April 27, 1965 J. W. O'BRIEN 3,180,125

ROLL CHANGING APPARATUS

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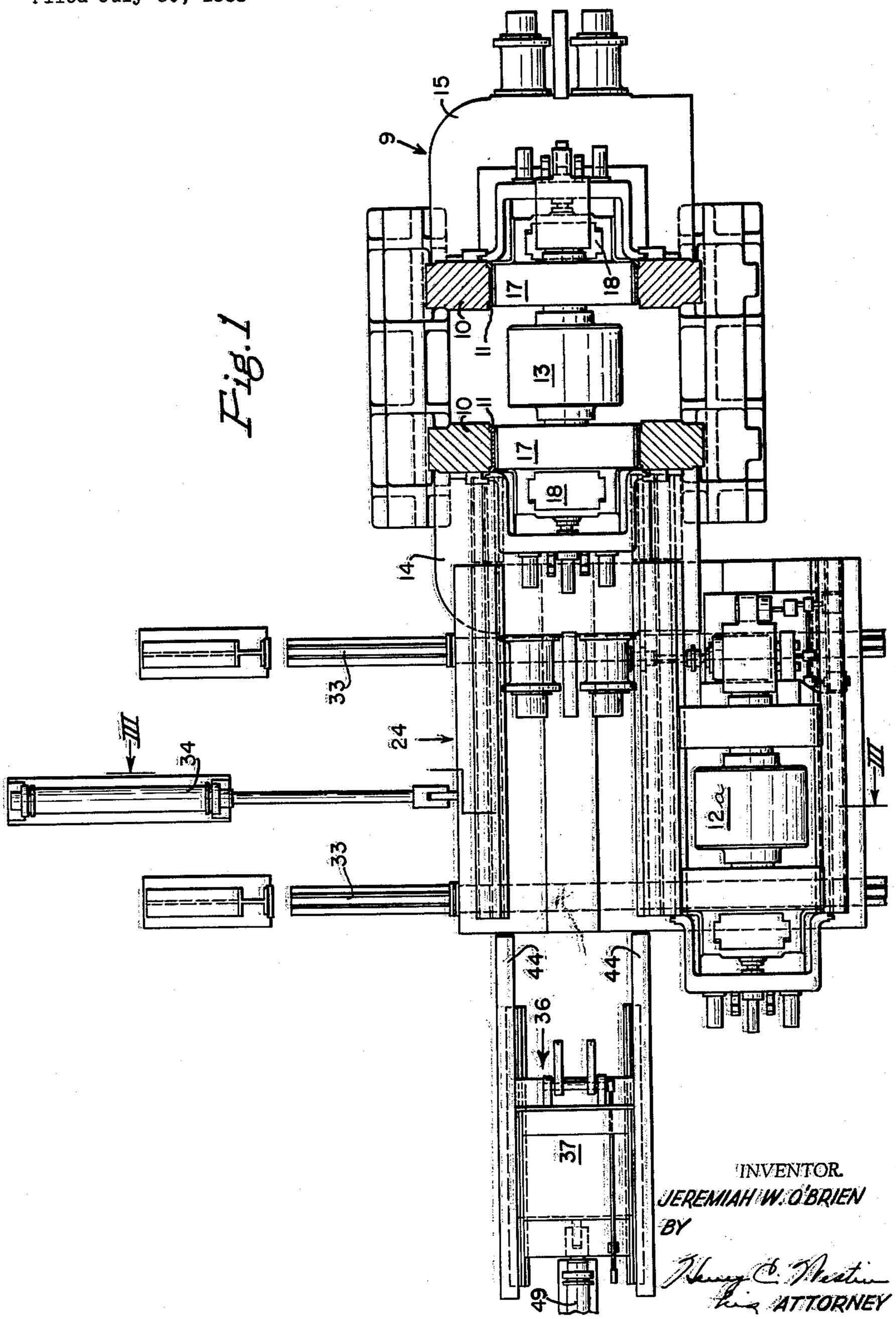
Fig. 1

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ROLL CHANGING APPARATUS

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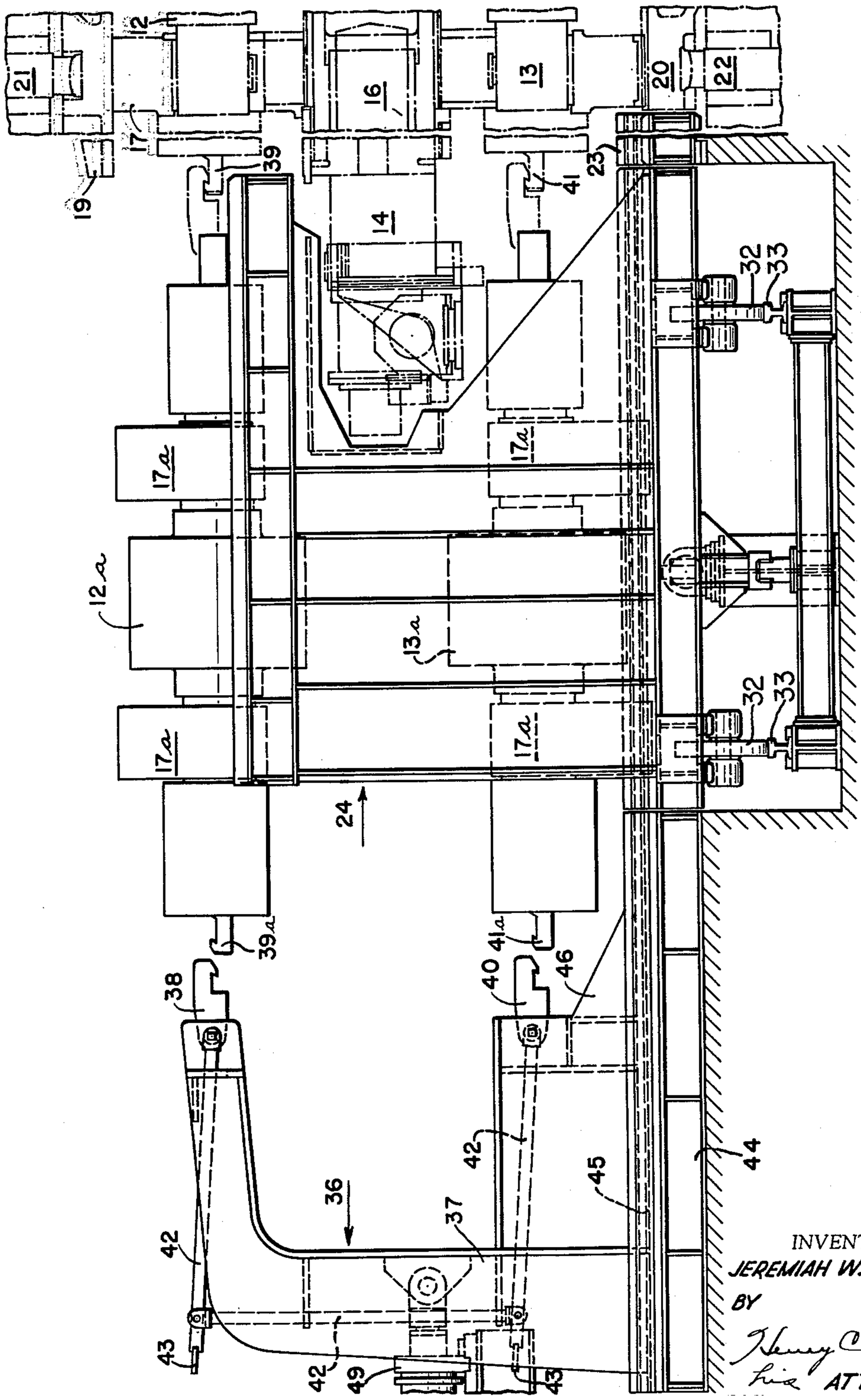


Fig. 2

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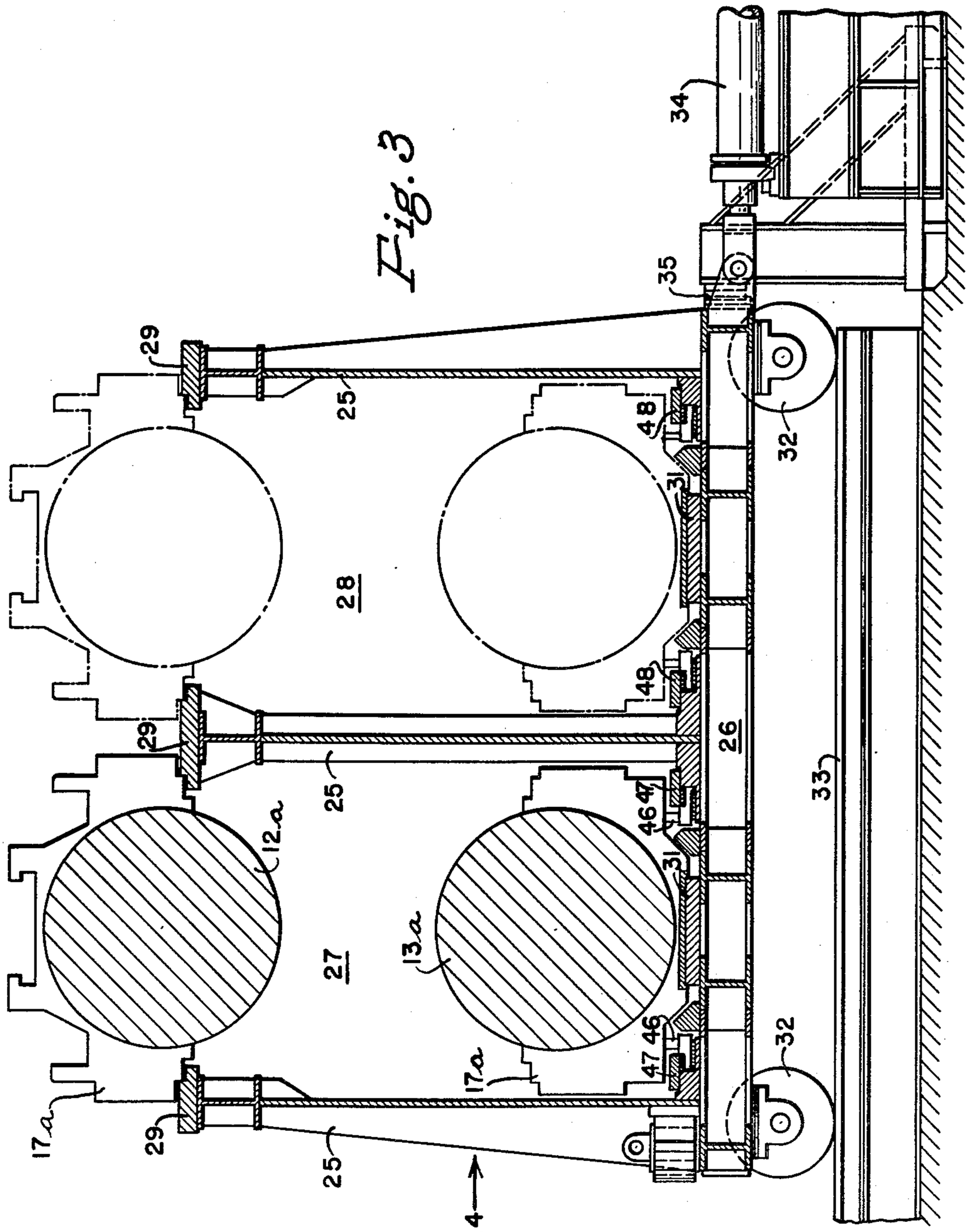
Fig. 3

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# ROLL CHANGING APPARATUS

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Claims priority, application Great Britain, Aug. 15, 1962, 31,284/62
2 Claims. (Cl. 72—239)

This invention relates to an apparatus for changing the rolls of a rolling mill and is particularly useful in changing the horizontal rolls of a universal beam mill.

In order to enhance the productivity of universal beam mills, it is highly desirable to be able to quickly and efficiently change the horizontal rolls of these mills. Such mills roll a wide range and many different shapes of products which practice necessitates frequent removal and replacement of the horizontal rolls, since new rolls must be employed for each different size of beam rolled. The present-day apparatuses for changing the horizontal rolls of universal beam mills are quite slow and inefficient, in addition, the rolls must be changed individually. One of the major difficulties in realizing quick roll changing is due to the fact that ready access to the rolls is prevented by the housings or frames of the vertical rolls on the mills. These housings or frames take the form of rigid wings projecting perpendicularly from the main housings and have heretofore not only prevented the positioning of a roll changing apparatus closely adjacent to the ends of the rolls, but also have prevented simultaneous changing of both rolls.

It is an object of the present invention to provide in one form an apparatus that will permit quick, efficient and, if desired, simultaneous removal and replacement of the horizontal rolls of the universal beam mill, and which will not in the least be impeded by the housings or frames of the vertical rolls. Accordingly, in one form the present invention provides a car for receiving two pairs of horizontal rolls, one pair being the replacement rolls and the other the rolls that are to be removed from the mill. This car is constructed with a cut-away portion at the side thereof adjacent to the mill so that when the car is in its roll changing position it will pass over the wing provided for the vertical roll on the operating side of the mill. Means are provided for moving the car perpendicular to a plane containing the axes of the rolls when positioned in the mill so that the rolls removed from the mill can be moved away from the mill, and at the same time a new pair of rolls automatically positioned for insertion into the mill.

The invention also contemplates the employment of a roll transferring means which passes through the car when the car is positioned adjacent to the mill to engage one or both of the rolls positioned in the mill, after which the transfer means can simultaneously withdraw the rolls out of the mill and onto the awaiting car. The transferring means is also employed to simultaneously insert the new rolls into the mill.

In order to better appreciate these and other features of the present invention, reference will be made to the accompanying drawings of which:

FIGURE 1 is a plan view, partly in section, of a wide flange beam mill, in connection with which a roll changing apparatus employing the features of the present invention is employed;

FIGURE 2 is an elevation view of the roll changing apparatus shown in FIGURE 1 showing a portion of the mill in phantom; and

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FIGURE 3 is a sectional view taken on lines III—III of FIGURE 1, but with the car of the apparatus shown in a position to one side of the mill.

With reference to these drawings, there is illustrated a wide flange beam mill 9 made up to two upright housings 10 formed with spaced-apart windows 11 for receiving a pair of horizontal rolls 12 and 13 and oppositely perpendicularly protruding rigid wings 14 and 15 which receive the vertical rolls of the mill, only one of these rolls 16 being shown and that in FIGURE 2. Identical chock-radial bearing assemblies 17 and thrust bearing assemblies 18 are provided for the rolls 12 and 13. Hereinafter in referring to either of the rolls 12 and 13 and their chocks and bearing components, on occasion, reference will be made to them as roll assemblies.

It is also important to note, as illustrated particularly in FIGURE 2, that the universal beam mill is provided with roll supporting beams 19 and 20 which are located between the chocks 17 of the horizontal rolls and the pairs of screws 21 and 22 of the mill 9, the drawing (FIGURE 2) only illustrating one screw of each pair. One of the purposes of these roll supporting beams is to guide and support the chocks during the withdrawal and replacement of the roll assemblies and for which reason it will be noted that the upper beam 19 extends out from one of the housing 10. At the bottom of the mill, separate extensions 23 are provided for the beam 20, the purpose of which will be explained hereinafter.

The construction and function of the components of the mill 9 and particularly the beams 19 and 20 are more fully disclosed in M. P. Sieger's U.S. application Serial No. 146,580 filed October 20, 1961 entitled Beam and Plate Rolling Mill.

With reference now more particularly to the novel roll changing apparatus herein disclosed and in referring first to FIGURES 2 and 3, a roll changing car 24 is provided comprising three spaced-apart upright members 25 which are rigidly secured together by a base 26. These upright members form two identical bays 27 and 28 to which unrestricted access is had from the top. At the top of each member 25 there is provided roll assembly supporting members 29, the center member, it will be observed, serves to support both the old and new roll assemblies as illustrated in FIGURE 3. Roll assembly supporting members 31 are also provided at the bottom of the bays, it being noted that these members are centrally located in each bay. As the drawings show, the roll assembly supporting members 31 are equipped with bearing lined surfaces to facilitate easy movement of the roll assemblies into and out of the car 24.

In returning to FIGURE 2, it will be noted that the upright members 25 at the side of the car adjacent the mill 9 assume the shape of a C so that when the car 24 is located in the roll changing position substantial portions of the supporting members 29 and the base 26 pass over and under, respectively, the wing 14 of the vertical roll 16. It will also be noted that when the car is so positioned two of the bearing lined surfaces of the roll supporting members 29 line up with the beam 19, so that as the upper roll 12 is retracted from the mill, its chock 17 will come to rest on the bearing lined surface of the members 29. The same relationship is maintained between the supporting member 31 and the chock 17 of the lower roll 13, however, in this case the extensions 23 serve as a bridge between the car 24 and the roll supporting surface of the beam 20.

As further shown in FIGURES 2 and 3, the car 24 is provided with two pairs of wheels 32 which engage a pair of parallel tracks 33, the tracks running in a longitudinal

direction in front of the mill 9. A piston cylinder assembly 34 shown in FIGURES 1 and 3 is secured to one side of the car through which agency the car is traversed along the tracks 33. In FIGURE 3 the car 24 is shown in its inoperative position away from in front of the mill 9, where it engages a stop 35.

In still referring to FIGURE 2, it will be observed that in conjunction with a roll changing car there is provided a roll assembly retracting and inserting mechanism 36. This mechanism consists of a C-shaped frame 37 whereby an opening is provided so that when brought into a position adjacent to the mill 9 it will pass around the wing 14 of the vertical roll 16. To the upper part of the frame 37 which is made to assume an elevation coincident with the axis of the upper roll 12, there is provided a hook 38 which engages a complementary hook 39 formed on the end of the chock 17 of the upper roll 12.

A similar hook 40 is provided at the lower portion of the frame 37 which cooperates with a hook 41 formed on the chock 17 of the lower roll 13. Each hook is formed with vertical flat surfaces which serve as pushing surfaces during the roll inserting operation. The hooks 38 and 40 are pivotally mounted on the frame 37 and are interconnected by a linkage system 42, two of the links having handles 43 by which means a manual force can be applied to rotate the hooks to cause their engagement with or disengagement from the hooks from the chocks 17.

The roll retracting and inserting mechanism 36, as shown in FIGURE 2, is carried by a base 44. The base is provided with parallelly arranged spaced-apart guide ways 45 into which there is received feet 46 of the mechanism 36. Similar guide ways 47 and 48 are provided in each of the bays 27 and 28 of the car 24 which serve as extensions of the guide ways 45. For purpose of illustration the feet 46 and the guide ways 47 are shown in their cooperative relationship in FIGURE 3, where being also noted that the guide ways 47 and 48 are arranged on either side of the chock supporting members 31. By reason of this construction the C-shaped frame 37 is adapted to be slid through either of the bays 27 or 28 of the car 24 to a position shown in phantom in FIGURE 2. The movement of the frame 37 is effected by a piston cylinder assembly 49 which is connected to the back of the frame as shown in FIGURES 1 and 2.

The piston cylinder assemblies 34 and 49 have sufficient strokes to perform the necessary movements of the car 24 and C-shaped frame 37, respectively, although the several different positions of these elements may be obtained if desired, by providing retractable stops that will predeterminately position the car and frame in their desired positions.

For purpose of discussion, the reference numbers that have been applied to the roll assemblies 12 and 13 and hooks 39 and 41 have been adapted for the new roll assemblies in conjunction with the letter *"a."*

A brief description of the operation of the roll changing apparatus herein disclosed is as follows:

Assuming that the horizontal roll assemblies 12 and 13 presently arranged in the mill are to be removed and the necessary preliminary steps incident thereto, such as the disconnection of the hydraulic connections, chock clamps, etc., have been performed and a new pair of roll assemblies 12*a* and 13*a* has been previously set upon the supporting members 29 and 31 of the bay 27; then in that event, the piston cylinder assembly 34 will be operated to bring the empty bay 28 of the car 24 into a position directly in front of the mill 9, as illustrated in FIGURE 1. A retractable stop may be provided to assure that when the car stops, the bay will be properly positioned in front of the mill.

In view of the fact that the car is provided with a cutaway portion, when it is brought to its position in front of the mill it will pass around the wing 14 of the vertical roll 16. Following this the piston cylinder assembly 49 will be operated to traverse the C-shaped frame 37 from its inoperative position, as shown in full line of FIGURE 2, to a position where it passes through the bay 28 of the car 24 into the phantom position, which is also shown in FIGURE 2. Once in this position, the hooks 38 and 40 which will have been raised, are brought into engagement with the hooks 39 and 41 of the chocks 17 of the rolls 12 and 13. After this operation, the cylinder 49 is again operated to simultaneously withdraw the roll assemblies from the mill 9.

During the initial portion of this action, the chocks 17 of the roll assemblies will be supported by the beams 19 and 20. As the front chocks pass clear of the beams, as to the upper one, its lower surface will come into engagement with the supporting members 29, and as to the lower one, its lower surface will slide onto the extensions 23 and then onto the supporting member 31 of the car. As the back chocks of the roll assemblies pass out of the mill they, too, will engage the aforesaid members. The rolls will continue to be moved out of the mill until they assume a position that coincides with the new rolls 12*a* and 13*a* shown in FIGURE 2, after which the operation of the cylinder 49 will be interrupted so that the hooks 38 and 40 may be raised out of engagement with the hooks 39 and 41 of the roll assemblies. Following this the piston cylinder assembly 49 will again be activated to further retract the C-shaped frame 37 to the inoperative position shown in FIGURE 1.

Once this operation has transpired, the piston cylinder assembly 34 will be operated for the second time to move the car 24 so that its bay 28 with the roll assemblies 12 and 13 is moved toward the top of the drawing as one views FIGURE 1 to a position out from in front of the mill 9. Of course this movement will result in the bay 27 and, hence, the new roll assemblies 12*a* and 13*a*, being positioned directly in front of the mill. This position may be assured, as indicated above, by a retractable stop. Once this takes place, the piston cylinder 49 is again actuated in which the pushing surfaces of the hooks 38 and 40 will engage similar surfaces of the hooks 39*a* and 41*a* formed on the chocks 17*a* and by this contact the new roll assemblies 12*a* and 13*a* will be simultaneously pushed through the car 24 and into the windows 11 of the mill. As the back chocks approach the mill, they will come into a supporting relationship with the beam 19 and the extensions 23 along with the beam 20 whereby the roll assemblies will be automatically guided into the mill 9. Once this has transpired, the hooks 38 and 40 will be disengaged from the chocks 17*a* and the piston cylinder assembly 49 operated to retract the C-shaped member 37 to an inoperative position. The mill will then be in readiness to be put back into operation, and while this is being done the piston cylinder assembly 34 can be operated to retract the car 24 to a position remote from the mill so that the workmen may have ready access thereto and where, at the convenience of the operator, the old roll assemblies may be removed from the car and new roll assemblies placed in the car in readiness for the next roll changing operation.

Should there be incorporated with the universal beam mill an edging mill, the rolls of this mill can be changed at the same time that the rolls are changed in the universal mill. In this arrangement, which would involve a second car to handle the rolls of the edger mill, the piston cylinder assembly 34 could, if desired, be used to automatically position the respective bays of the two cars in the desired positions.

While for purpose of illustration the invention has been described in connection with a beam mill, it is apparent that it can be used for various other types of mills, such as strip and bar mills, and that while the illustrated form of the invention relates to changing more than one roll simultaneously by employing a car having two bays, if a particular occasion calls for it, the inven-

tion could be employed to change a single roll in a car arrangement having only one bay.

In accordance with the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I consider to represent the best embodiment thereof. 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. An apparatus, for use in changing rolls of a rolling mill having at least two rolls, comprising a roll carrying car, upright members carried by said car forming two bays, two platforms mounted on said car in each of said bays, each for supporting a roll, two platforms mounted on said upright members, each for supporting a roll, said platforms of said car being arranged coplanar to one of the rolls when positioned in the mill, said platforms of said upright members being arranged coplanar to the other roll when positioned in the mill, means for positioning the car so that one or the other of said bays is located adjacent to said mill, said bays having opposite open sides, roll moving means arranged on the side of said car opposite the mill, means for moving said roll moving means into and out of said car for removing the rolls from the mill onto said car and from said car into the mill, and means on said roll moving means for engaging the rolls.



2. An apparatus, according to claim 1, wherein said mill has a projecting portion on the side adjacent said car and said upright members on the side adjacent the mill are formed with an opening into which said projecting portion of the mill extends when the car is in a position adjacent to the mill, and the roll moving means has an opening on the side adjacent said car into which said projection portion of the mill extends when the roll moving means is brought into close proximity to the mill.


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