

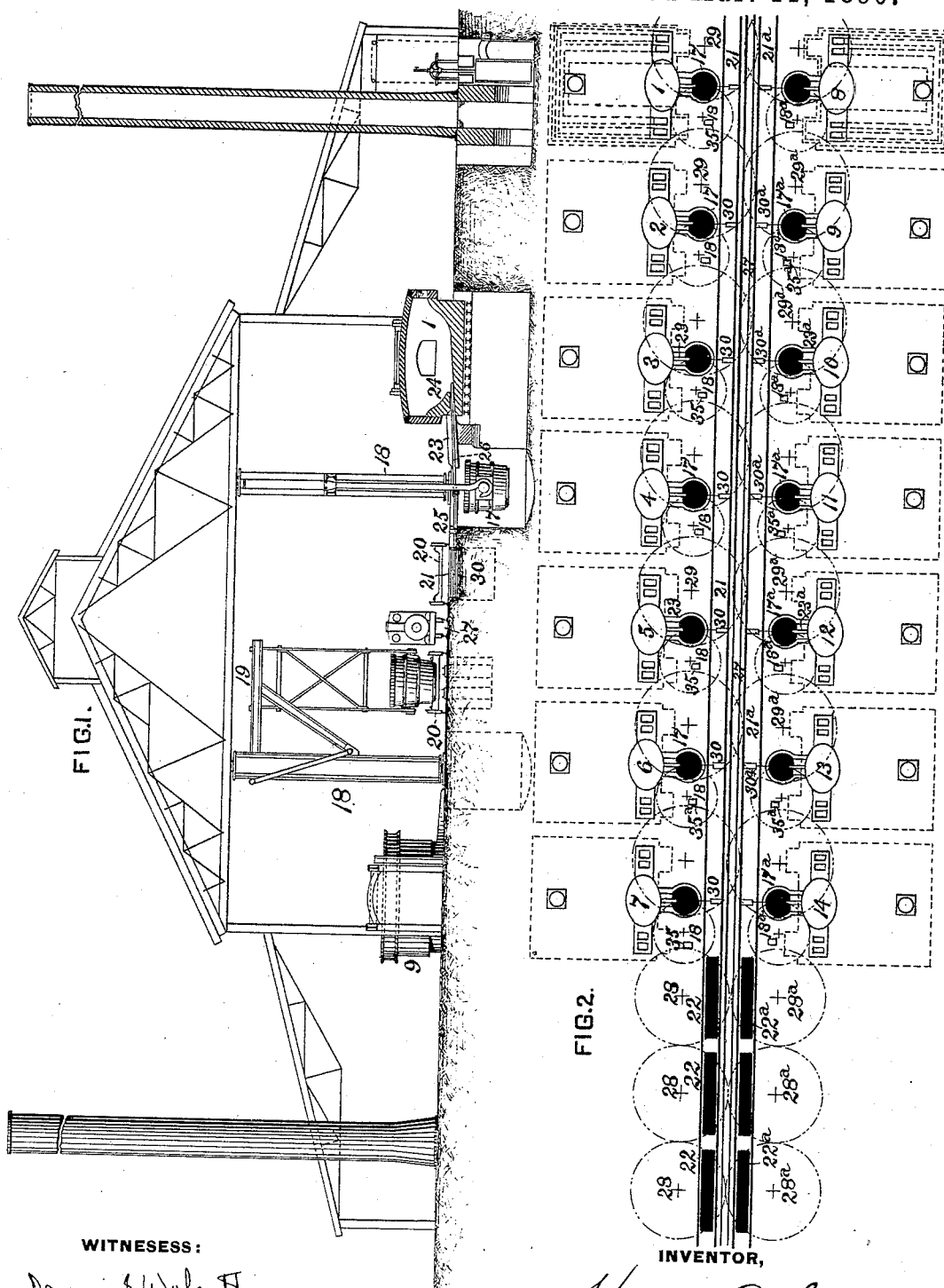
(No Model.)

2 Sheets—Sheet 1.

H. AIKEN.
METALLURGICAL PLANT.

No. 423,199.

Patented Mar. 11, 1890.



WITNESSES:

Danwin S. Wolcott
F. E. Gaither

INVENTOR,

Henry Aiken
by George H. Christie
Att'y.

(No Model.)

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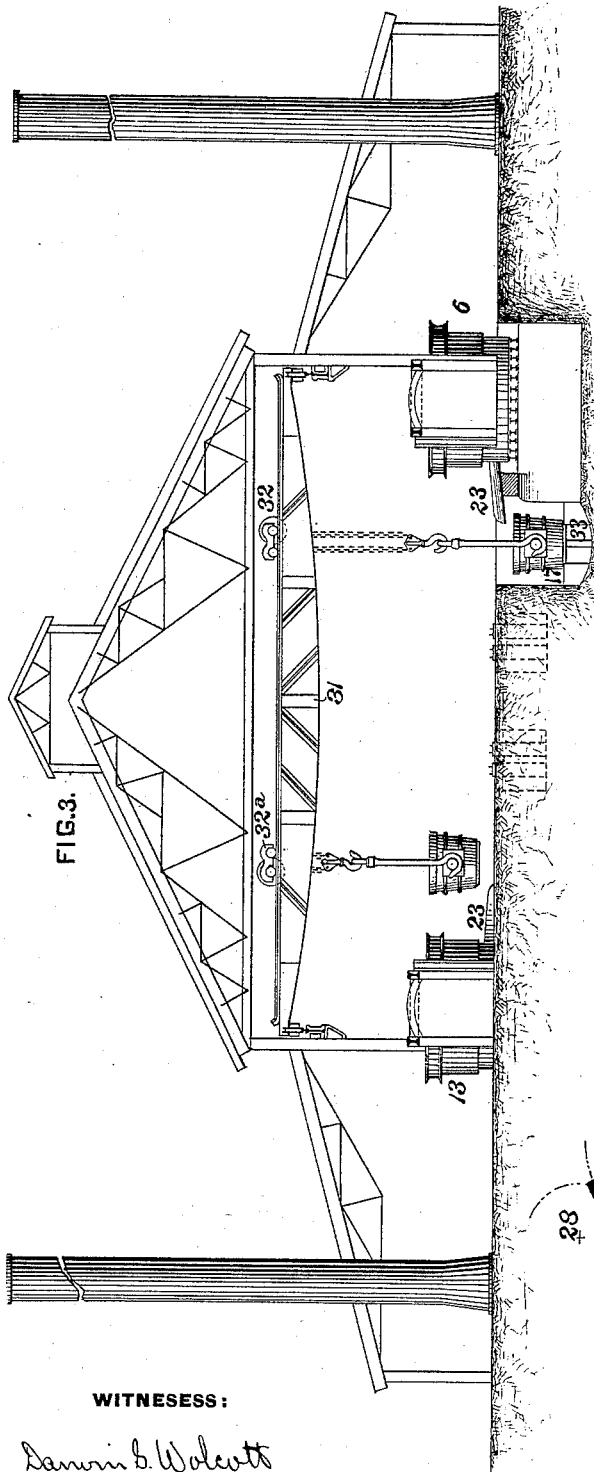


FIG. 3.

WITNESSESS:

Danwin B. Wolcott
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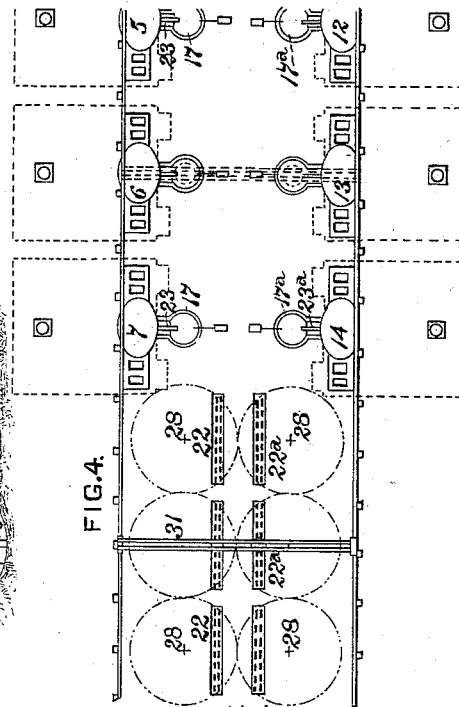


FIG. 4.

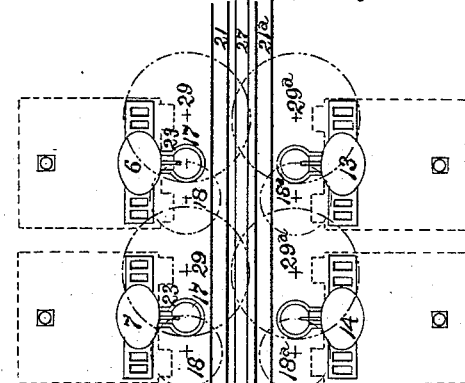


FIG. 5.

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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF HOMESTEAD, PENNSYLVANIA.

METALLURGICAL PLANT.

SPECIFICATION forming part of Letters Patent No. 423,199, dated March 11, 1890.

Application filed November 5, 1889. Serial No. 329,350. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, a citizen of the United States, residing at Homestead, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Metallurgical Plants, of which improvement the following is a specification.

The invention described herein relates to improvements in metallurgical plants. According to the present practice the open-hearth furnaces forming such plants are generally arranged in two ways. In one arrangement the furnaces are entirely above the floor-level, no pits being employed; hence the hearth must be raised to a considerable height in order that the ladle may be swung in under the tap-hole or trough. In the other arrangement the furnaces are built with their hearths at or near the floor-level and are located around or along the edge of a pit, which serves as the ladle or tapping pit for each and all the furnaces. In both arrangements of plant the ladles, after being filled with molten metal, are placed on cars running on a system of track passing along adjacent to furnaces and extending to or toward the casting-pits. As this system or line of track is in both arrangements below the level of the hearth, it will be readily understood that in case of the breaking out of any one of the furnaces, which frequently contain thirty or forty tons, the molten metal will flow down over the system of track, destroying the same and stopping the operation of all the other furnaces until the metal has been removed and the track replaced.

The object of this invention is to provide for the isolation of each furnace of the plant, as regards the charging, melting, and tapping operations, from the other furnaces, and for the casting of the metal from the several furnaces into molds arranged in a pit or pits located at a suitable distance from the furnaces.

In the accompanying drawings, forming a part of this specification, Figure 2 is a plan view of my improved plant. Fig. 1 is a sectional elevation of the same, the plane of section being indicated by the line *x x*, Fig. 2; and Figs. 3, 4, and 5 are views in elevation and plan of modifications of the plant.

In the practice of my invention I arrange a series of two, three, or more open-hearth furnaces 1 2 3, &c., in a row, as shown in Fig. 1, each furnace being provided with regenerative flues or chambers, stack, and reversing-valves, so that it may be operated independently of the other furnaces in the series. Each furnace is also provided with a ladle-pit 17, located in front of the furnace and below the tapping-hole of the same and entirely independent of and isolated from the pits of each and all of the other furnaces. Adjacent to each ladle-pit is placed a crane 18, preferably of the hydraulic type, said cranes being provided with jibs 19, extending over the pits, for the purpose of supporting the ladles in position under the tapping-holes, swinging them into and out of the pits, and depositing them upon suitable car or cars 20 on the line of track 21, extending along in front of the series of furnaces and in such proximity to the ladle-pits that the ladles may be easily transferred from the pits to the car, and vice versa. Between the rails of the track 21, and preferably at a distance from the line or row of furnaces, one or more casting-pits 22 are formed, said pits being provided with the usual appliances for handling the molds, ingots, &c.

In order to facilitate the operation of tapping off the metal, a fluid-pressure cylinder 30 is arranged beneath the floor-plates of the plant at the edge of each ladle-pit, opposite and in line with the trough 23 and tapping-hole 24 of each furnace. The piston-rod 25 of the cylinder is provided at its outer end with a pin adapted to engage an eye on the outer end of the tapping-bar 26, or any other suitable device may be employed for connecting the piston-rod and tapping-bar.

When it is desired to tap off any of the furnaces, the ladle being supported by its crane under the trough 23, the tapping-bar is placed in position, one end in engagement with the piston-rod 25 and the other end resting on a guide supported by the trough in line with the tap-hole 24. The forward end of the bar is then forced through the plug in the tap-hole by the admission of fluid-pressure into the cylinder 30, thereby on the withdrawal of the bar permitting the metal to flow into the ladle. As soon as the metal has

been discharged into the ladle the latter is by the operation of the crane 18 lifted from the pit and placed upon a car 20 on the track 21. The car and ladle are then moved along the track over the molds in one of the divisions or compartments of the pit 22 by an engine on the track 21, or preferably upon a track 27, parallel with the track 21, but at such a distance therefrom that the engine will be, while moving along its track, outside of the swing of the jib of the cranes 18 or ladles suspended from the jibs. This provision of an independent track for the engine, while not essential to the successful operation of the plant, is preferred, for the reason that the movements of the engine will not be interfered with by the ladles nor interfere with the movements of the ladles to and from the car. As soon as the metal in a ladle has been discharged into the molds in the pit it is returned to its furnace, connected to the jib of the crane 18 of said furnace, and swung from the car into its normal position in the ladle-pit, where it is supported by the crane until it is again charged by tapping the furnace, as hereinbefore stated. It is preferred that each furnace should have a ladle, which should always be in position under the tapping-hole, except during the transference of the molten metal to the casting-pits, as hereinbefore described, so that in case of a furnace breaking out or any indications thereof the molten metal may be tapped off into the ladle, thus preventing a loss of the metal and avoiding the labor incident to the removal of the chilled metal from the ladle-pit. As soon as the empty ladle has been removed from the car the latter is moved in front of a furnace which has been or is about to be tapped.

It will be understood that several cars may be employed in transporting the ladles from the furnaces to the casting-pit.

Suitable cranes are arranged, as indicated at 28, in such proximity to the casting-pits as to permit of their employment in handling the ingot-molds, &c., and each furnace is provided with an auxiliary crane, as indicated at 29, employed in placing the troughs in position, adjusting the tapping-bar, removing slag from the ladle-pit, and in repairing the furnace.

While the plant may be arranged as hereinbefore described for a single line of furnaces, I prefer to arrange them in two lines, as shown. Each furnace of each line is provided with its own isolated ladle-pit 17, ladle-crane 18, tapping-cylinder 30, and auxiliary crane 29, and each line of furnaces is provided with a ladle-track 21, arranged on opposite sides of a single engine-track 27, so that the engine on said track may shift the ladle-cars on each of the tracks passing along the two lines of ladle-pits. In this preferred arrangement of plant casting-pits 30 are formed between the rails of each line of track 21^a, or in proximity thereto, as hereinbefore.

The valve mechanisms for operating the ladle-crane 18, auxiliary crane 29, and the tapping mechanism 30 are located at one place, as indicated at 35, in order that said parts may be easily operated by one man.

It will be observed that each furnace of the plant is entirely independent of and isolated from all the other furnaces as regards the charging, melting, and tapping operations, so that in case of any accident to the furnace—such as the breaking out thereof—or any accident to the ladle during the tapping operation whereby the molten metal escapes, the latter is confined to the ladle-pit of that furnace, and hence cannot interfere in any way with the operation of the other furnaces; and it will be further observed that by dividing the casting-pit in two or more compartments any accident occurring in one of said compartments will not interfere with the casting operations in the others.

In lieu of forming the casting-pits between the rails of the tracks, as shown in Figs. 1 and 2, they may be located at one side thereof, as shown in Fig. 3. These pits are preferably curved longitudinally, the radii of curvature corresponding to the distances of the cranes indicated at 36 from the tracks 21^a, and said cranes are preferably placed equidistant from the tracks and the pits, so that the ladles may, when lifted from the cars 20 by the cranes, be swung around over the molds without any racking in or out of the trolleys on the crane-jibs after the ladles have been connected thereto.

While preferring the arrangement hereinbefore described, wherein each furnace is provided with a crane for moving the ladle from the ladle-pit to the car running on tracks on the floor-level of the plant, one or more traveling cranes 31, mounted at their ends upon overhead tracks, may be employed, as shown in Figs. 4 and 5. The bridges of these cranes have one or more trolleys 32 mounted thereon, which can be shifted by the usual or any suitable mechanism.

When employing the overhead cranes, the system of tracks, the cars, and the ladle-crane 18 may be dispensed with, the ladles being lifted from their pits, where they normally rest upon stools 33, by a chain and hydraulic lift carried by the trolleys, and then carried by the lateral movements of the cranes over the casting-pits. These casting-pits may be located in line with the ladle-pits, thereby avoiding any movement of the trolleys along the cranes, or may be located between such lines, but beyond the same, in which case the trolleys with the ladle must be moved inwardly, so as to bring the ladles over the pits.

I claim herein as my invention—

1. In a metallurgical plant, a series of two or more furnaces, each provided with an independent ladle-pit, a series of two or more ladles, and means for transferring the ladles from the ladle-pits to casting pit or pits common to

all the ladles, and in combination with such casting pit or pits, substantially as set forth.

2. In a metallurgical plant, the combination of a series of two or more furnaces, each
5 provided with a ladle-pit, one or more casting-pits located at a distance from the furnaces, a line of track arranged adjacent to the ladle and casting pits, cars mounted on the line of track, and cranes for transferring
10 the ladles from the ladle-pits to the cars, and vice versa, substantially as set forth.

3. In a metallurgical plant, the combination of a series of two or more furnaces, a like series of ladle-pits, a series of two or more cyl-
15 inders for operating the tapping-bars; a series of two or more ladle-cranes, one or more casting-pits, a line of track connecting the ladle and casting pits, and one or more cars mounted on said track, substantially as set
20 forth.

4. In a metallurgical plant, the combination of a series of two or more furnaces, a like series of ladle-pits, a line of track passing
25 along in proximity to the ladle-pits, one or more casting-pits located between the rails of the track at a suitable distance from the ladle-pits, ladle-cars mounted on the track, and cranes for transferring the ladles to and from the cars, substantially as set forth.

5. In a metallurgical plant, the combination of a series of two or more furnaces, a like series of ladle-pits, a series of two or more ladle-cranes, one or more casting-pits located at a suitable distance from the furnaces, a line of track passing along within the sweep of the
35 jibs of the ladle-cranes and extending to or in proximity to the casting pit or pits, ladle-cars mounted on said line of track, a second line of track outside of the sweep of the jibs of the ladle-cranes, and an engine on said
40 second line of track, substantially as set forth.

6. In a metallurgical plant, the combination of two lines of two or more furnaces, each furnace provided with a ladle-pit, one or more casting-pits, two lines of track pass-
45 ing along in proximity to the ladle and casting pits, ladle-cars on said lines of track, a third line of track between the other lines of track, and an engine on said third line of track adapted to shift the ladle-cars on either
50 of the other tracks, substantially as set forth.

In testimony whereof I have hereunto set my hand.

HENRY AIKEN.

Witnesses:

R. H. WHITTLESEY,
DARWIN S. WOLCOTT.