

No. 726,728.

PATENTED APR. 28, 1903.

M. J. MURDOCH.
METAL TREATING FURNACE.
APPLICATION FILED NOV. 26, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

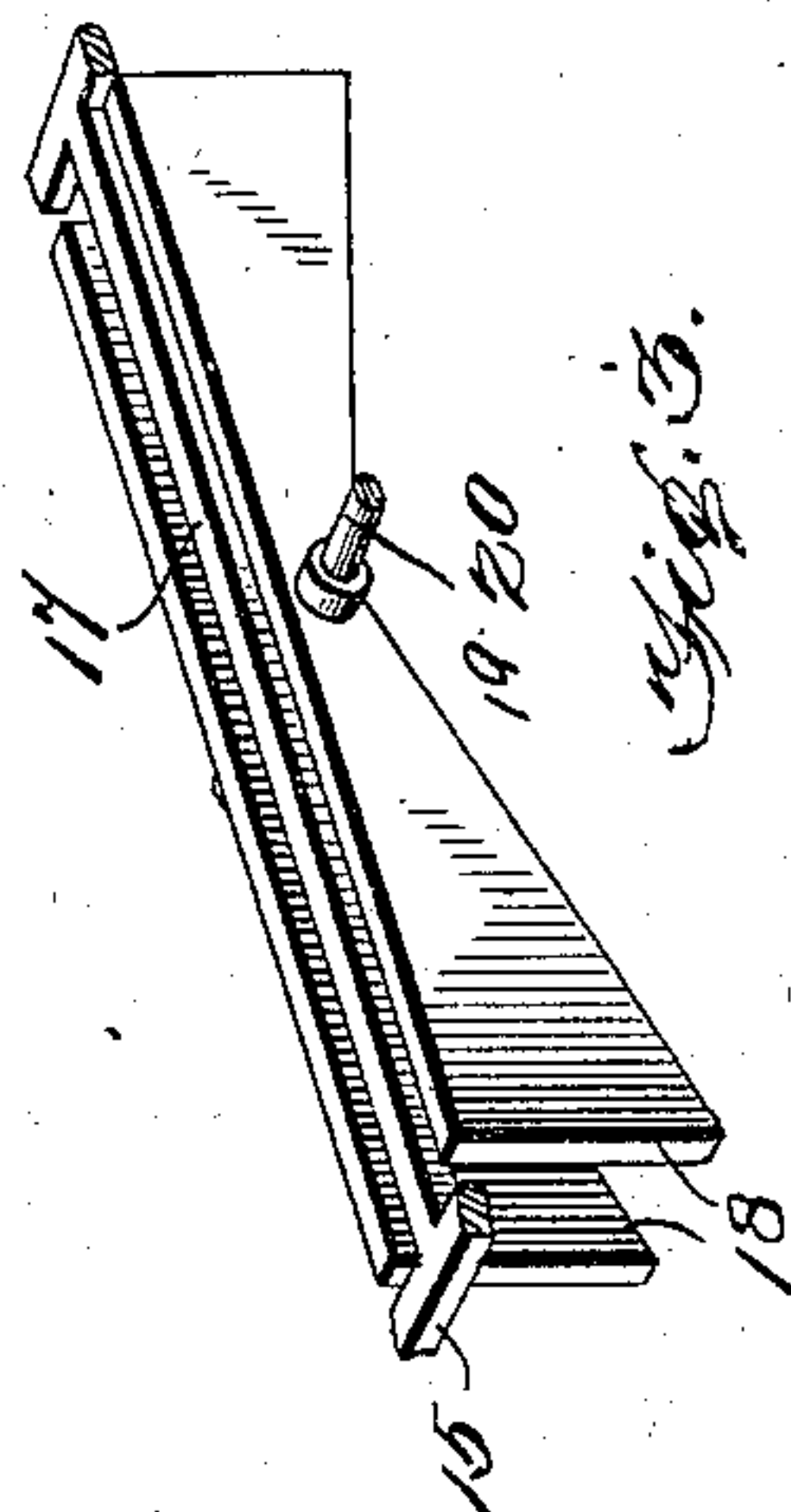
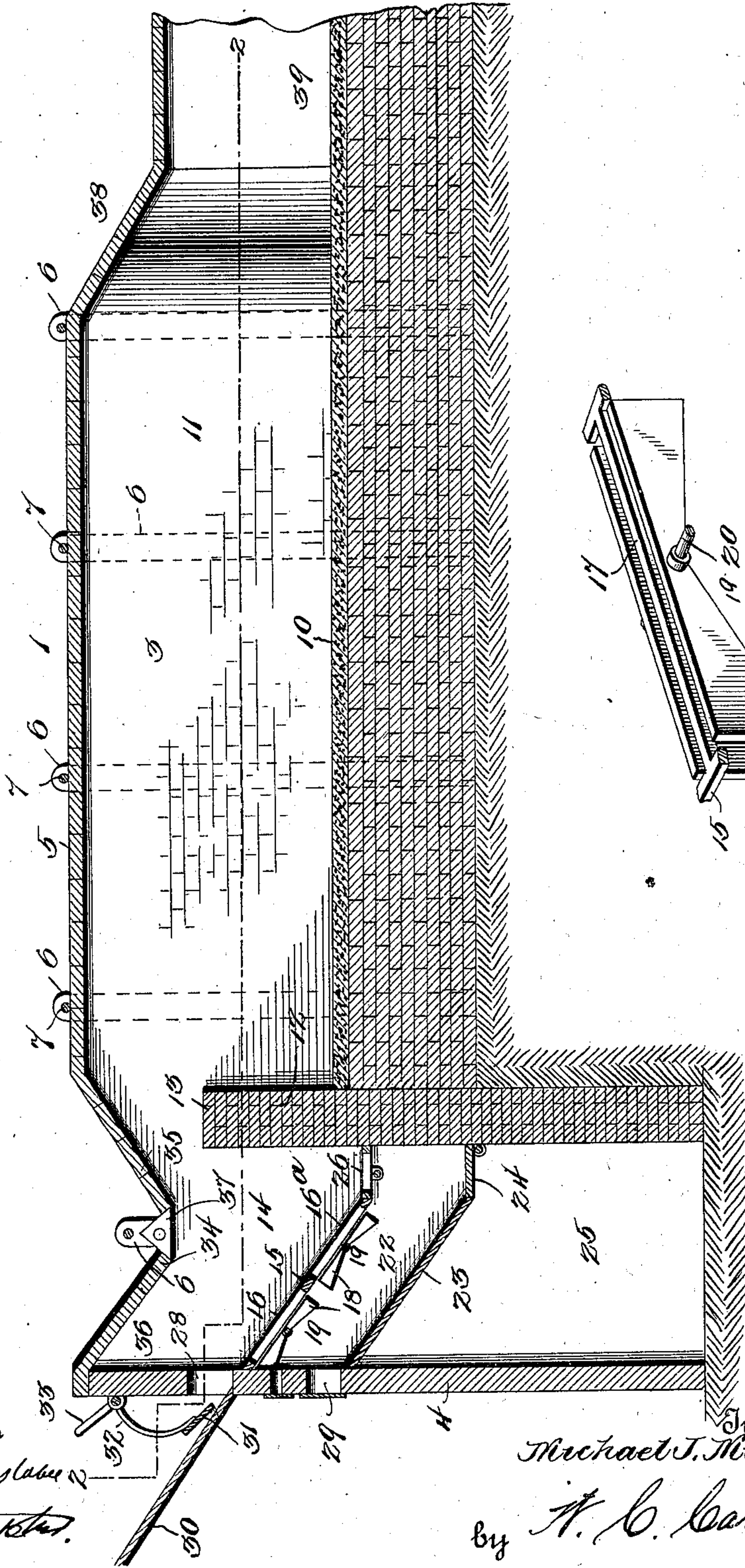


Fig. 2.

Witnesses
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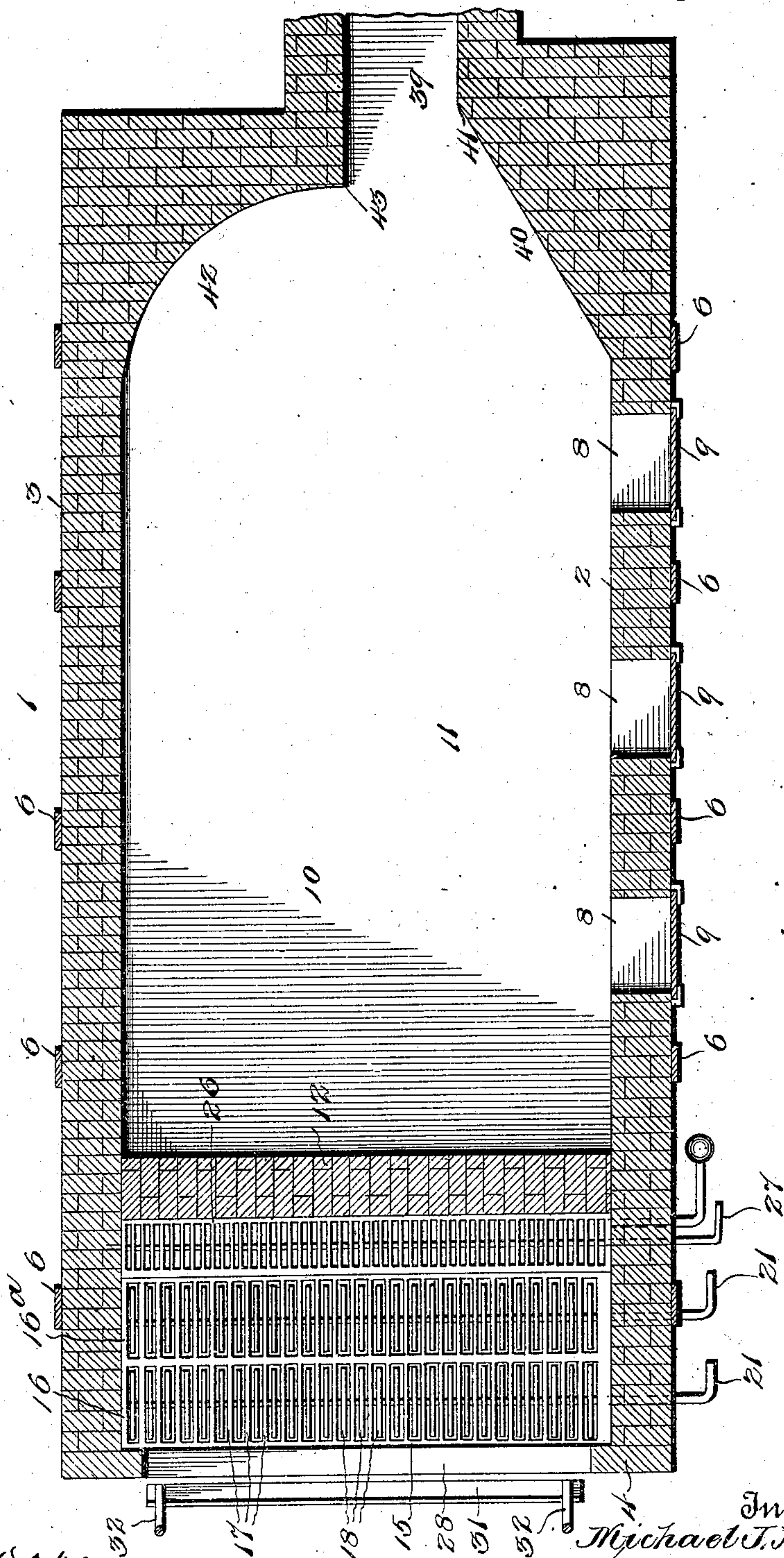
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2 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

MICHAEL J. MURDOCH, OF YOUNGSTOWN, OHIO.

METAL-TREATING FURNACE.

SPECIFICATION forming part of Letters Patent No. 726,728, dated April 28, 1903. .

Application filed November 26, 1902. Serial No. 132,899. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL J. MURDOCH, a citizen of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented certain new and useful Improvements in Metal-Treating Furnaces; 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.

This invention relates to metallurgy, and more particularly to furnaces of the reverberatory type designed for the treatment of metal for melting, puddling, or heating purposes generally, but possessing special utility in the treatment of metal where it is desirable for the heat to be confined as long as possible upon the body of metal and strongly reflected or directed thereon.

To this end the invention primarily contemplates a novel construction of furnace-body embodying means for a thorough utilization and distribution of the heat throughout the hearth-chamber containing the metal to be treated. In this connection the invention also has in view a peculiarly novel formation of the fire-chamber part of the furnace casing or body, whereby the heat is directed out of the chamber in such a manner as to insure the downward reflection thereof from the roof immediately after passing over the bridge-wall, and also providing means whereby a superheating of the air is accomplished, as well as a consumption of the smoke, gases, and other consumed products, which ordinarily pass in an unconsumed state into the hearth-chamber.

With these and many other objects in view, which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts, which will be hereinafter more fully described, illustrated, and claimed.

The essential features of the invention involved in the formation of the furnace-casing and the construction of the fire-chamber, in conjunction with the peculiarly-arranged grate-surface, are necessarily susceptible to modification without departing from the spirit or scope of the invention; but a pre-

ferred embodiment of the latter is shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional view of a metal-treating furnace constructed in accordance with the present invention. Fig. 2 is a horizontal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a detail in perspective of a section of the grate and a section of the raker associated therewith.

Like reference-numerals designate corresponding parts throughout the several figures of the drawings.

In the carrying out of the invention the furnace casing or body (designated in its entirety by the numeral 1) may be constructed in any approved manner and of suitable material, such as ordinarily employed in the construction of metal-treating furnaces. As shown in the drawings, the same essentially comprises in its general organization the longitudinal front and rear side walls 2 and 3, respectively, the front end wall 4, and the roof 5, said elements of the furnace casing or body structure being suitably joined together, and, if desired, the main body portion may be braced through the medium of a plurality of upright side truss-bars 6, arranged at intervals along the outer sides of both the front and rear side walls 2 and 3 and connected in pairs transversely across the top or roof of the casing by tie or truss rods 7.

The front side wall 2 of the furnace-casing is usually provided with a plurality of working openings 8, designed to be covered and uncovered by suitable doors 9 and permitting of ready access to the metal upon the hearth 10, provided at the bottom of the hearth-chamber 11, occupying the greater portion of the interior of the furnace-casing and extending longitudinally thereof. The hearth may be constructed in any suitable manner to provide for holding thereon metal in a molten or highly-heated condition for puddling or other purposes and is disposed below the plane of the working openings 8 to permit of proper manipulation of the metal. The hearth-chamber 11 is therefore confined between the hearth-bottom 10 and the main roof 5 of the furnace-casing.

At the front end of the hearth-chamber 11 the furnace-casing is provided with an interior upright bridge-wall 12, terminating at its

upper end 13 short of the roof and arranged in spaced relation to the front end wall 4 to confine between the upper portion of said wall and the upper portion of the bridge-wall the fire-chamber 14, within which the fire is maintained. The fire-chamber 14 has arranged at the bottom thereof an inclined grate-surface 15, which inclines upwardly and forwardly toward the front end wall 4, and hence declines from the latter toward the interior bridge-wall 12. The rearward declination of the inclined grate-surface 15 toward the bridge-wall bears an important relation to the roof formation, to be presently referred to, and while the said grate-surface may be variously constructed it is preferable in the carrying out of the present invention to provide the same in separate duplicate sections 16 16^a, each consisting of a plurality of regularly-spaced grate-bars 17, with which grate-bars alternate the raker-bars 18 of a rocking raker 19, arranged beneath the grate-section. The rocking raker 19 beneath each grate-section essentially consists of a rock-shaft 20, extending entirely across the furnace-casing and provided with an exterior operating-handle 21 and a series of the regularly-spaced bars 18, projecting from both sides of the shaft 20 and of a flaring width, as plainly shown in Figs. 1 and 3 of the drawings. The flared bars 18 of each rocking raker are normally supported in such position that their upper edges will lie entirely below the bottom edges of the grate-bars 17, and thus not interfere with the draft for the fire, while at the same time by rocking the shaft 20 the oppositely-projecting bars 18 will be carried up between the grate-bars into the fuel. In this action, on account of the flaring width of the bars 18, the same never pass entirely through the grate-spaces and above the plane of the grate-bars. Hence this peculiar formation of the raker-bars prevents the fire falling through while being shaken to loosen up the ashes, which fall from the grate-surface into the primary ash-chamber 22, immediately below the grate. A special function subserved by the rakers is to provide for raking the fire forward toward the bridge-wall whenever this is necessary.

The primary ash-chamber 22 is confined below the inclined grate-surface 15 and is provided with an inclined bottom 23 in substantial parallelism to the grate-surface 15 in order to deflect the ashes downwardly and rearwardly toward the dumping-damper 24, which is pivotally mounted in the interval between the lower end of the inclined bottom 23 and the bridge-wall 12. The damper 24 when closed permits of the accumulation of ashes in the chamber 22 and when opened serves to dump or drop the ashes into the main ash-pit 25 at the front of the furnace-casing. By reason of the provision of the primary ash-chamber 22, with its inclined bottom 23 in substantial parallelism to the grate-surface 15, a more even and effective distribution of

the draft through such grate-surface is provided for.

Immediately above and in the vertical plane of the dumping-damper 24 the grate-surface for the fire also includes a grate-door section 26, pivotally hung and having an exterior operating-handle 27, whereby the grate-door section 26 may be readily turned for cleaning the fire-chamber. The said grate-door section constitutes the portion of the grate-surface immediately adjoining the bridge-wall.

Suitable door-openings 28 and 29 are respectively provided in the front end wall for communication with both fire-chamber and the ash-chamber, and the door-opening 28 of the fire-chamber usually constitutes a feeding-opening, with which communicates a feed-chute 30 for the fuel and at one side of which is arranged a swinging feeding-bar 31, carried by a suitable swinging support 32, controllable through a handle 33, said elements constituting a feeding device for working fuel into the fire-chamber.

A distinctive feature of the invention resides in providing the fire-chamber 14 with a depressed crown 34. This depressed crown constitutes the front end portion of the roof 5 and is preferably of an angular or V form, being, in effect, a drop-section of the roof, so as to project into the top portion of the fire-chamber. The angular formation of the depressed crown 34 for the fire-chamber is the preferable form, inasmuch as the same provides immediately over the upper end 13 of the bridge-wall 12 an inclined updraft roof-section 35, which extends at both sides of the vertical plane of the bridge-wall and adjoins the horizontal section of the main roof 5 immediately in rear of the wall. The said inclined updraft section 35 by reason of its peculiar location serves to direct the heated products as they escape from the fire-chamber over the bridge-wall in an upward direction against the horizontal straight portion of the roof 5 at the extreme front of the hearth-chamber 11, whereby the heated products will be reflected downwardly from said portion of the roof into the front portion of the hearth-chamber, thus insuring a better distribution and utilization of heat for the front of the hearth-chamber than would otherwise be possible. The rearward declination of the inclined grate-surface 15 holds the fuel in such a position as to aid the circulation just described, and by reason of the depressed character of the crown 34 the same provides at the front upper corner of the fire-chamber a gas-pocket 36, within which will accumulate gas, smoke, and other products of combustion from the fire, that will be caused to slowly work their way around the apex of the depression or drop 34 before finding escape over the bridge-wall. When such gas, smoke, and other unconsumed products come in contact with the extreme heat at the bridge-wall, a thorough consumption thereof takes place, with the result of greatly superheating the heated currents that pass

into the hearth-chamber. In view of the extreme heat to which the apex or lowest point of the depression or drop 34 is necessarily subjected it is desirable to provide added protection therefor. This is accomplished by inserting at the apex or lowest point of the depressed crown 34 a heat-absorbing member 37, preferably in the form of a closed water-chamber extending transversely and entirely across the furnace-casing, and hence the full length of the depressed crown 34 for the fire-chamber, said water-chamber or heat-absorbing member 37 having its cooled surface exposed to the heat within the fire-chamber.

In a position corresponding to that of the inclined updraft roof-section 35 at the front end of the main horizontal portion of the roof 5 the latter is provided at the rear end thereof with a rear downwardly-inclined reflecting-section 38, which serves to reflect back into the hearth-chamber upon the metal on the hearth currents which skirt along the main portion of the roof.

At the rear end of the hearth-chamber 11 the furnace casing or body 1 is extended into a vent-flue 39 in the form of a contracted neck leading to the chimney or stack. At its inner end this vent-flue 39 is connected with the front and rear side walls 2 and 3 in different transverse planes. This peculiarity of construction is plainly shown in Fig. 2 of the drawings. By reference to this figure of the drawings it will be seen that the front side wall 2 is provided at the rear end thereof with an inturned oblique straight-faced deflecting wall-section 40, joining the wall of the flue 39 in the shoulder 41, while the rear side wall 3 is provided at its rear end with a corresponding inturned curved deflecting wall-section 42, joining the wall of the flue 39 in the shoulder 43. The deflecting wall-section of the rear or back wall 3 is disposed well in advance of the corresponding deflecting wall-section 40 of the front side wall 2, thus disposing the shouldered portions 41 and 43 out of alignment transversely. In explanation of this construction it is to be noted that the heat-currents passing into the hearth-chamber from the fire-chamber circulate with stronger force along the rear or back wall 3 than along the front wall, and hence by reason of arranging the deflecting wall-section 42 of the rear side wall in advance of the corresponding section of the front side wall the strong heat-currents along the side wall 3 as they reach the wall-section 42 are arrested by the latter wall-section and deflected thereby transversely across the hearth-chamber and into the currents of less strength circulating along the front wall, thereby tending to hold back such currents somewhat, and hence retaining the heat more effectively on the metal at the back portion of the furnace.

From the foregoing it is thought the construction, operation, and many advantages of the herein-described furnace will be readily apparent without further description, and

it will also be understood that changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

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

1. In a metal-treating furnace of the class described, the combination with the hearth-chamber and the fire-chamber separated by the bridge-wall, of the roof having a horizontal section over the hearth-chamber, and a depressed portion or drop constituting the crown of the fire-chamber, said depressed portion or drop including an inclined updraft section lying above the bridge-wall and meeting said horizontal roof-section, and also including a separate inclined section reaching to the front wall of the casing to form therewith a closed gas-pocket in the front upper corner of the fire-chamber.

2. In a metal-treating furnace, the combination with the hearth-chamber and the fire-chamber, of the roof having a horizontal section over the hearth-chamber, and an angular drop constituting the crown of the fire-chamber and cooperating with the horizontal roof-section to provide for the downward reflection of the heated products into the front portion of the hearth-chamber, said angular drop being provided at its apex with an inserted water-chamber having a side exposed within the fire-chamber and forming a heat-absorbing member.

3. In a metal-treating furnace, the combination with the hearth-chamber and the fire-chamber, of the roof having a horizontal section over the hearth-chamber and an angular drop constituting the crown of the fire-chamber and including an inclined section lying above the bridge-wall and meeting the horizontal roof-section in an obtuse angle, said angular drop also including an inclined section reaching to the front of the casing-wall to form a gas-pocket, and an inclined grate-surface arranged in approximate parallelism to the front inclined section of the angular drop and having a rearward declination toward the bridge-wall.

4. In a metal-treating furnace, the combination with the hearth-chamber and the fire-chamber, of the roof having a horizontal section over the hearth-chamber, and an inclined section overlying the bridge-wall and meeting the horizontal section in an obtuse angle whereby the heated products are deflected downwardly in the first instance into the front portion of the hearth-chamber, an inclined grate-surface at the bottom of the fire-chamber, said grate-surface having a grate-door section adjoining the bridge-wall, a primary ash-chamber arranged below the grate-surface and including an inclined bottom, and a dumping-damper below the grate-door section.

5. In a furnace of the class described, the

casing including a hearth-chamber and having a vent-flue at the rear end of the latter, the front side wall of said chamber being provided at the end adjoining the vent-flue with
5 an oblique straight-faced deflecting wall-section, and the rear side wall being also provided at the adjoining vent-flue with an intumed curved deflecting wall-section set in advance of the corresponding section of the
10 front side wall.

6. In a furnace of the class described, the casing including a hearth-chamber and having front and rear side walls and a vent-flue at the rear end of the hearth-chamber, the

front side wall being provided at the rear end 15 with an intumed deflecting wall-section, and the rear side wall being also provided at its rear end with an intumed deflecting wall-section set in advance of and out of the transverse alinement with the corresponding section of the front side wall. 20

In testimony whereof I affix my signature in presence of two witnesses.

MICHAEL J. MURDOCH.

Witnesses:

H. C. CORBETT,
W. H. WOOLF.