other usual adjuncts, constitute the plant. The balling-furnaces are, in the main, constructed in manner well known to the art—that is to say, having a fuel and fire chamber, D, fitted with grate-bars *d*, a rotary balling-vessel, E, open at its ends and sustained upon the rollers *e e* in close juxtaposition to the bridge-wall of the fire-chamber D, said balling-vessel E being free to revolve through the medium of circumferential rack *e'*, affixed thereto, pinion *e''*, shaft E², miter-gear *e'''*, and line-shaft E³, the friction-clutch gear *e''''* upon the shaft E² controlling the period and degree of rotation. These several details of structure need not be more minutely described, because the same are made and co-operate in the usual well-known way.

At the front of the balling-vessel E there is provided a movable door, F, which may be hinged in any suitable manner, so as to swing freely to and from the mouth of the vessel E. The door F is sustained by the standards S, having brace-rods *s* extending therefrom. The standards and brace-rods are adjustably connected to the supporting-plate S² by means of the bolts *s'*, which work in the slots *s''* and *s'''* of said plate and in slots *s''''* in the base of the standards, arranged at right angles to the slots

s⁴. By this construction of parts the position of the doors can be readily adjusted to compensate for any wear or distortion. The door F consists of a stout metal frame having an opening through it corresponding to that of the baller E, and bears upon its outer face a short projecting flue, F', of same internal diameter as the opening in door F, these parts being properly lined to prevent the destructive action of the highly-heated furnace-gases. When the door F is tightly in position against the mouth of the baller E, so that the face-plate *f*, secured to said door, bears against the like plate, *e*³, of the baller E, then will the end of the projecting flue-piece F' be in position to abut against the corresponding end of the movable flue G.

The flue G may consist of a stout sheet-metal casing lined internally with fire-brick of similar resistance, and in the form shown by the drawings is bent elbow like, the downtake of said flue discharging freely into a main flue, H, common to all of the several balling-furnaces, which connects in turn with the ordinary chimney-stack. Attached to the downtake of the flue G is an encircling collar, *g*, having a circumferential groove in the face thereof, to receive a series of rollers, balls, or equivalent friction devices, which rest below in a like groove formed in the face of a plate, *g'*, sustained upon the main flue H. By this pivotal or union joint the movable flue-section G is free to swing about its downtake as an axis, and thus at will to be tightly joined to the door F, having the projecting flue F' thereon, or to be swung clear and away therefrom, as may be necessary in the working of the balling-furnace. It will be noticed that by thus curving or bending the movable flue-section its weight is sustained by the main flue and a constant joint or close connection is maintained between the two. It will be noted that the flue-piece F' terminates in an opening whose plane is oblique to the door F. The contour of the abutting end of the movable flue-section G is an exact counterpart of this opening, whereby a perfectly-tight joint is secured between the parts, so that all leaks in the flues shall be avoided. The ends of the flue-sections are shown as curved with an equal radius and from a common center. This is the preferable construction. A slide-valve, G', located in flue G, controls at will the egress of furnace-gases from the balling-vessel to the main flue H, so that at any desired stage of treatment of the charge in the balling-vessel the flame may be shut down and the charge kept quiescent until such time as the loop of another baller has been disposed of or other conditions necessary to the economic working of the metal fulfilled. It must be apparent that by thus connecting the several flues leading from each of the balling-vessels to a single main flue the charge of metal in each vessel may be worked with entire independence, and yet if the flame from any one be temporarily shut down it can be

quickly varied to a degree of high intensity, when the valve G' is shifted and the furnace-fire is subjected to the extreme draft of the common flue and stack.

When the connection between the swinging flue and the furnace-door is broken for purpose of obtaining access to the interior of the furnace, the valve G' is closed to prevent the entrance of air into the main discharge-flue, for in the absence of the valve it is clear that such ingress of cold air must tend to reduce the temperature of the main flue and to materially diminish the draft when the connection is re-established. If more than one furnace be used, the valves in the several flue-sections have the further useful function of preventing an outflow of hot products of combustion from the main discharge-flue into the working-room—a detrimental result which, in the absence of the valve, must occur when any one of the furnace-connections is temporarily broken, as before described.

The common flue H may be located below the floor of the mill, as shown, or may be overhead and sustained in any preferred way, in which event the swinging flue-section G will be suspended from the same, so as to abut against the projection F' of the door F, as heretofore described. Nor is it necessary to the efficiency of this part of the invention that there shall be a common flue at all, inasmuch as the swinging section G and door F co-operate with each other and with the furnace to which they pertain with equal success, whatever the nature of the conduit into which swinging flue-section G may discharge.

By having the flue-section G and the door F to swing separately from each other, they are rendered less cumbersome, are easier of access, simpler in construction, independent in movement, yet capable of being quickly and tightly joined together. More room is afforded because of the compact and simple arrangement of the parts, thus through the medium of the elevated railway and traveling ladles allowing for the use of a series of balling-furnaces in connection with a single converter or cupola.

It will be obvious that the several details of construction heretofore described may be varied without departing from the spirit of the invention.

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

1. The combination, with a furnace, of a movable door, a movable flue-section sustained independently of said door, and a main discharge-flue, substantially as described.

2. The combination, with the furnace, of a movable door having a flue-piece projecting from the back thereof and terminating in an opening the plane of which is oblique to the door, a movable flue-piece having an end whose contour is the counterpart of the door flue-piece, and a main discharge-flue, substantially as described.

3. The combination, with a furnace and the

main discharge-flue, of a movable flue-section connected by a union-joint to the main discharge-flue, whereby the joint between said movable section and main flue is maintained constant during rotation of the flue-section, substantially as described.

4. The combination, with a furnace and the main discharge-flue, of an intermediate curved or bent flue-section movably connected to and bearing upon the main discharge-flue, substantially as described.

5. The combination, with the balling-vessel and the main discharge-flue, of a movable flue-section connected by a union-joint to the main discharge-flue, whereby the joint between said movable section and main flue is maintained constant during rotation of the flue-section, substantially as described.

6. The combination, with the balling-vessel and the main discharge-flue, of the movable flue-section connected to the main flue by a joint, as described, and provided with a valve, substantially as set forth.

7. The combination, with a series of balling-

vessels and a main discharge-flue, of a series of movable flue-sections, each provided with a valve, substantially as described.

8. The combination, with rotary balling-vessel E, of the hinged door F, the swinging flue-section G, provided with the collar *g*, and the main flue H, bearing the plate *g'*, substantially as described.

9. The combination, with the balling-vessel, of a swinging door and an adjustable standard for sustaining said door, substantially as set forth.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

LUCIUS D. CHAPIN.
LEBEUS C. CHAPIN.

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W. W. ELLIOTT.

Witnesses for Lebeus C. Chapin:

WM. S. LAWRENCE,
W. MILTON LEE.