No. 863,968.

PATENTED AUG. 20, 1907.

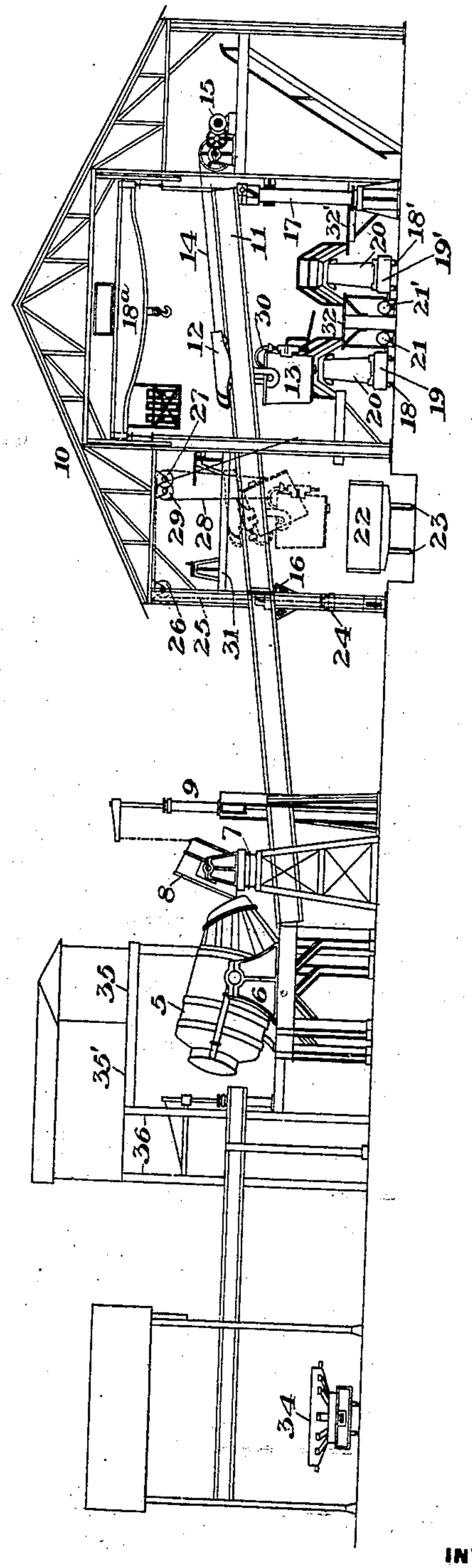
F. H. CROCKARD & S. HOSKING.

APPARATUS FOR STEEL PLANTS.

APPLICATION FILED APR. 27, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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INVENTORS:

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by their attorneys
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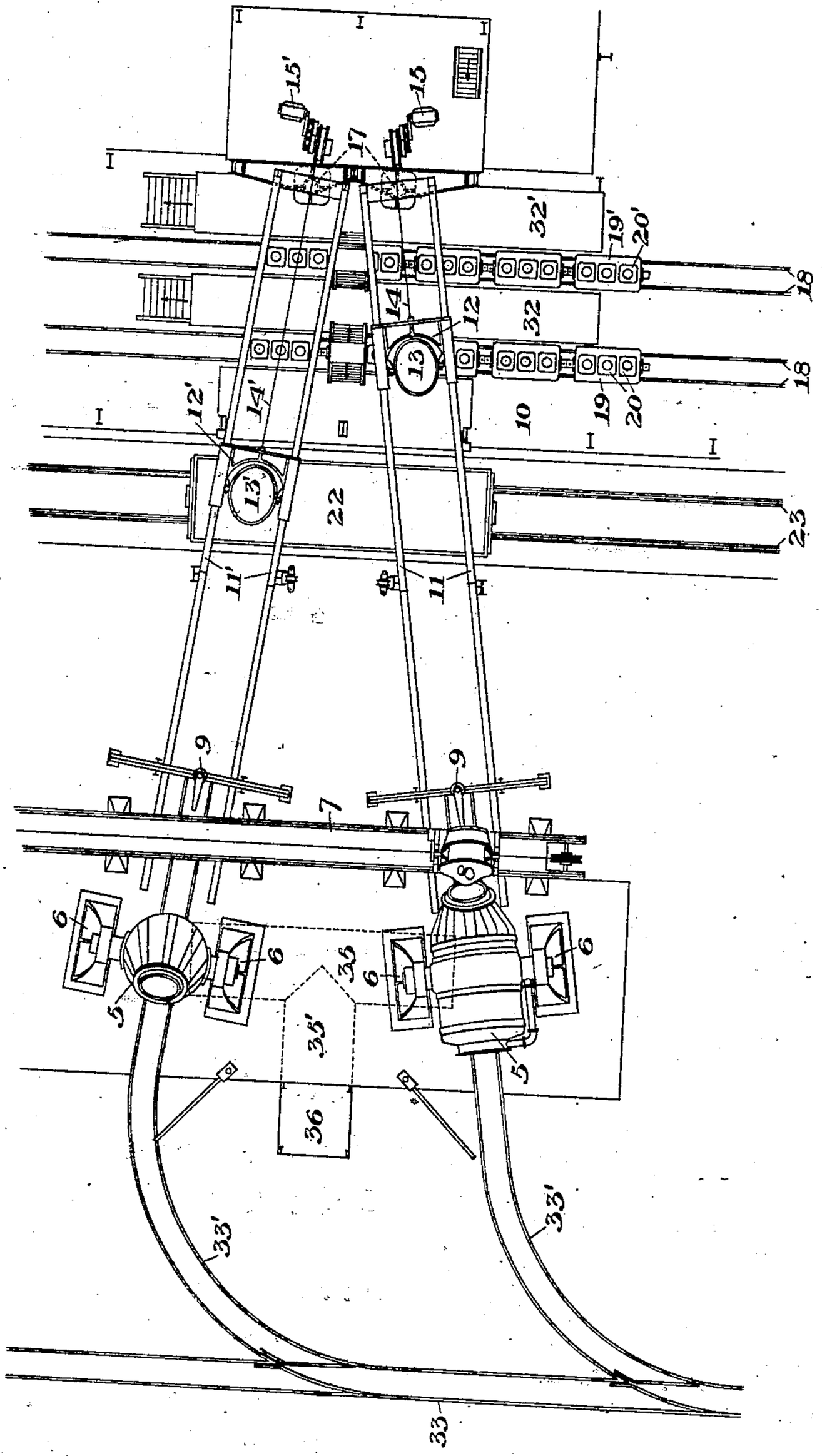
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

FRANK H. CROCKARD AND SETH HOSKING, OF WHEELING, WEST VIRGINIA.

APPARATUS FOR STEEL PLANTS.

No. 863,968. Specification of Letters Patent. Patented Aug. 20, 1907.

Application filed April 27, 1905. Serial No. 257,615.

To all whom it may concern:

Be it known that we, FRANK H. CROCKARD and SETH HOSKING, both of Wheeling, Ohio county, and State of West Virginia, have invented a new and useful Apparatus for Steel Plants, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a Bessemer steel plant constructed according to our invention, and Fig. 2 is a plan view showing the converters and pouring tracks, and the tracks leading from the converters to the pouring tracks.

Our invention relates to the manufacture of Bessemer steel and affords improved means for handling and pouring the metal after it has been converted, and overcomes disadvantages met with in the apparatus used heretofore for this purpose.

Another object of our invention is to provide means by which the number of operations required in changing the bottoms of the converters is lessened and the time lost in operating the plant owing to the delay occasioned by such changes is reduced.

In bessemer plants as constructed heretofore the equipment for handling the molten metal from the converters consists of a ladle crane which carries the pouring ladle and is adapted to be swung under each of a pair of converters to receive the molten metal and then swung on its axis to the place where the metal is poured into the ingot molds. The ladle crane is vertically movable to permit of the ladle being lowered to receive the charge from the converters and to be raised sufficiently to enable the metal being poured into the ingot molds. As the one ladle crane handles all the metal from two converters, it is necessary to change the ladles on the crane more frequently than if each converter were provided with a separate ladle. Any delay in the operation of the crane or ladle also delays the operation of the converters, and in this way prevents the plant from being operated to its greatest capacity. The bottoms of the converters also require frequent renewals, and in existing plants when a bottom is to be changed on the converter an empty jack-car is placed on its track beneath the converter. The jack-car is provided with a vertical cylinder, the piston of which is moved upwardly until it is in engagement with the bottom then on the converter. The bottom is then disengaged from the converter and lowered on the car, and the car and bottom removed from beneath the converter. Another similar jack-car carrying the new bottom is then placed beneath the converter, and the bottom is raised into position on the converter and the empty car then removed.

With plants having a ladle crane for handling the metal from the converters the construction has been such as to prevent the tracks located beneath the converters from being extended beyond the converters into the pit. This has made it necessary heretofore to remove the car carrying the removed bottom before the car with the new bottom could be placed in position to be attached to the converter.

By means of our invention the difficulties heretofore met with are overcome and liability of delay in the continuous operation of the plant is greatly lessened.

In the drawings, 5, 5 are the converters pivoted on suitable bearings 6, 6.

7 is an elevated track on which the ladle-car 8 travels in supplying molten metal to the converters.

In front of each of the converters are cranes 9, 9 by which the ladles are tipped to pour the metal into the converters.

10 is a pouring house, which is preferably located at some distance in front of the converters in order to insure the pouring operation not being interrupted when the converters are tipped, and to remove the workmen out of the heat of the blowing operation.

Leading from the pouring house 10 to each of the converters are elevated tracks 11, 11′, and mounted on these tracks are trolleys 12, 12′ each of which carries a pouring ladle 13, 13′. The elevated tracks, as shown, are inclined upwardly from the converters toward the pouring house, and the ladles 13, 13′ are drawn upwardly on their track by means of the ropes 14, 14′, and suitable winding motors 15, 15′ and run down the inclined tracks 11, 11′ by gravity. In this way the trolleys and ladles are returned into position to receive another charge.

In the pouring house 10 beneath the tracks 11, 11′ are parallel pouring tracks 18, 18′ running transversely through the pouring house.

Mounted on the tracks 18, 18′ are mold cars 19, 19′, which carry the ingot molds 20, 20′. The mold cars are moved along the tracks in the operation of filling the molds by means of suitable car-moving mechanism 21, 21′.

After the metal has been poured from the ladles, the ladles are moved along their tracks until they are over the cinder car 22, which is placed on the cinder track 23, also running through the pouring house. When the ladles are in such position they are tipped to dump the cinder therefrom into the cinder car 22 by means of the

cylinder 24 and chains 25 passing over suitable pulleys 26, 27 located in the roof of the building. A chain 28 passing over the pulley 29 is also provided for handling the ladle stopper 30 by the workmen on the platform 31. The pouring is controlled by the operators, and the mold-cars are shifted along their tracks from the pouring platforms 32, 32′ in the pouring house.

Above the pouring tracks 18, 18′ and elevated tracks 11, 11′ is an overhead traveling crane 18ª by which the ladles are removed and replaced in their trolleys and by which the molds may be placed in upright position on the mold cars.

A track 33 leads from the bottom-house, in which the converter bottoms are repaired, and spur tracks 33′ lead from the track 33 to points beneath and in front of the converters.

By means of the jack-cars 34 the bottoms are moved on the tracks 33, 33′ to and from the bottom-house to the converters and are raised and lowered into and out of engagement with the converters.

Above and between the converters is a scrapping platform 35, which is connected by a platform 35′ with a hoist 36, on which the scrap used is hoisted to the platform, from which point it is placed in the converters, as required.

The operation of a plant constructed according to our invention is as follows:—The ladle car 8 is filled with molten metal from a cupola or metal mixer, and the car is moved along its track 7 to a position in front of the converter in which the charge is to be placed. The ladle on the car 8 is then tipped by means of the tipping crane 9 and its contents emptied into the converter which has been turned on its trunnions into position to receive the charge of molten metal. The ladle car 9 is then taken to receive another charge of metal from the cupolas or mixer. Meanwhile the converter has been turned up and the blowing operation commenced. When the blowing operation has been completed, the converter is turned so as to pour the charge into the pouring ladle 13 which has been moved along its track into position to be filled. The ladle 13 on its trolley 12 is then moved along its track until it is in position above one of the pouring tracks 18, 18′, and the ladle is adjusted vertically relatively to the top of the ingot molds, by raising or lowering the inclined track on its pivot 16 by means of the vertical adjusting cylinder 17. The pouring operation is then carried on in the usual manner, after which the ladle is moved along its track until above the car 22 on the cinder track 23 and is tipped to dump the cinder and to make any necessary repairs to the ladle or ladle stoppers. The ladle is then allowed to run down its inclined track to receive another heat of steel, which meanwhile has been blown in the converter.

When it becomes necessary to change the bottom on one of the converters, two jack-cars, one carrying the new bottom to be placed on the converter and the other being empty, are moved along the spur tracks until the empty car is in position to receive the bottom of the converter. When brought into this position the bottom is removed in the usual manner, and thereafter both cars are shifted to bring the new bottom under the converter in position to be raised and secured to the converter.

By extending the spur tracks beyond the converters sufficiently to hold two jack-cars, it is not necessary to shift from the spur-track the car on which the removed bottom is received before the car having the new bottom is placed in position beneath the converter. In this manner loss of time in shifting the cars is avoided, and the time required for changing the bottoms on the converters is reduced.

The advantages of constructing a plant according to our invention are many. By dispensing with rotating ladle cranes a continual source of trouble and expense is avoided and the possibility of a suspension of operations which would result from an accident to the ladle-crane is removed. The absence of the ladle-crane, renders a top structure unnecessary and the expensive building over the converters may be dispensed with. This makes the heat from the converters much less oppressive to the workmen. The pouring house being located at some distance from the converters loss of time in pouring caused by the heat and sparks from the converters when they are turned down on the completion of the blowing operation is avoided. Each converter having a pouring ladle, the metal can be poured in less time than where only one ladle is used to receive the metal from two converters. In case of accident to one ladle, the other can be operated, and a suspension of operations until the ladle is repaired is not necessary. By the use of two pouring tracks, different grades of metal can be made in the converters, and by pouring the different grades on different tracks they may be kept separate without trouble. By the saving in time in changing the bottoms and in pouring the metal the output of the plant is increased.

The elevated tracks which we show as inclined may be horizontal within the scope of our broader claims, and instead of converging toward the pouring tracks they may be parallel.

Other changes in the construction and arrangement of the parts may be made within the scope of our invention, since

What we claim is:—

1. In a bessemer plant, the combination with a converter and an ingot pouring track, of a ladle track in stationary position extending from below the top of the converter to said pouring track, a ladle carrier having a ladle and mounted on the ladle track, and means whereby the ladle carrier is moved on said ladle track between said pouring track and converter; substantially as described.

2. In a bessemer plant, the combination with a plurality of converters, and an ingot pouring track, of ladle tracks in stationary position extending from below the top of the converters to said pouring track, ladle carriers having ladles and mounted on the ladle tracks, and means whereby the ladle carriers are moved on said ladle tracks between the pouring track and converters; substantially as described.

3. In a bessemer plant, the combination with a converter and a plurality of ingot pouring tracks, of an elevated ladle carrier track in stationary position extending from below the top of the converter to said pouring tracks, a ladle carrier having a ladle and mounted on the elevated

ladle carrier track, means for moving the ladle carrier on the ladle carrier track, and means for vertically adjusting the ladle and ladle carrier above the pouring tracks; substantially as described.

4. In a bessemer plant the combination of a plurality of converters, means for supplying metal to the converters, a pouring track, elevated ladle tracks in stationary position extending from beneath the converters to said pouring track, ladle carriers having ladles mounted on the elevated ladle tracks, and means for moving the ladle carriers on the elevated ladle tracks between the pouring track and converters; substantially as described.

5. In a bessemer plant the combination of a plurality of converters, means for supplying metal to the converters, a pouring track, inclined ladle tracks in stationary position extending from beneath the converters to said pouring track, a ladle carrier having a ladle mounted on inclined ladle tracks and means for moving the ladle carriers on the inclined ladle tracks between said pouring track and converters; substantially as described.

In testimony whereof, I have hereunto set my hand.

FRANK H. CROCKARD.
SETH HOSKING.

Witnesses:

THOS. A. BEATTIE,
LAWRENCE H. UNDERWOOD,
F. B. DODGE,
W. F. CREIGHTON.