April 14, 1936. C. F. BUENTE 2,037,210

ROLL CHANGING APPARATUS

Filed Dec. 18, 1934 3 Sheets-Sheet 1

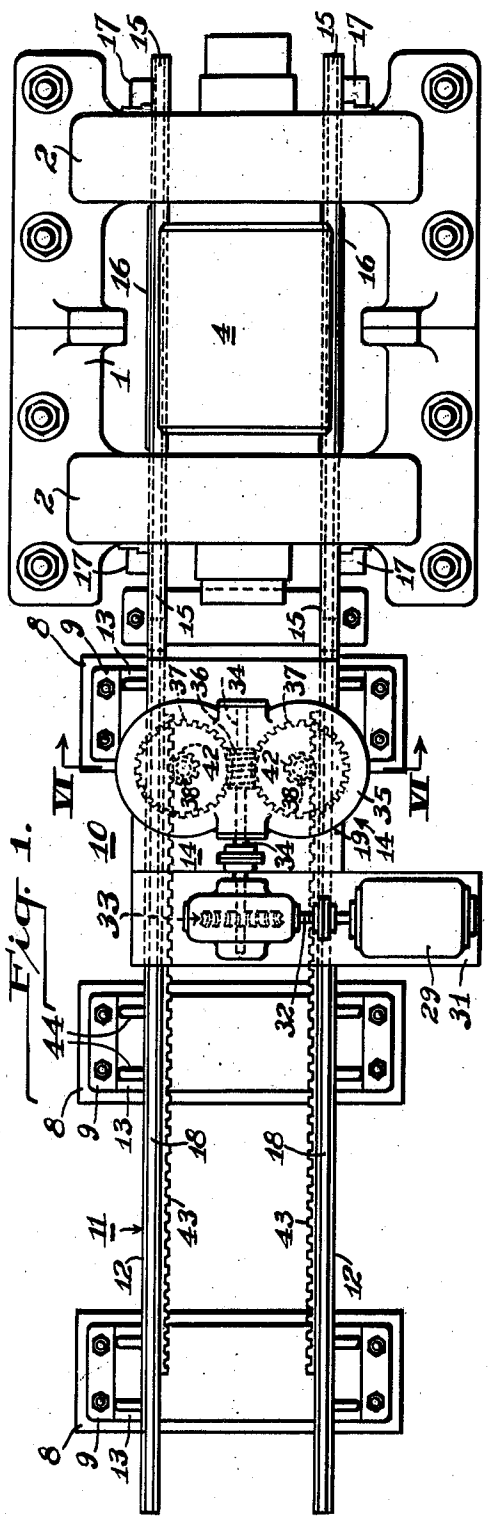

Fig. 1.

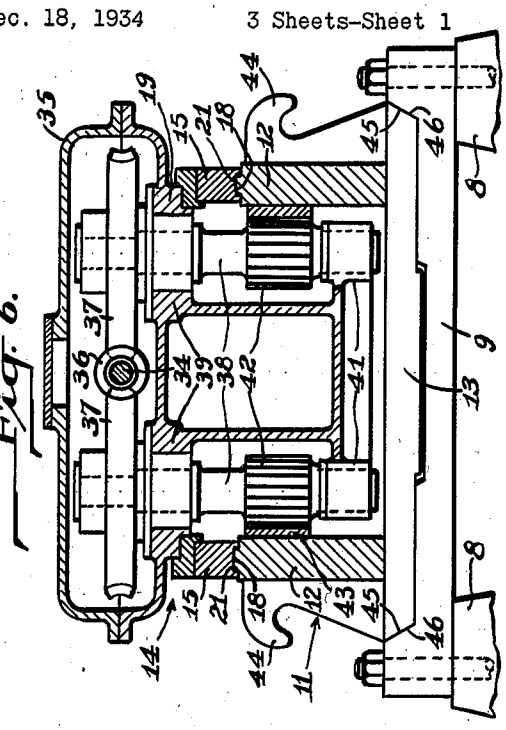

Fig. 6.

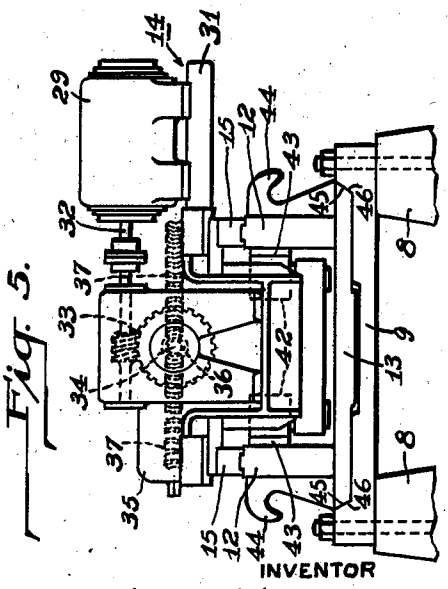

Fig. 5.

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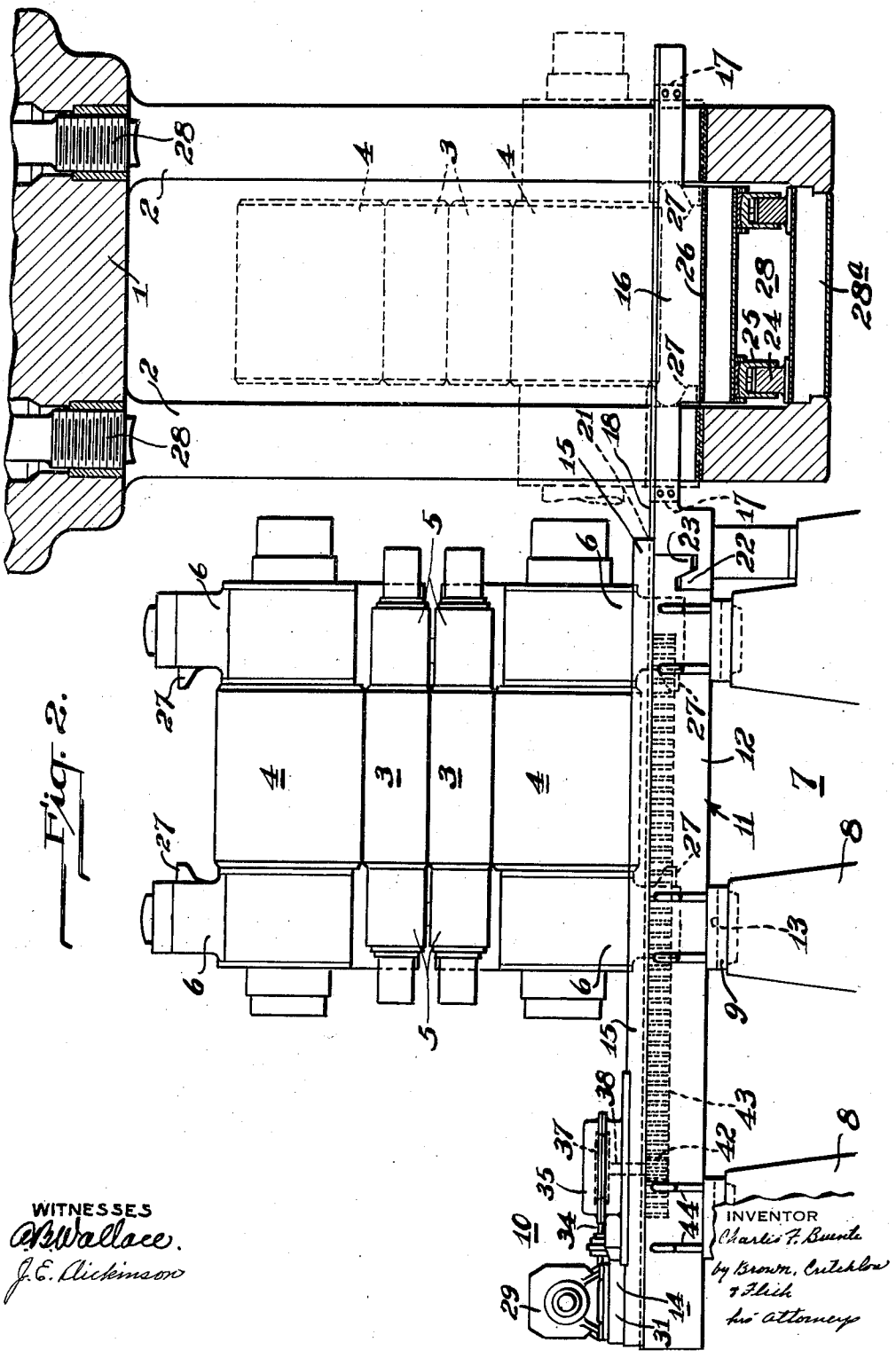

Fig. 2.

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Fig. 3.

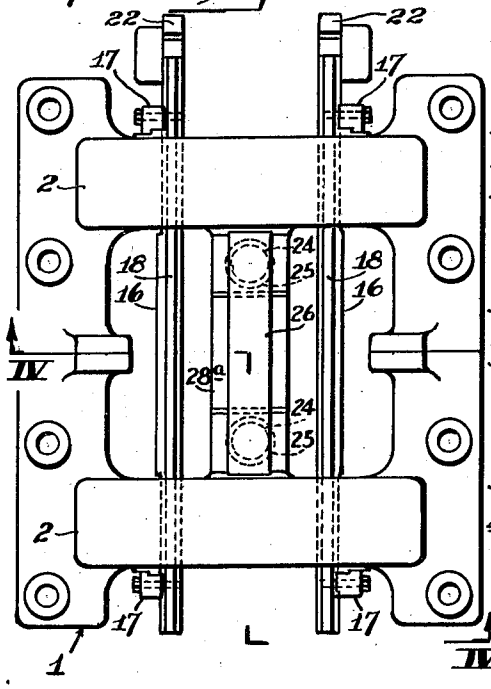


Fig. 7.

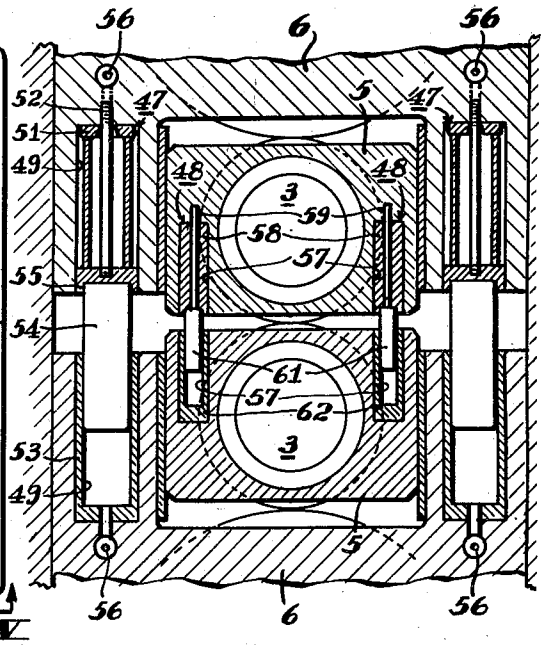
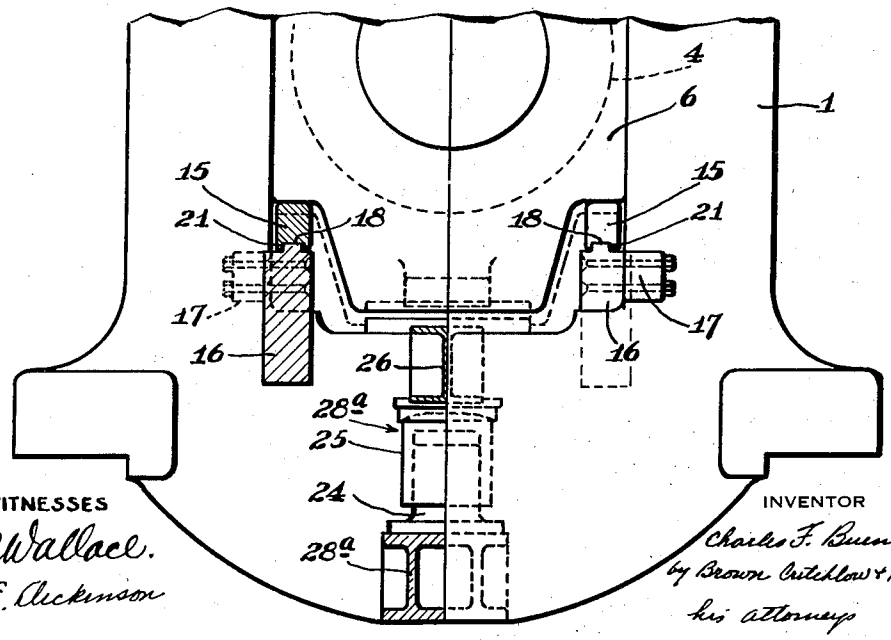


Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE

2,037,210

ROLL CHANGING APPARATUS

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Application December 18, 1934, Serial No. 758,035

12 Claims. (Cl. 80—1)

This invention relates to rolling mills, and more particularly to apparatus for removing the rolls from and replacing them in the roll housings of such a mill.

It is necessary for various reasons, as is well known, to remove and replace or change the rolls of a rolling mill at frequent intervals. In large mills and especially mills of the backed-up working roll type this is both a difficult and a costly operation, difficult because of the size and weight of the rolls, and costly because of the time consumed by it which is wasted as the mill must be stopped while the rolls are being changed.

With this in mind it is the primary object of this invention to provide a simple and sturdily constructed roll-changing apparatus which is adapted to both facilitate the changing of the rolls and minimize the time required to make the change.

Another object is to provide an apparatus of this character which can be conveniently used with a plurality of mills.

These and various other objects as well as the various other novel features and advantages of the invention will be apparent when the following detailed description is read in conjunction with the accompanying drawings of which Fig. 1 is a plan view of a rolling mill and roll-changing apparatus incorporating one embodiment of the invention; Fig. 2 a side elevation of the roll-changing apparatus shown in Fig. 1 but illustrating the rolls of the mill on the roll-changing apparatus outside of the mill and the roll housings in section; Fig. 3 a plan view of the mill with the roll assembly removed; Fig. 4 a view partly in elevation and partly in section of the base of the mill, the section being taken on the line IV—IV of Fig. 3 and showing the lower backing roll chuck in full line supported on the skids attached to the roll-changing buggy and in dotted lines in its normal position; Fig. 5 an end view looking toward the mill from the outer end of the roll-changing pit; Fig. 6 a vertical section taken on the line VI—VI of Fig. 1; and Fig. 7 a vertical section taken through the mid-section of one of the roll housings and the roll chucks supported in it.

Referring in detail to the drawings, by way of explaining the invention the numeral 1 designates generally a rolling mill of the four-high type which consists essentially of a pair of roll housings 2 provided with the customary windows in which there is supported in suitable bearing chucks 5 and 6, respectively, a pair of working rolls 3 and backing rolls 4. Opposite the driving end of this mill, the drive for which is not shown, there is provided the usual roll-changing pit 7 which is normally covered by suitable cover plates also not shown. In such pit there is provided a plurality of pairs of spaced piers 8 which are utilized as a support for the roll-changing apparatus.

In accordance with the invention a cross member or tie 9 is securely bolted to the tops of each of the opposed pairs of these piers 8 and adapted to receive and support the roll-changing apparatus proper designated generally by the numeral 10. As shown, this apparatus comprises principally a frame 11 made up of a pair of rail-forming side plates 12 held together by a plurality of spaced cross members 13 and a power-driven buggy 14 to which there is attached a pair of skids 15 that are adapted to slide upon the tops of the side plates 12 and be slid into the mill housings 2 under the chucks 5 of the lower backing roll for changing the roll assembly of the mill.

To provide a continuous support through the mill for the skids 15 a pair of rails 16 is permanently mounted by means of bolted clamps 17 or other suitable means in the lower corners of the housing windows and projected beyond the end of the mill into the roll-changing pit 7 sufficiently far enough to be engaged by the front ends of the side plates 12 of the roll-changing apparatus frame 11 which are spaced the same distance apart as these rails. To effectively guide the skids 15 and also the buggy 14 to which the skids are attached over the side plates 12 and these latter rails 16, the side frames 12 and these rails are provided on their upper surfaces with tongue-like ribs 18 over which grooves 21 provided in the bottom surfaces of the frame 19 of the buggy and the skids 15 are adapted to just fit. While other means may be used for such purpose, the protruding ends of the housing rails 16 are provided with upwardly projecting hooks 22 which are adapted to receive and be engaged by oppositely disposed hooks 23 provided on the forward ends of the side plates 12 of the roll-changing apparatus frame 11 when the latter is placed in its operative position and thereby prevent any endwise movement of such frame when the roll-changing buggy 14 is being moved along it with a load of rolls.

To permit the skids 15 to slide a roll assembly out of and into the housings 2 they must of course support the lower backing roll chucks out of contact with the housing. This means that for the roll assembly to be removed from the housing it must be raised somewhat and the skids 15 slid under it and then lowered back

onto the skids. To accomplish this an elevator 28 is provided in the base of the mill below the lower backing roll chucks 5. As illustrated, this elevator comprises a cross beam 28a which is secured between the bottoms of the two housings 2 directly below the centers of the rolls. Adjacent its two ends and on the upper surface of this cross beam there is provided a pair of fixed plungers 24 which are disposed to operate in a pair of cylinders 25 attached to the under side of a movable cross beam 26. This latter cross beam when raised sufficiently by hydraulic pressure supplied to the cylinders 25 by any suitable means not shown is adapted to engage lugs 27 formed on the inner lower faces of the lower backing roll chuck. Hence by backing off the screws 28 at the tops of the mill housings, the roll assembly may be readily lifted by the elevating mechanism and the skids 15 slide under it. Once the skids are in place the elevator is returned to its lowered position and the roll assembly deposited on the skids. The skids are then withdrawn carrying the roll assembly with them. To replace the assembly all that is required to do is to merely slide the assembly into the housing, lift it off the skids by means of the elevating apparatus, remove the skids, and then lower the assembly into place in the housing windows.

For operating the roll buggy 14 to move the skids, a motor 29 is mounted on an overhanging platform 31 secured to the frame 19 of the buggy and connected by a drive shaft 32 to a gear-reducing unit 33. From this gear unit a drive shaft 34 is projected into a gear housing 35 and equipped at its outer end with a worm pinion 36 which is meshed with a pair of opposed worm gears 37. These in turn are keyed to a pair of shafts 38 supported in the frame 19 of the buggy in suitable bearings 39 and 41 and equipped with keyed pinions 42 which are disposed to engage a pair of gear racks 43 attached to the inner faces of the side plates 12 of the roll-changing apparatus supporting frame 11. Consequently through the use of a reversible motor 29 the buggy 14 can be readily propelled in either direction to remove or replace a roll assembly and, as will be obvious to those skilled in the art, various other forms of apparatus can be used for this purpose.

Once the rolls are outside of the roll housing they may be picked up individually or the whole assembly transported with the roll-changing apparatus by a crane, not shown, to a convenient part of the mill for unloading and reloading. To facilitate the connection of the crane to the frame 11 of the roll-changing apparatus for this purpose a pair of hooks 44 is provided on the outer ends of each of the cross members 13 secured to the bottoms of the side plates 12 of the roll-changing apparatus frame 11, being projected outwardly to conveniently receive the crane hooks and extended upwardly along and welded to the side plates 12 for rigidity. To facilitate and securely seat the roll-changing apparatus frame 11 on the ties 9 extended across the piers 8 in the roll-changing pit 7, the cross members 13 comprising the bottom of this frame 11 are spaced the same distance apart as these ties 9 and provided with tapered bottom edges 45 which are adapted to guide the frame to a seat in correspondingly tapered insets 46 provided in the tops of the ties 9.

It is also a feature of the invention to so construct the balancing mechanism for the backing and working rolls as to render it operable for holding the roll assembly firmly together without the aid of other means when such assembly is being moved out of and into the roll housings and on the roll-changing apparatus. This phase of the invention is illustrated more partcularly in Fig. 7 in which incidentally the chucks for the backing rolls as well as those for the working rolls are shown as being identical and interchangeable. This makes for economy of construction and maintenance of the mill, and particularly the latter, as it greatly reduces the number of spare parts which must be carried in stock by the mill operator for repairs.

As illustrated, the chucks 6 in which the necks of the backing rolls 4 are supported are provided in the middle of their abutting faces with rectangular openings in which the chucks 5 for the working rolls 3 are nested, and retained by suitable means not shown. For maintaining the upper backing roll chuck 5 against the mill screws and the working rolls against the backing rolls two pairs of hydraulic pressure jack assemblies 47 and 48 located respectively in the backing and working roll chucks are employed. The first-mentioned of these assemblies 47 which are located in the backing roll chucks, one on each side of the working roll chucks, comprises two pairs of identical cylinder bores 49 provided in aligned opposition to each other in the abutting faces of the backing roll chucks. In the upper of such bores 49 there is provided a removable filler 51 held in place by a screw bolt 52, while in the lower one a sleeve 53 and a plunger 54 are arranged, the plunger being adapted to engage the outer end of the filler 51 and to be operative under the influence of some suitable hydraulic pressure, not shown, for lifting the upper backing roll chuck.

To hold the upper backing roll chucks 5 and their supported roll 4 firmly in place when the roll assembly is being changed, the plungers 54 for the backing roll jacks 47 are adapted to function as retaining pins, being so constructed as to have their outer ends project into insets 55 provided in the fillers 51. To accomplish this when the working rolls are in place hand valves 56 are provided in the hydraulic pressure lines extending through the backing roll chucks to close the fluid outlet for the cylinders 53 and hold the plungers in their upper positions even though the hydraulic pressure supply is disconnected from the roll assembly. To so function after the working rolls are removed, which they usually are before the assembly is taken out of the housings, the plungers 54 are made sufficiently long to extend into the insets 55 when the backing roll chucks are together, but not long enough to take the weight of the upper chucks under such circumstances.

Like the hydraulic balancing assemblies 47 for the backing rolls, the balancing assemblies 48 for the working rolls each comprise a pair of opposed cylindrical bores 57 which are located in the abutting faces of the working roll chucks. In the upper of these a filler 58 is arranged and held in place by a screw bolt 59, while a plunger 61 is disposed in a sleeve 62 mounted on the lower bore 57, and a supply of hydraulic pressure for the lower bore 57 provided by a suitable source not shown.

From the foregoing it will be apparent that the backing roll chucks and also the working roll chucks can be interchanged and that the working rolls and their chucks can be either removed

without disturbing the backing rolls, or may be removed with the backing rolls. If the working rolls are to be removed with the backing rolls, a pressure is locked in the balancing assemblies **47** of the backing rolls by the hand valves **56** before the pressure supply is disconnected from the mill to hold the plungers **54** in the insets **55** of the fillers **51**. However, if the working rolls are removed first the upper backing roll chucks are merely lowered by relieving the pressure in the balancing jacks **47** until they engage the lower backing roll chucks and the hydraulic pressure disconnected. Under these latter conditions as previously described the plungers **54** of the backing roll balancing assemblies are sufficiently long to function as pins for holding the upper backing roll chucks in place while they are being moved.

As will be appreciated by those skilled in the art, such an apparatus provides a very convenient and readily operable means for changing the rolls of a mill, and one which may be used with a plurality of mills.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention, and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A roll-changing apparatus comprising a supporting frame, a pair of roll assembly supporting and transferring skids mounted on said frame for movement into and out of a rolling mill under the roll assembly thereof, means permanently mounted in the mill below the entire roll assembly thereof for supporting said skids when inserted in the mill, means for raising the roll assembly to permit the movement thereunder of the skids, and power means connected to said skids for moving them into and out of the mill to convey a roll assembly when rested thereon into or out of the mill.

2. A roll-changing apparatus comprising a supporting frame, a roll buggy mounted for movement on said frame, a pair of skids attached to said buggy and adapted to be slid into a rolling mill under the roll assembly thereof, means permanently mounted in the mill below the entire roll assembly thereof for supporting said skids when inserted in the mill, means for raising the roll assembly to permit the movement thereunder of the skids, and power means for actuating said buggy to slide said skids into and out of the mill to thereby convey a roll assembly rested on them into or out of the mill.

3. A roll-changing apparatus comprising a portable supporting frame provided with rail-like side plates adapted to be mounted at one end of a mill, a pair of skids mounted for endwise movement on said side plates, means permanently mounted in the mill below the entire roll assembly thereof for supporting said skids when inserted in the mill, means for raising the roll assembly to permit the movement thereunder of the skids, and a power-operated buggy attached to said skids and disposed for movement on said frame for moving said skids into the mill beneath the roll assembly thereof and out again to convey a roll assembly when rested thereon into or out of the mill.

4. A roll-changing apparatus comprising a portable supporting frame provided with rail-like side plates adapted to be mounted at one end of a mill, a pair of rails permenently secured in the mill below the chucks of the entire roll assembly and out of contact therewith, a pair of skids normally outside the mill mounted on said supporting frame for movement into and out of the mill over said side plates and said mill rails, means for raising the entire roll assembly to permit the insertion thereunder of the skids and power means for moving said skids to and from the mill.

5. In combination with a rolling mill, a pair of rails mounted in the windows of the roll housings of the mill below the roll assembly supported therein, a roll-changing apparatus frame comprising a pair of rigidly connected spaced side plates mounted at one end of the mill in alignment with said mill rails, a pair of skids mounted on said side plates for movement into and out of the mill over said mill rails and beneath the roll assembly of the mill and normally outside the mill, hydraulic means for raising the roll assembly to permit the insertion thereunder of said skids, and power means for actuating said skids to and from the mill.

6. In combination with a rolling mill, a pair of rails mounted in the windows of the roll housings of the mill below the roll assembly supported therein, a roll-changing apparatus frame mounted at one end of the mill in alignment with said rails, a pair of skids mounted on said frame for movement into and out of the mill below the roll assembly mounted therein, means on said frame for actuating said skids, and means for raising and lowering the roll assembly of the mill to permit the insertion therebelow of said skids.

7. In combination with a rolling mill, a pair of rails mounted in the windows of the roll housings of the mill below the roll assembly supported therein, a roll-supporting frame mounted at one end of the mill in alignment with said mill rails, a pair of skids normally outside of the mill disposed for movement over said roll-supporting frame and said mill rails and under the entire roll assembly of the mill, power means for actuating said skids, means for raising the roll assembly to permit the insertion of the skids, and means for holding said roll assembly together while it is being moved on said skids.

8. In combination with a rolling mill, a pair of rails mounted in the windows of the roll housings of the mill beneath the roll assembly mounted therein, a roll-supporting frame mounted at one end of said mill with its end engaging the ends of said rails, a carriage mounted on said frame for movement to and from the mill, power means for actuating said carriage, a pair of skids connected to said carriage for movement thereby into and out of said mill over said mill rails, means for guiding said skids in their movement, and means for raising the roll assembly of the mill to permit the skids to be slid thereunder and then lowering it onto said skids.

9. In combination with a rolling mill, a roll-changing apparatus according to claim 1, a balancing mechanism for the bearing chucks of the rolls which is so constructed as to hold the roll assembly together as it is being moved out of and into the roll housings on the roll-changing apparatus.

10. A roll-changing apparatus according to claim 2 in which the power means for actuating the skids is mounted on the buggy to which the skids are attached.

11. In combination with a rolling mill, a roll changing apparatus comprising a supporting frame, a pair of roll assembly supporting and transferring skids mounted on said frame for movement into and out of a rolling mill under the roll assembly thereof, means permanently mounted in the mill below the entire roll assembly thereof for supporting said skids when inserted in the mill and means located between the bases of the roll housing for raising and lowering the roll assembly mounted in the housings.

12. In combination with a rolling mill, a roll changing apparatus comprising a supporting frame, a pair of roll assembly supporting and transferring skids mounted on said frame for movement into and out of a rolling mill under the roll assembly thereof, means permanently mounted in the mill below the roll assembly thereof for supporting said skids when inserted in the mill and means comprising a part of the mill for raising and lowering the roll assembly in the roll housings of the mill to permit the insertion and removal of the skids.

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