

(No Model.)

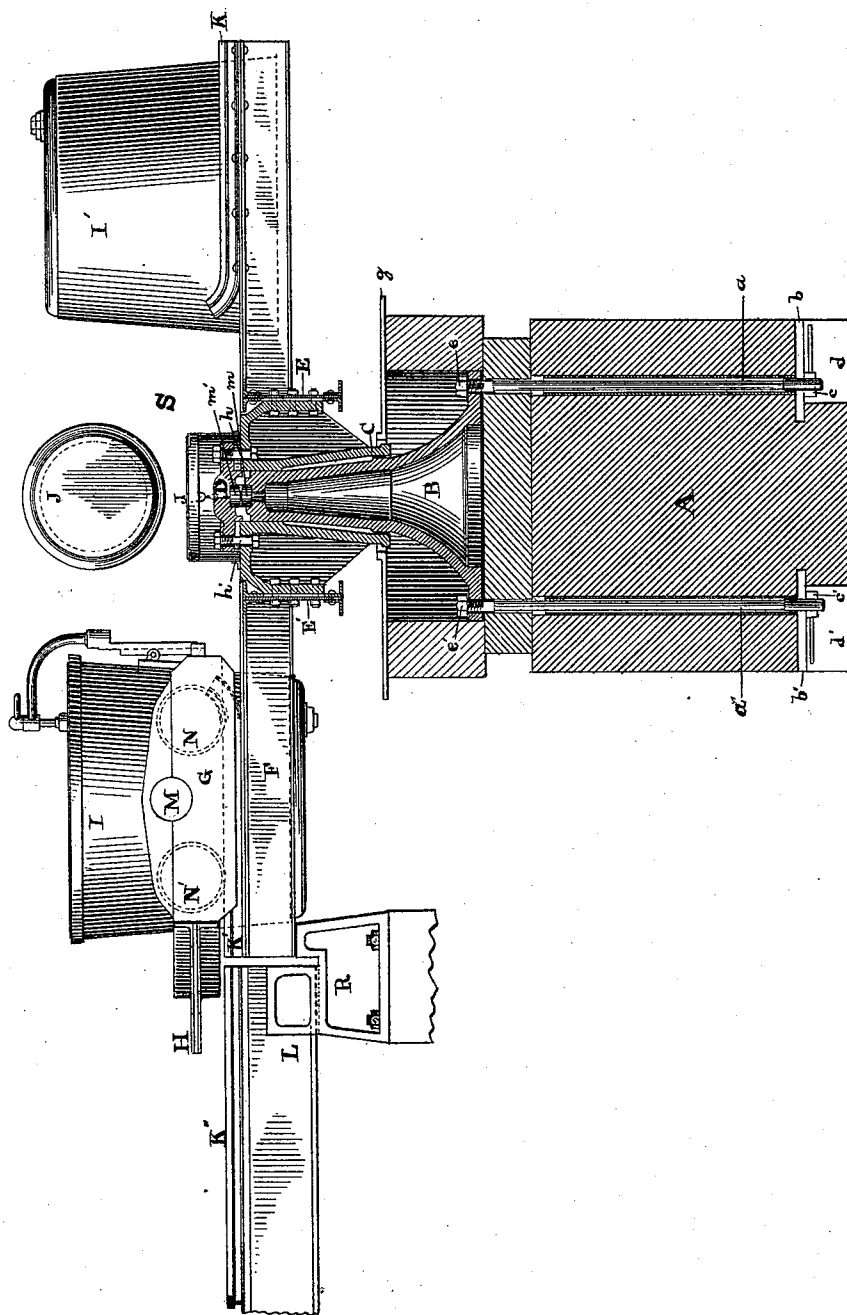
4 Sheets—Sheet 1.

C. S. PRICE.
APPARATUS FOR CHANGING LADLES.

No. 581,367.

Patented Apr. 27, 1897.

Fig 1.



Witnesses

Ed. R. Buchanan
Geo. E. Thackray

Inventor

Charles S. Price

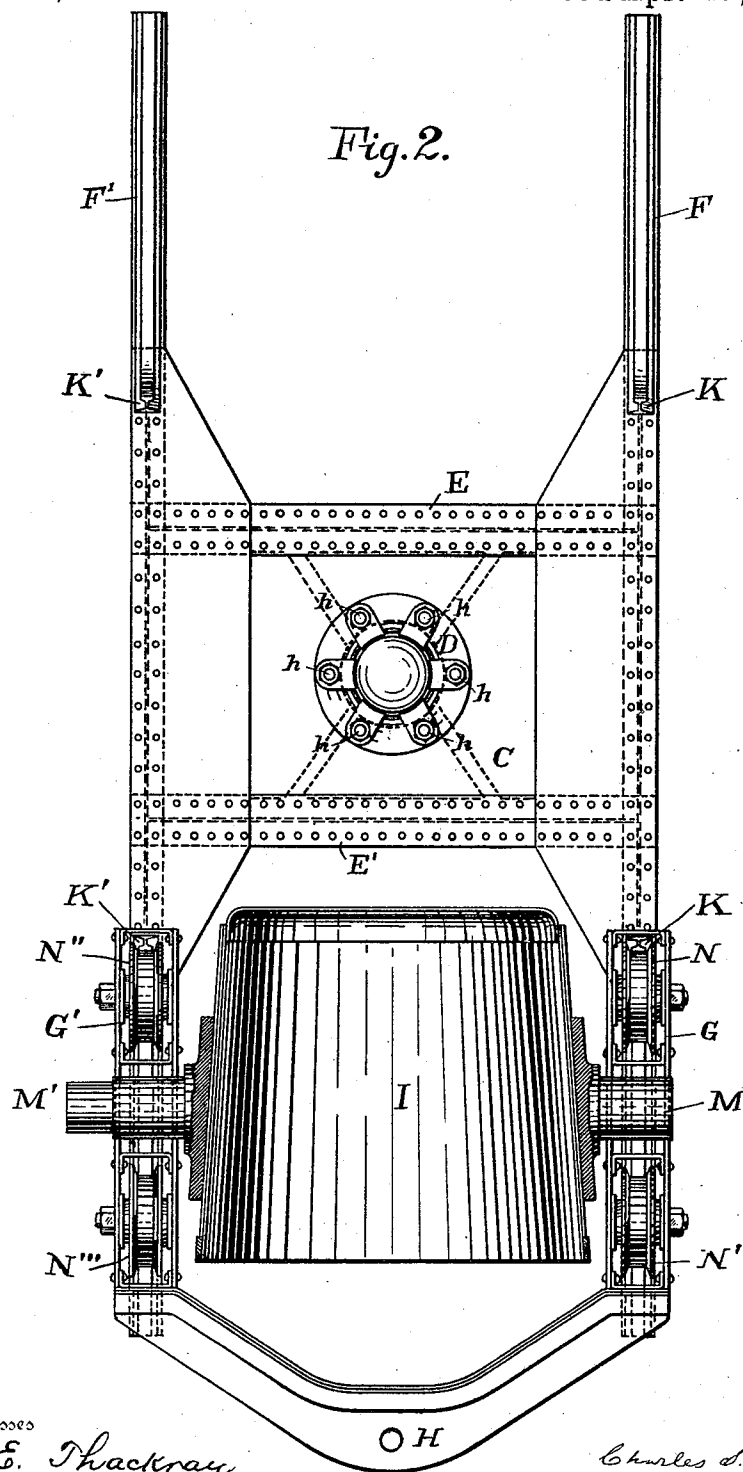
By his Attorneys

Cyrus Elder

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Witnesses
Geo. E. Thackray
Harry A. Shields,

Inventor
Charles S. Price
by his attorney
Lyman Elder

(No Model.)

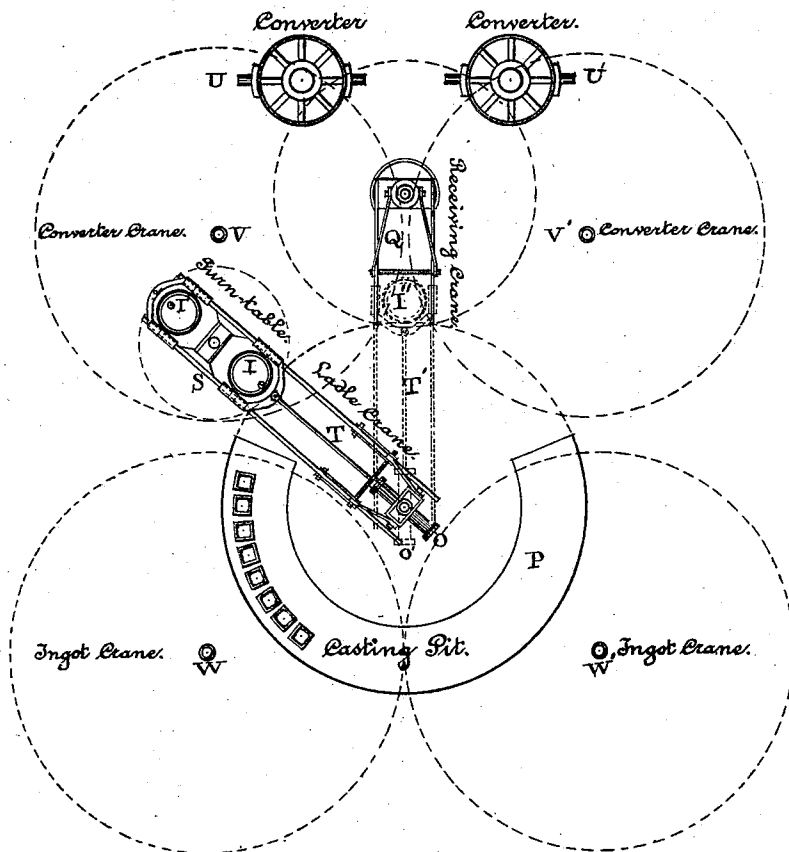
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Fig. 3.



WITNESSES.

Ed. R. Buchanan
Geo. E. Thackray

INVENTOR.

Charles S. Price
by Cyrus Elder
his ATTORNEY.

(No Model.)

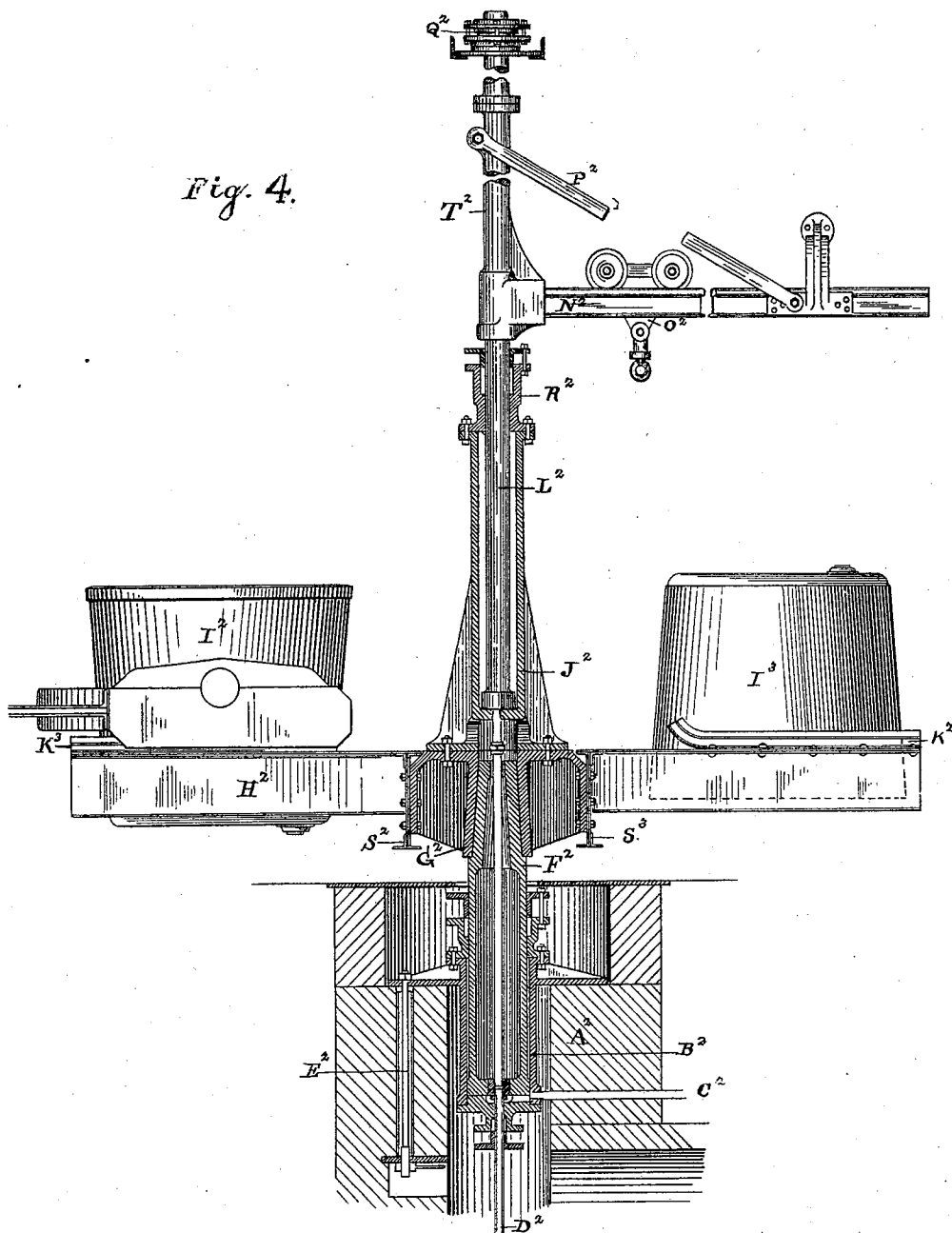
4 Sheets—Sheet 4.

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Fig. 4.



WITNESSES.

Wm. P. Scoby
W. G. Moore

INVENTOR.

Charles S. Price
by Cyrus Eldred
his
ATTORNEY.

UNITED STATES PATENT OFFICE.

CHARLES S. PRICE, OF JOHNSTOWN, PENNSYLVANIA.

APPARATUS FOR CHANGING LADLES.

SPECIFICATION forming part of Letters Patent No. 581,367, dated April 27, 1897.

Application filed January 9, 1891. Serial No. 377,275. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. PRICE, a citizen of the United States, residing at Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Changing Ladles; 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.

In the process of manufacturing steel by the pneumatic or by the open-hearth process it is customary to use a ladle, carried on a ladle-crane, for the purpose of receiving the steel from the converters or furnaces and delivering it to the molds, which are set in a casting-pit, over which the ladle is swung.

There is always a greater or less amount of slag or refuse floating on top of the steel in the ladle, and as the steel is withdrawn a portion of this slag adheres to the inner side of the ladle. The greater part, however, is generally left in the bottom of the ladle after the steel is poured therefrom. In order that the ladle may be used again without undergoing a thorough repair to its lining, it is necessary to clean this slag from it quickly, before it has time to cool and harden. Most of this slag may be dumped by turning the ladle over on its trunnions, the remainder being removed by a scraper or bar. On account of the delay that would be occasioned in removing the ladle for cleaning, and the consequent chilling of the slag and small amount of steel contained in it, this cleaning operation has heretofore been performed while the ladle is in position on its crane, and of necessity the crane cannot be used for receiving or casting a heat of steel while the cleaning operation continues. It was also the practice to remove a ladle needing repairs from the ladle-crane and replace it by a good one by means of an auxiliary crane, the chain-hooks of which were inserted into suitable lugs on opposite sides of the ladle, near its top.

The above method of changing ladles necessitates several operations, which consume time, and during its continuance the ladle-crane cannot be used for casting.

The delays and difficulties above mentioned have the effect of limiting the output of a steel plant; and it is the object of my invention to provide an apparatus by the use of which these delays and difficulties may be avoided and the product of a steel plant increased thereby.

My invention consists in placing a turn-table in such a position with regard to a ladle-crane that a ladle may be transferred from the arms of one to those of the other. My turn-table has a track on each of its ends corresponding in form to the track on the ladle-crane, and it has a pivot at its center, about which it may be easily turned in a horizontal plane. My turn-table is so located and constructed that by turning it about its pivot either of its tracks can be brought into line with those of a ladle-crane, the ends of the two tracks being close together, so as to practically form one track. While the ladle-crane and turn-table are in line with each other, as above described, their contiguous ends are supported by iron plates under them, these plates being carried by a suitable pedestal or foundation. While the turn-table and ladle-crane are in position for transferring a ladle their ends may be locked together, to prevent accident, by a latch, sliding bolt, or any suitable device.

Instead of turning on a stationary pivot the turn-table can be provided with a central hydraulic cylinder and a hydraulic plunger fitting therein, so constructed as to allow the table to be raised and lowered and swing about its axis in the manner of a hydraulic crane. It may also have fixed upon it near its center a small auxiliary crane, actuated by hydraulic or other suitable power, for the purpose of dumping or tipping the ladles when they are on the turn-table, and this auxiliary crane may also be used for taking ladles from and placing them on the turn-table.

Although my turn-table is described as having a separate track at each end, I do not limit myself to this specific arrangement, but wish it to be understood that by a different construction the track of the turn-table may be made continuous from end to end and in

such manner as to allow a ladle to be shifted on the track from one end of the turn-table to the other. It is obvious that my turn-table can be used in any metallurgical plant
5 provided with one or more ladle-crane, ladle-tracks, or combination of same or their equivalent.

My invention is shown in the drawings in connection with a Bessemer plant, but it can
10 also be applied to any plant where ladles are used.

Having given this general description of my invention, I will now, to make my invention more clear, refer to the annexed four
15 sheets of drawings, which form a part of this specification and in which like letters refer to like parts.

Figure 1 is a side elevation showing turn-table with two ladles upon it, end of jib of
20 ladle-crane, and showing pivot of turn-table and its foundation in vertical section through their centers. Fig. 2 is a plan of turn-table, showing a ladle at one end turned horizontally on its trunnions. Fig. 3 is a general
25 plan showing my invention in connection with a Bessemer plant provided with receiving and casting cranes. Fig. 4 is a sectional elevation of the apparatus fitted with hydraulic plunger and auxiliary crane situated
30 on the turn-table.

In the different figures, A represents the foundation of my turn-table, having near its bottom the openings $d\ d'$ to allow the introduction of the keys $c\ c'$ into the keyways at
35 the bottom of the anchor-bolts $a\ a'$, these keys taking a bearing against the washers $b\ b'$, which are embedded in the foundation A. At their upper ends these bolts $a\ a'$ pass through holes in the pivot-casting B and by
40 means of the nuts $e\ e'$ secure it to the foundation A.

C is the central casting of the turn-table, which fits over the pivot-casting B and which supports the arms F F' by means of the cross-girders E E'. This central casting C has fastened to its center at the top the flanged carrier D, which is held in place and adjusted by means of the bolts $h\ h'$. Between this
45 flanged carrier D and the pivot-casting B are a pair of hardened-steel bearing-blocks $m\ m$, whose convex curved surfaces are in contact with each other at their centers. These bearing-blocks $m\ m$ transfer the weight of the movable part of the turn-table and its load
50 to the pivot-casting B, and by reason of their form the table is easily turned, the friction being very small.

E E' are cross-girders bolted to the central casting C, and they carry at their ends the arms F F', which in turn support the tracks
60 K K' upon which the ladles I I' are run.

As shown in Figs. 1 and 2, N N' N'' N''' are wheels of the ladle-carriage G G', which supports the ladle I by means of its trunnions M
65 M'. The ladle I' has a similar carriage. (Not shown on the drawings.)

H is a yoke attached to the ladle-carriage G G' for the purpose of connecting it with the piston-rod of the hydraulic cylinder, (marked
O in Fig. 3.)

J is a dust-shield to protect the central bearing of the turn-table, and g is a coping-plate for the foundation A.

In Fig. 1, L represents the end of the jib of a ladle-crane carrying the track K'', the jib
75 L and the turn-table arm F both being supported in line by the casting R.

Referring now to Fig. 3, S is my turn-table with the ladles I I' shown in position upon it. T is a ladle-crane having a hydraulic cylinder
80 O, the piston-rod of which is shown attached to the yoke of the ladle I for the purpose of moving it backward on its track from the turn-table to the ladle-crane. Q is a receiving-crane which can swing under either of the
85 converters U U for the purpose of receiving from them a charge of metal to be transferred to the ladle-crane, thence to be poured into the molds set in the pit P. The ladle-crane and ladle are shown in dotted lines at T' and
90 I' in position for transferring the ladle from the receiving-crane to the ladle-crane, or vice versa. V V' are converter-crane. With my turn-table located as shown in the drawings
95 the crane V is used for placing ladles on and taking them from the outer arm of the turn-table, the ladles being brought to and taken away from the crane in any convenient and suitable manner. W and W' are ingot-crane. In the figure the large dotted circles represent those described by the outer ends of the
100 various cranes as they swing about their centers.

Referring now to Fig. 4, which shows my turn-table fitted with hydraulic plunger and
105 auxiliary crane, A² is the foundation. (Shown in section.) B² is a hydraulic cylinder resting on the foundation and secured by bolts, one of which is shown at E². The pipe C² admits water under pressure to the cylinder B² and
110 carries the discharge-water from the cylinder, the flow being controlled by a suitable three-way valve situated at any convenient point on the extension of the pipe C² (Not shown, as such devices are common and well understood.) F² is a hydraulic plunger capable of
115 upward or downward movement within the cylinder B². Attached to the top of the plunger F² is the forging or casting G², which supports the frame of the table, composed of the beams S², S³, and H². K² and K³ are rails
120 resting on the beams H². I² and I³ represent ladles resting on the tracks of the turn-table.

At the center of the table is a hydraulic crane, the cylinder of which is shown in section at J². It has a plunger L², a mast T², a stuffing-box R², a jib N², a trolley O², a diagonal brace P², and top support Q², which latter is attached to the roof of a building or otherwise held firm to serve as a steadiment
130 for the mast I².

Water is admitted to the crane by the pipe

D², which passes through a stuffing-box in the lower head of the cylinder B². The pipe can be connected to another similar pipe at its lower end by a swing-joint to allow of rotation and reciprocation of that part of the pipe attached to the movable plunger F². The valve for controlling the flow of water through the pipe D² may be situated at any convenient point on its extension. This valve is not shown on the drawing, as such a device is well known and need not be described.

Having now described my invention, I will proceed to show how it is used, first describing the operation of the apparatus constructed as shown in Figs. 1, 2, and 3.

The turn-table is swung around on its axis and placed with one end resting on the casting R. A ladle in good repair and ready for use is placed on the other end of the turn-table. After pouring a heat from a ladle which is on the ladle-crane the latter is quickly swung around and lowered, so that the ends of its jibs rest on the block R with its track in line with the track on the turn-table. By means of the hydraulic cylinder O the ladle just used is transferred to the turn-table, which is then quickly swung half-way around, thus presenting a ladle ready for use to the ladle-crane, to which it is transferred by the action of the hydraulic cylinder O. The other ladle from which the steel has just been poured may be dumped by an auxiliary crane and cleaned while resting on its trunnions on the table, the whole operation of turning and dumping requiring but a few seconds, after which the ladle may be made ready for use again, it being in a position on the table where this work may be deliberately performed, or it may be removed and replaced by another one, if it is found necessary. The work of changing ladles on the ladle-crane is thus performed very quickly and the use of the ladle-crane for casting is not interfered with, as would be the case if the ladle had to be dumped, cleaned, and repaired upon it after pouring a heat.

The operation of the turn-table shown in Fig. 4 is similar to that described above, the hydraulic plunger F² serving as a pivot upon which the table is turned, while the same may be raised from or lowered to its position in connection with a ladle-crane or otherwise by means of the same plunger.

The crane shown in Fig. 4 may be used for tipping or holding ladles on the turn-table and also for transferring ladles to and from the turn-table, and its operation is similar to that of other cranes and need not be described.

One of the arrangements which I have described includes a direct combination of the receiving and casting cranes by which they receive and deliver ladles to and from each other without the use of an intermediate track.

I am aware that an intermediate track mounted upon a turn-table has been proposed for connecting the tracks of a receiv-

ing and a casting crane, and I do not claim this arrangement, although my turn-table may be used in combination with it; but

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. In a metallurgical plant provided with receiving and casting cranes, having tracks thereon, arranged so as to allow the direct transfer of a ladle from one to the other, the combination with the casting-crane of a turn-table provided with two tracks, arranged to register with the track of the casting-crane, substantially as and for the purpose set forth.

2. The combination with a converter or other vessel containing metal to be cast, of a turn-table having a pair of tracks to support ladles, a casting-crane having a similar track arranged to register with those of the turn-table, a hydraulic cylinder for moving a ladle backward or forward on any of said tracks when they are in line with one another, and a receiving-crane arranged to hold a ladle while receiving a charge of molten metal, deliver it when charged to said casting-crane, and receive it from said casting-crane when empty, the cranes being arranged so as to allow the direct transfer of a ladle from one to the other, substantially as and for the purpose set forth.

3. The combination with a converter or other vessel containing metal to be cast of a turn-table having a pair of tracks to support ladles, a ladle-crane having a similar track arranged to register with those of the turn-table, a hydraulic cylinder so located as to move a ladle backward or forward on said tracks when they are in line with one another, a receiving-crane to receive a ladle from, or deliver a ladle to said ladle-crane and arranged to hold same in position for receiving a charge from said converter or other vessel, and one or more converter-cranes for placing a ladle on or taking the same from or handling same when on said turn-table, substantially as and for the purpose set forth.

4. In an apparatus for transferring ladles, the combination with the turn-table of a crane located upon said turn-table at or near its center, said crane having in combination a hydraulic cylinder with a hydraulic plunger working therein, a mast attached to said plunger, a jib attached and braced to said mast, a trolley capable of motion on said jib, pipes for supplying water or other fluid to and discharging same from said cylinder and valves on said pipes for regulating the flow therein, substantially as set forth.

5. In a turn-table for transferring ladles, the combination of a hydraulic cylinder forming a base for said table, a plunger working within said cylinder, a frame carried by said plunger, and tracks or ladle-supports carried by said frame, pipes for conveying water or other fluid to and from said cylinder, valves for controlling flow of fluid in said pipes, and a crane situated upon said turn-table at or near

its center, said crane having in combination
a hydraulic cylinder with a plunger working
therein, a mast attached to said plunger, a
jib attached and braced to said mast, a trolley
5 capable of motion on said jib, supply-pipe
passing vertically upward through a stuffing-
box in the lower head of the first-mentioned
cylinder, said pipe being provided with verti-
cal swing-joints near its lower end to allow
10 for the rotary and reciprocating motion of the

turn-table without destroying the power con-
nection to the crane-cylinder, substantially
as set forth.

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

CHARLES S. PRICE.

Witnesses:

D. M. STACKHOUSE,
F. J. SHAFFER.