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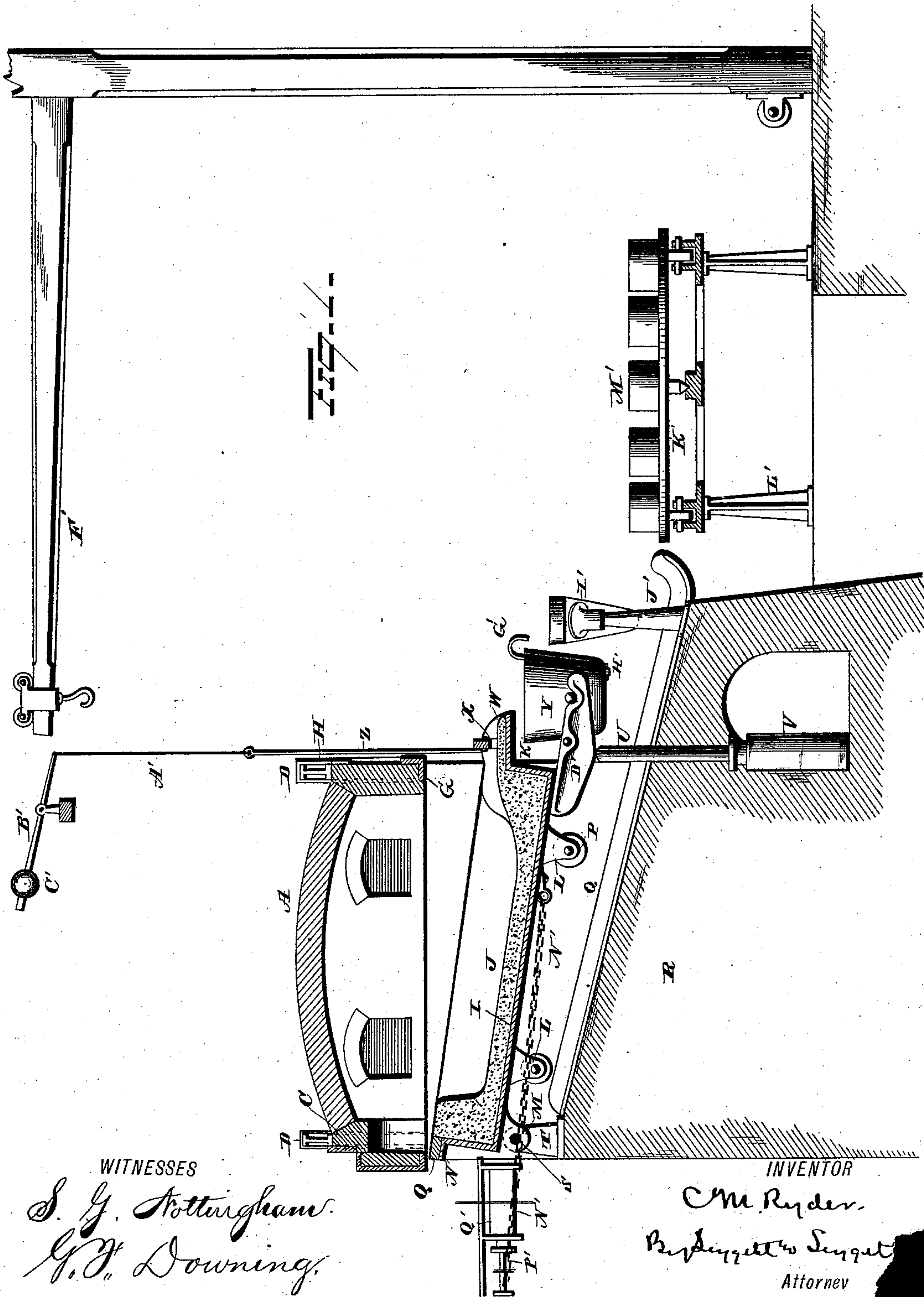
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C. M. RYDER.

OPEN HEARTH STEEL MELTING FURNACE.

No. 287,864.

Patented Nov. 6, 1883.



WITNESSES

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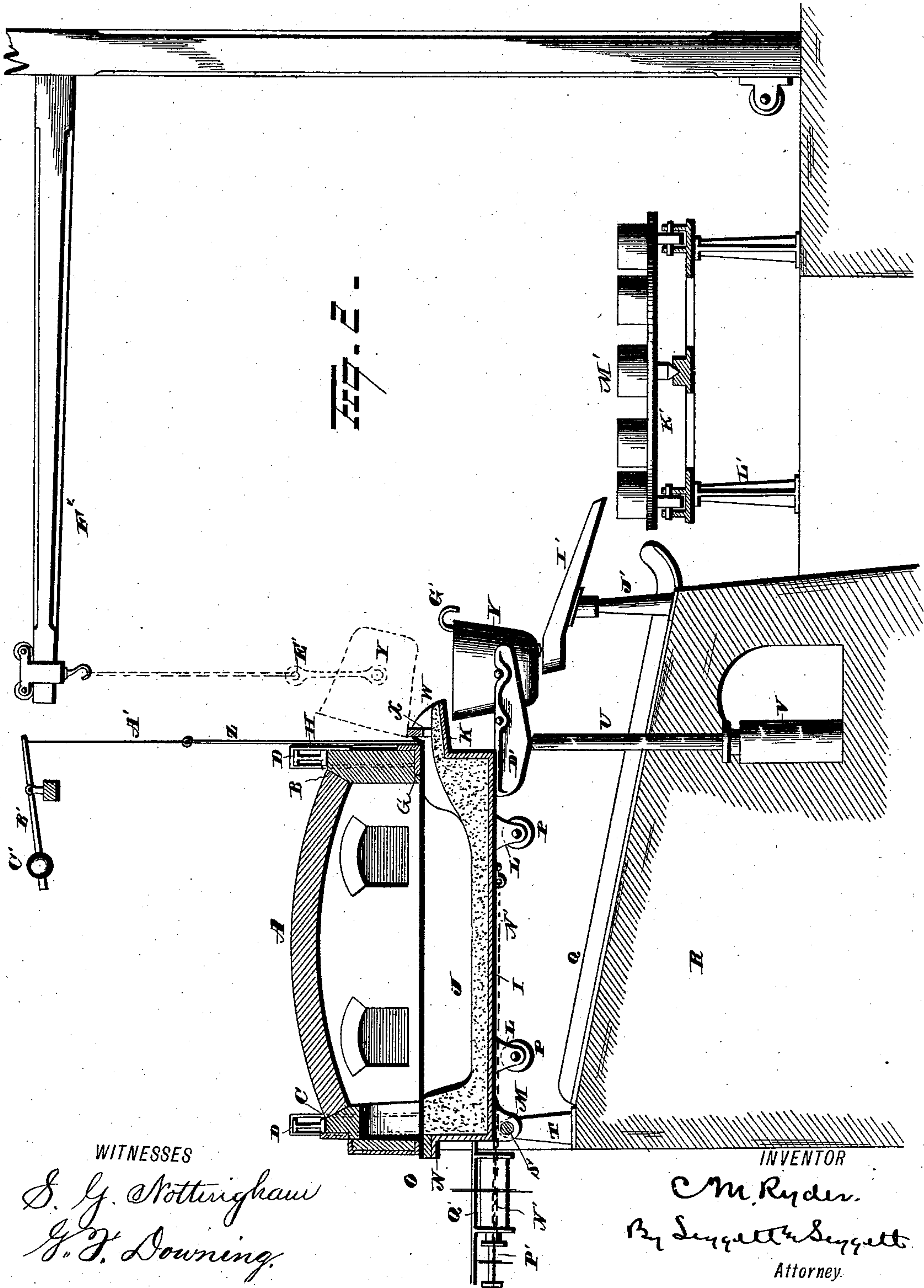
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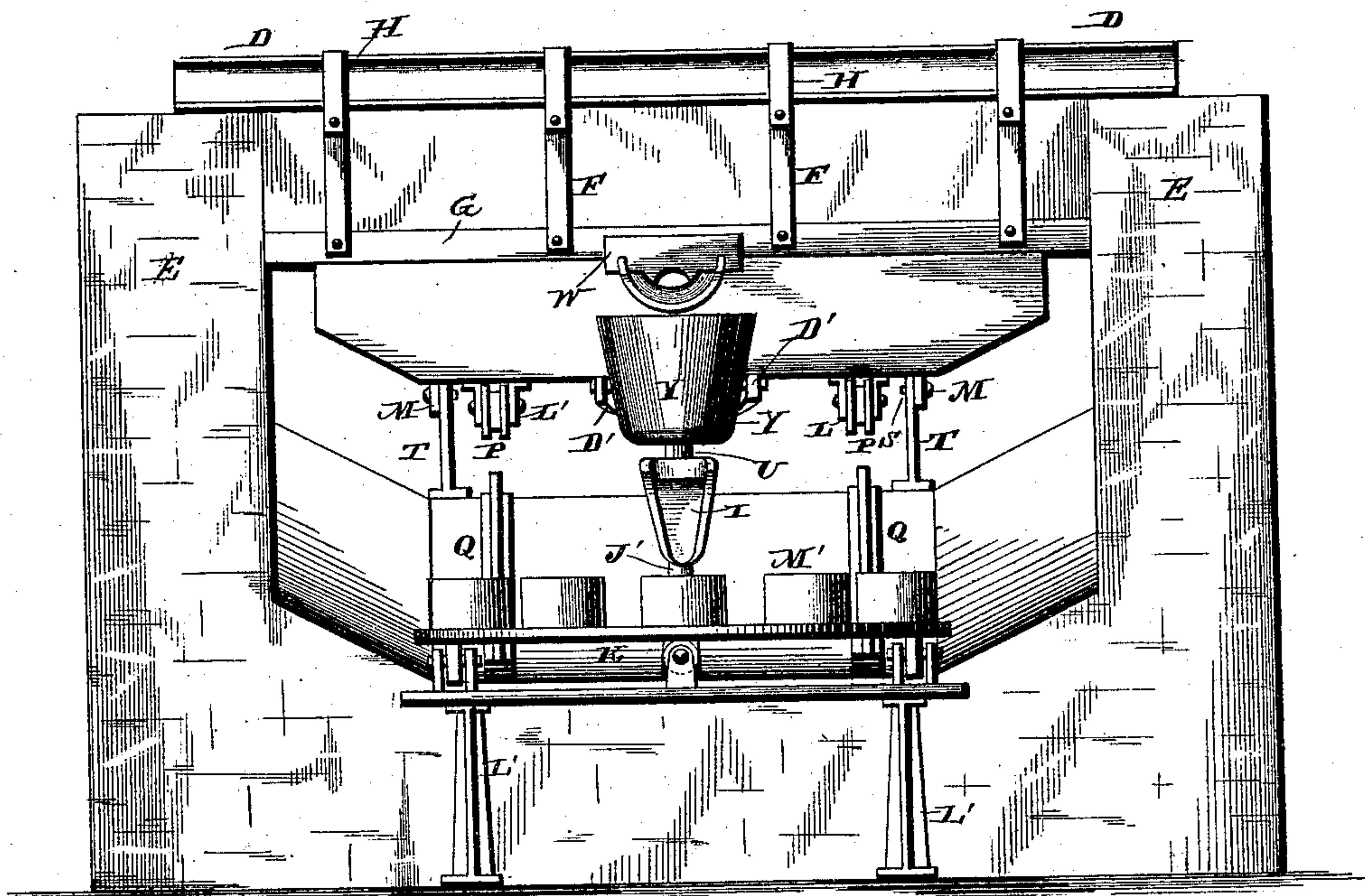
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WITNESSES

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(No Model.)

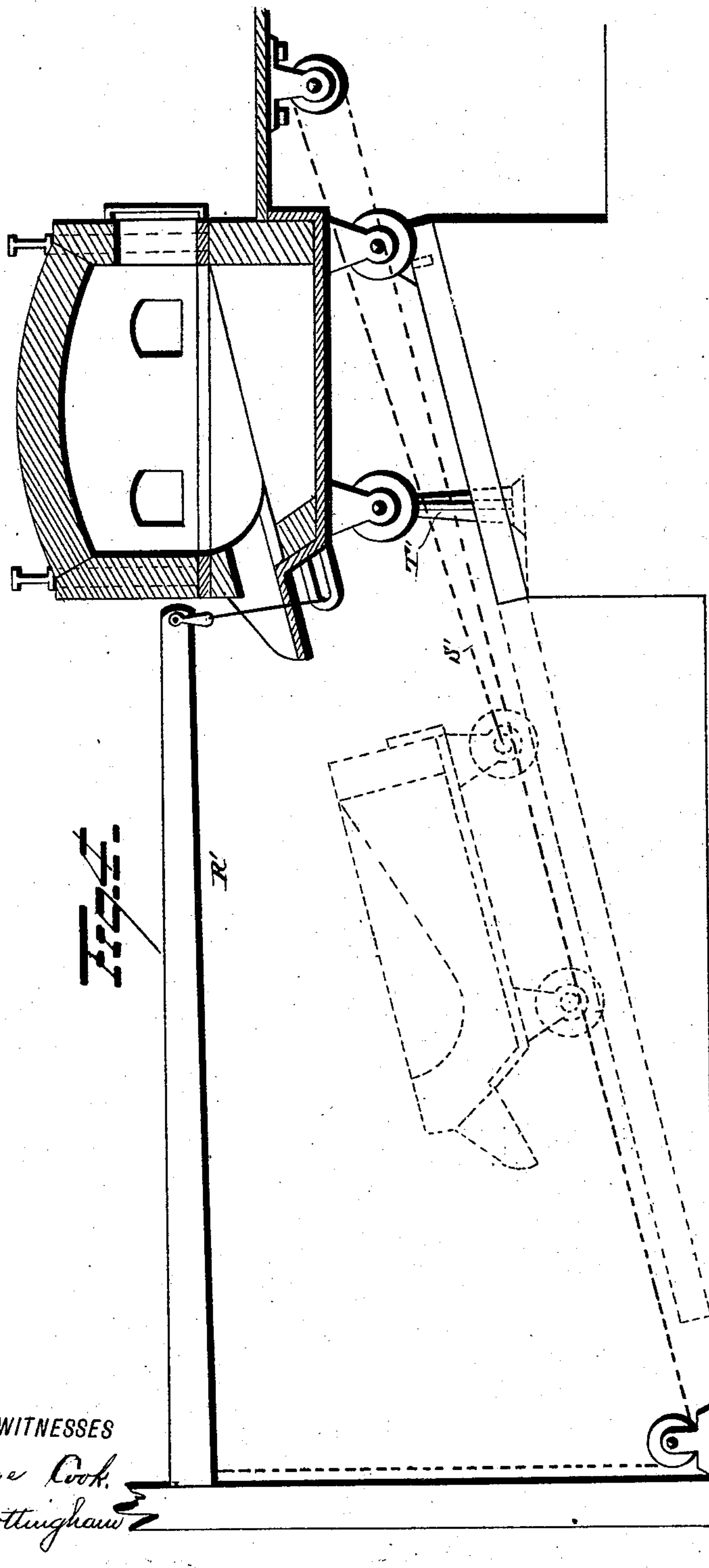
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Patented Nov. 6, 1883.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES M. RYDER, OF CHESTER, PENNSYLVANIA.

OPEN-HEARTH STEEL-MELTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 287,864, dated November 6, 1883.

Application filed May 7, 1883. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. RYDER, of Chester, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Open-Hearth Steel-Melting Furnaces and Casting Attachments therefor; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in open-hearth steel-melting furnaces and casting attachments therefor, the object being to adapt this class of furnaces to general foundry use, and to simplify all operations of casting small articles of structural steel by an arrangement whereby the metal of the bath may be withdrawn from the furnace fractionally and in the quantities desired.

A further object of the invention is to provide means for removing the hearths of this class of furnaces not only for the purpose of facilitating all operations of repairing them as well as the furnace structure, but also for charging them with masses of metal and imperfect castings too large to be introduced through the charging-door of the furnace itself.

A further object of my invention is to provide the furnace with a skimmer arranged and adapted to prevent the slag from being drawn off simultaneously with the metal.

With these objects in view, my invention consists in certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in vertical section of a furnace embodying my invention and provided with my improved attachments. Fig. 2 is a similar view, the hearth being shown in its closed position. Fig. 3 is a view of the furnace in front elevation, and Fig. 4 is a view showing a modified arrangement for removing and replacing the hearth.

The arched roof A, the front wall, B, and the rear wall, C, of the furnace are suspended from girders D, the ends of which are supported by the usual structures, E, embodying the flues arranged to convey air and gas-blasts to the furnace. This suspension of the roof and

walls from the girders is effected by means of hangers F, embracing the walls, the lower ends of the said hangers being attached to plates G, located under the walls, while their upper ends are secured to the girders aforesaid by means of inverted stirrups H.

While the devices above described answer all purposes, it is apparent that the suspension of the roof and walls of a furnace may be effected in many other ways.

The hearth is preferably composed of a metallic shell, I, having a lining, J, of refractory material of suitable character. The shell is provided with a spout, K, with depending bearings L and M, and with a shelf or flange, N, the latter being designed to support the fore plate, O, constituting the sill of the charging-door of the furnace. Wheels P, journaled in the depending bearings L, are arranged to register with and travel upon inclined trackways Q, mounted upon the supporting structure or bed R. These trackways should extend sufficiently beyond the front line of the casting side of the furnace to permit that displacement of the hearth required for all operations of repairing and charging. The bearings M are designed to be secured by pins S to standards T, located upon the highest part of the structure R aforesaid. The union of these parts forms a fulcrum-bearing for the hearth by supporting the charging side thereof and permitting its casting side to be raised or lowered, as desired. These means for fulcruming one side of the furnace may, however, be dispensed with and any equivalent bearing—as one of the knife-edge type—employed. While conversion is going on, the casting side of the hearth is supported in its raised or closed position by means of a plunger, U, playing in a cylinder, V, in which hydrostatic pressure is developed by the usual means employed for that purpose. After conversion and during the operation of casting, the said side of the hearth is raised and lowered, as need be, for withdrawing the metal fractionally and in the desired quantities by elevating and depressing the plunger by varying the pressure in the cylinder V aforesaid.

For the purpose of skimming the metal as it is drawn off, and for retaining the slag and kindred impurities in the hearth, a skimmer, W, is employed. It is mounted in bearings

X, located on opposite sides of the spout K, and consists of a slab of fire-brick or other refractory material conforming to the contour of the spout, and having its lower edge cut away for the escape of the metal. As neither metal, slag, nor impurity can escape above the level of the aperture in the skimmer, the metal, being of higher specific gravity, and consequently floating the slag, may be drawn off without being mingled to any extent therewith. As a matter of fact, a little slag escapes with the metal; but it floats in the ladle Y and is easily disposed of. When the body of the metal has been exhausted, the slag remaining in the hearth is withdrawn by depressing the same and removing the skimmer.

A metallic shield, Z, suspended in front of the casting side of the furnace and adapted to be vertically adjusted, is designed to protect the foundry-men from the intense and blinding heat thrown out by the furnace when the hearth is depressed. As herein shown, the shield is suspended by a rod, A', from a lever, B', provided with a counterweight, C', the latter being arranged to balance the shield, so that it may be readily raised and lowered with the hearth. It is obvious that other devices of equal efficiency may be employed for handling the shield.

The ladle Y is mounted in a fork-shaped bearing, D', secured to the under face of the casting side of the hearth. A bail, E', arranged to be secured to the ladle in the usual manner, adapts it to be lifted from its bearings by the crane F', for the purpose of conveying it to molds distributed over the foundry-floor, and for returning its contents to the metal in the hearth when such a course is desirable. The ladle is further provided with the ordinary stopper, G', fitting into the pouring-hole H', from which the metal issues into the spout I', the same being swiveled upon a column, J', as shown. A turn-table, K', elevated above the floor of the casting-pit on pillars L', supports the molds M', the table being rotated by any suitable means to bring the molds within range of the spout. As fast as the molds are filled, they are replaced by others, the operation of pouring and handling the filled and unfilled molds being conducted simultaneously. In case it is desired to pour very large castings, the ladle-spout and turn-table are removed, the metal being conveyed directly from the furnace to molds located in the casting-pit by means of suitable conduits or spouts.

The hearth is operated on the trackways Q by means of a chain, N', connecting it with the plunger P' of the cylinder Q', which is located beneath the charging-floor of the furnace, and provided with the usual means for developing hydrostatic pressure. When it is desired to displace the hearth for any of the purposes mentioned, the plunger U is depressed to allow the hearth to descend and the wheels P to engage with the trackways aforesaid. This done, the pins S, uniting the bearings M and standards T, are removed, leaving

the hearth free to run down the said trackways as the pressure in the cylinder is gradually decreased. When thus displaced, the hearth may be relieved or otherwise repaired, or charged with masses of metal and imperfect castings too large to be introduced through the charging-door of the furnace-structure, and, although of desirable quality, but little used on account of the difficulty of breaking them up. This displacement of the hearth also accelerates the cooling of the furnace and renders it readily accessible for repairs. When the object prompting the displacement of the hearth has been accomplished, it is drawn up the inclined trackway by increasing the pressure in the cylinder Q'. When in position under the furnace-structure, the bearings M and standards T are reunited by the pins S, and the casting side of the hearth raised to place by the plunger U. As the hearth is drawn up under the furnace on an incline, masses of metal or large castings will not engage with the front wall, B, of the furnace-structure and injure it.

Instead of handling the hearth by the plungers shown and described, a hydraulic crane, R', and connections S', arranged as shown in Fig. 4 of the drawings, may be employed. In such case two removable columns T are used to support the casting side of hearth during conversion.

If desired, arrangements may be made for conducting the operations of charging and casting on the same side of the hearth, either side being capable of being so used. Instead, also, of employing the power of water under pressure to elevate and depress the hearth, the same may be counterweighted and operated by a slight expenditure of power applied in any desired manner. I would therefore have it understood that I do not limit myself to the exact construction shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

I am aware that it is old to suspend the hearth of a glass-furnace by chains running over pulleys attached to the furnace-structure, whereby the hearth is adapted to be lowered in a vertical line from the furnace, and to be tilted for the purpose of pouring out its contents. I do not, therefore, broadly claim a furnace provided with a hearth adapted to be removed and tilted, but only a specific construction for accomplishing these results.

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

1. In an open-hearth steel-melting furnace, the combination, with a structure forming the side walls and top thereof, and a hearth located under said structure, of fixed bearings adapted to have one side of the hearth detachably fulcrumed to them, and means to raise and lower the unsupported side of the hearth, substantially as set forth.

2. In an open-hearth steel-melting furnace,

the combination, with a structure forming the side walls and top thereof, and a hearth located under the said structure, of fixed bearings adapted to have one side of the hearth detachably fulcrumed to them, and the described hydraulic piston impinging on the under face of the unsupported side of the hearth, and arranged to raise and lower the same, substantially as set forth.

3. In an open-hearth steel-melting furnace, the combination, with a structure forming the side walls and top thereof, and a hearth located under said structure, of fixed bearings arranged to have one side of the hearth detachably fulcrumed to them, an inclined trackway located under the furnace, and extending beyond the casting side thereof, and means to lower the hearth upon and to elevate it above the trackway, and to operate it thereon, substantially as set forth.

4. In an open-hearth steel-melting furnace, the combination, with the side walls and top thereof, of a hearth having one side supported and the other free to be raised and lowered, means to operate the unsupported side of the hearth, and a ladle mounted on bearings attached to the hearth, substantially as set forth.

5. The combination, with an open-hearth steel-melting furnace provided with a hearth having one side supported and the other free to be raised and lowered, of means to operate the unsupported side of the hearth, a fork-shaped bearing attached thereto, and a ladle removably mounted in said bearing, substantially as set forth.

6. In an open-hearth steel-melting furnace, the combination, with a structure forming the side walls and top thereof, and a hearth located under the said structure, and having one side fulcrumed in fixed bearings, of means for rais-

ing and lowering the unsupported side of the hearth, a ladle to receive the metal running from the hearth when lowered, and means to lift the said ladle for returning its contents to the hearth, substantially as set forth.

7. In an open-hearth steel-melting furnace, a hearth adapted to be depressed and displaced laterally with respect to the walls and top of the furnace, substantially as set forth.

8. In an open-hearth steel-melting furnace, the combination, with a hearth adapted to be depressed and displaced laterally with respect to the walls and top of the furnace, of an inclined trackway located under and extending beyond the casting side of the hearth, and means for operating the hearth on the said trackway, substantially as set forth.

9. The combination, with an open-hearth steel-melting furnace having a removable hearth, of an inclined trackway located under and extending beyond the casting side of the hearth, and means to lower the hearth upon and to elevate it above the trackway, and to operate it thereon, substantially as set forth.

10. In an open-hearth steel-melting furnace, the combination, with a hearth adapted to be depressed and displaced laterally with respect to the walls and top of the furnace, of an inclined trackway located under and extending beyond the casting side of the hearth, and means to apply hydrostatic pressure to operate the hearth upon the trackway, substantially as set forth.

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

CHARLES M. RYDER.

Witnesses:

G. F. DOWNING,
S. G. NOTTINGHAM.