Oct. 31, 1950 F. J. WOOD 2,527,667

ROLLING MILL MATERIAL HANDLING METHOD AND APPARATUS

Filed Oct. 6, 1947 4 Sheets-Sheet 1

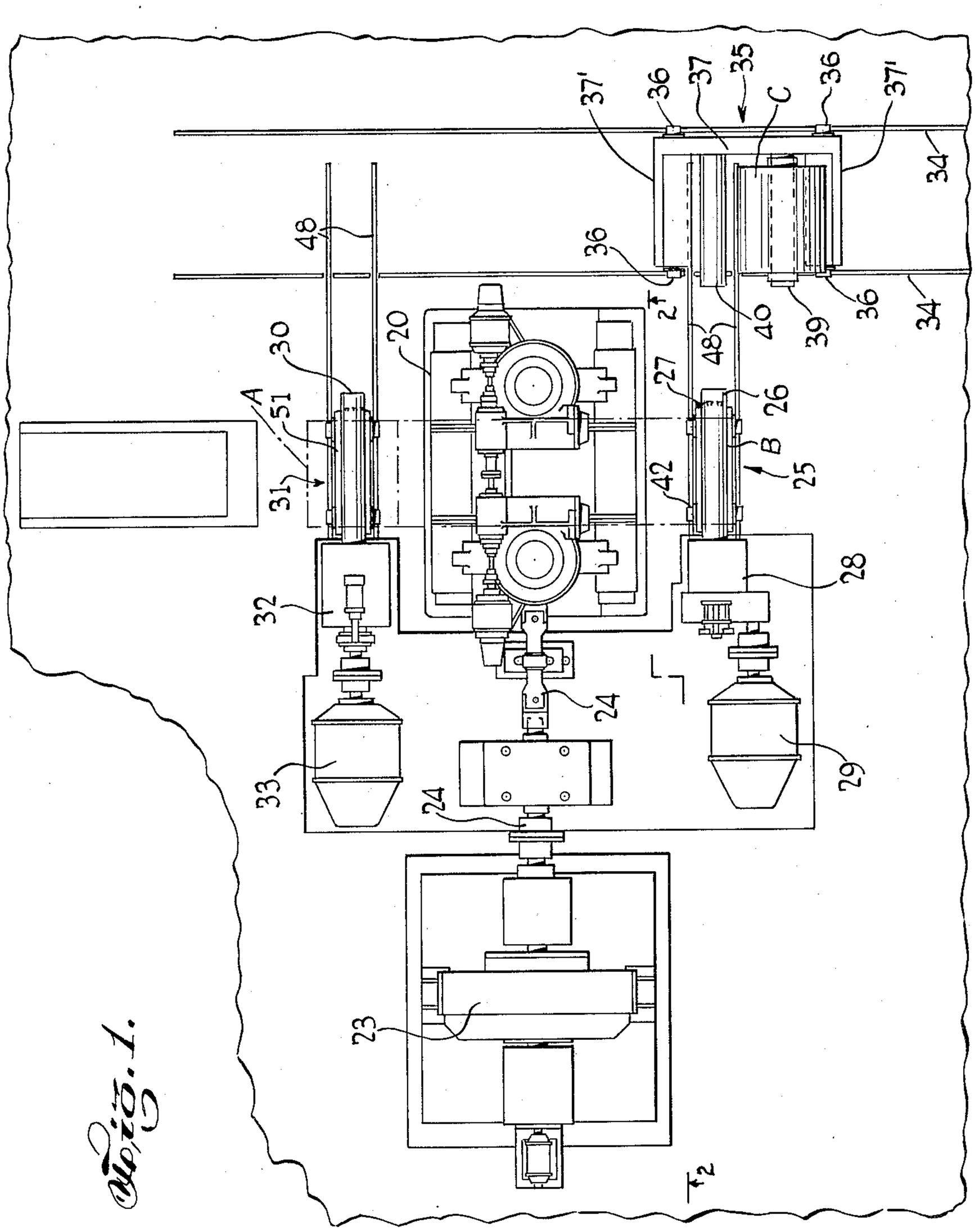

Fig. 1.

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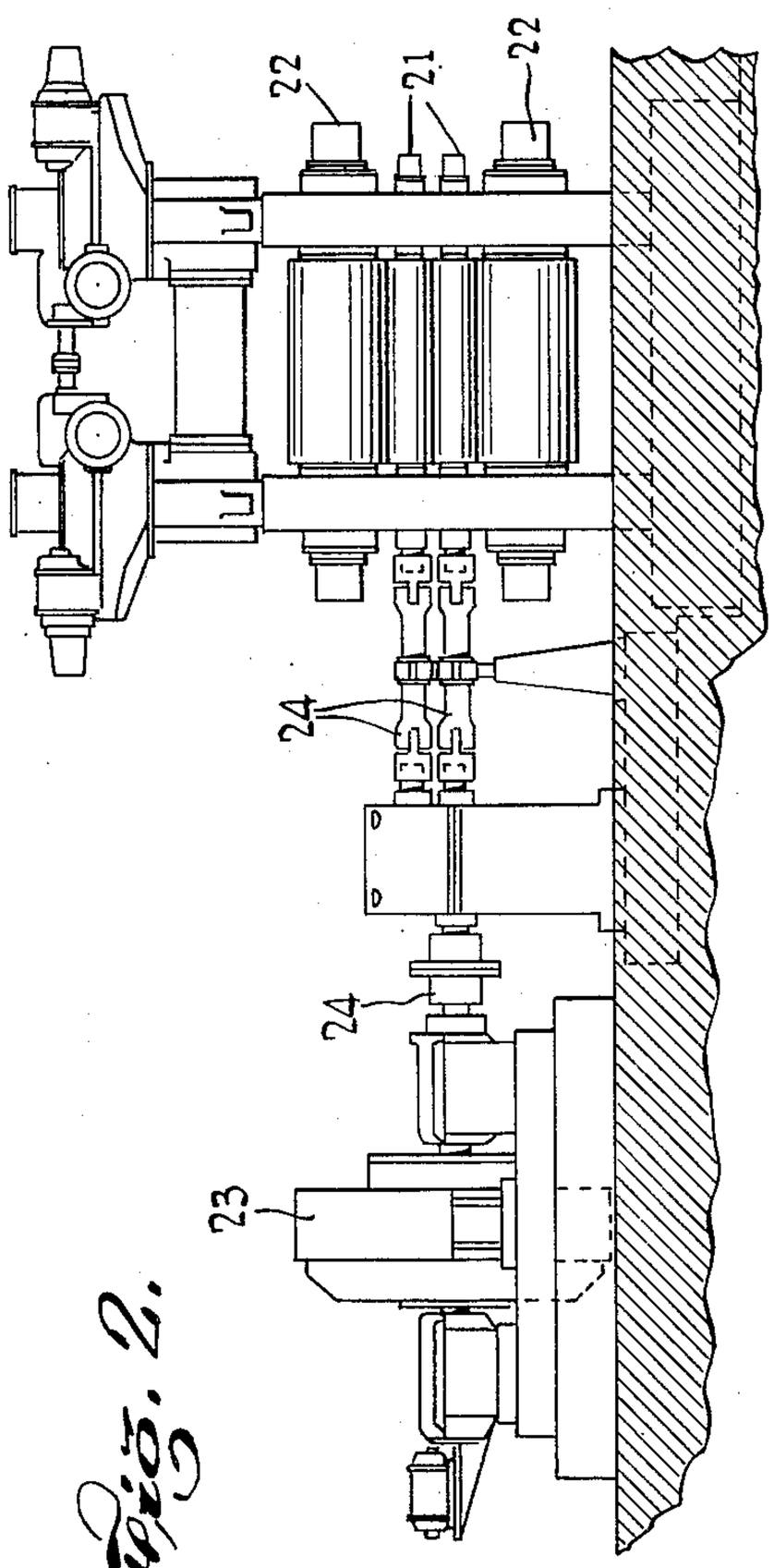

Fig. 2.

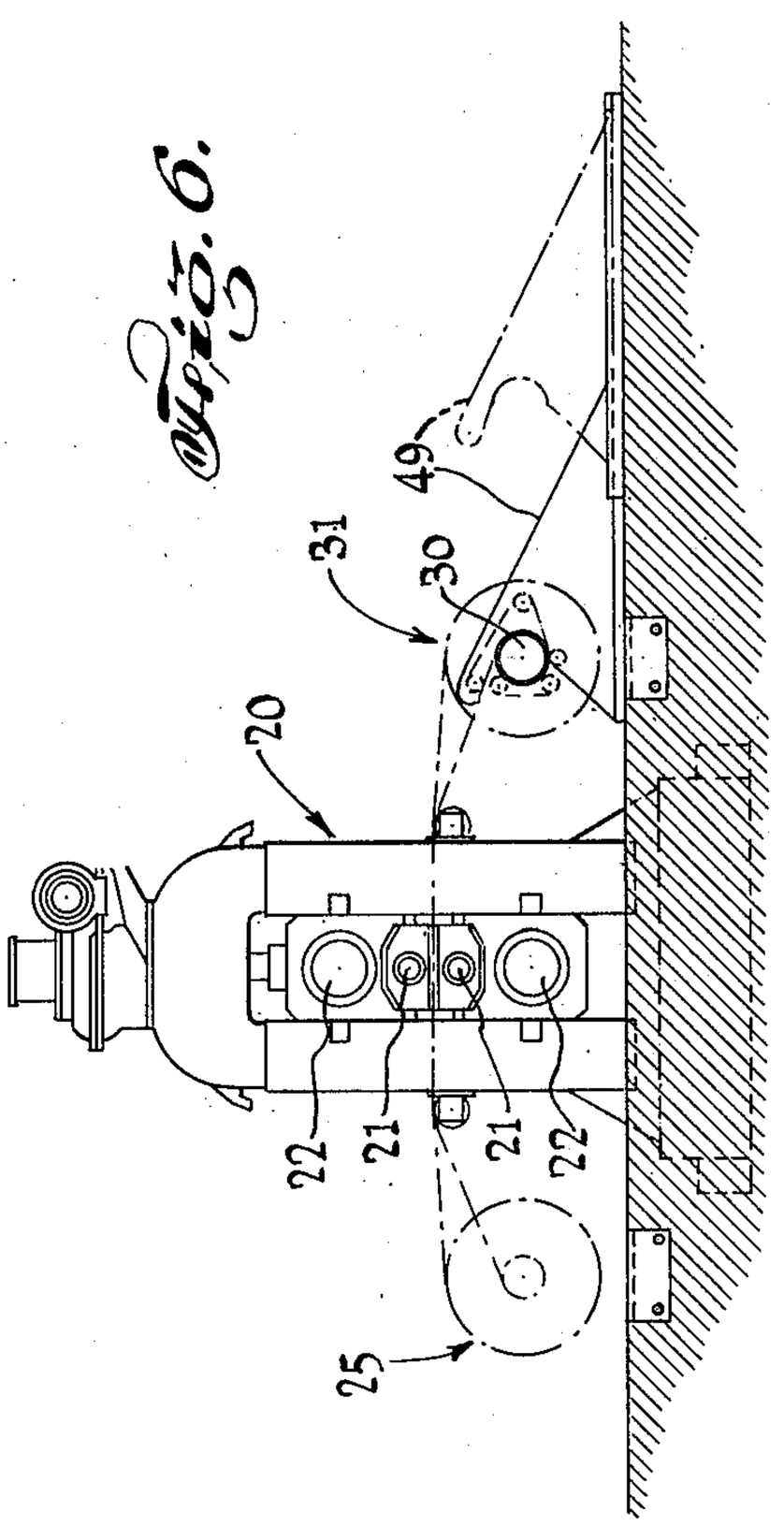

Fig. 6.

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ROLLING MILL MATERIAL HANDLING METHOD AND APPARATUS

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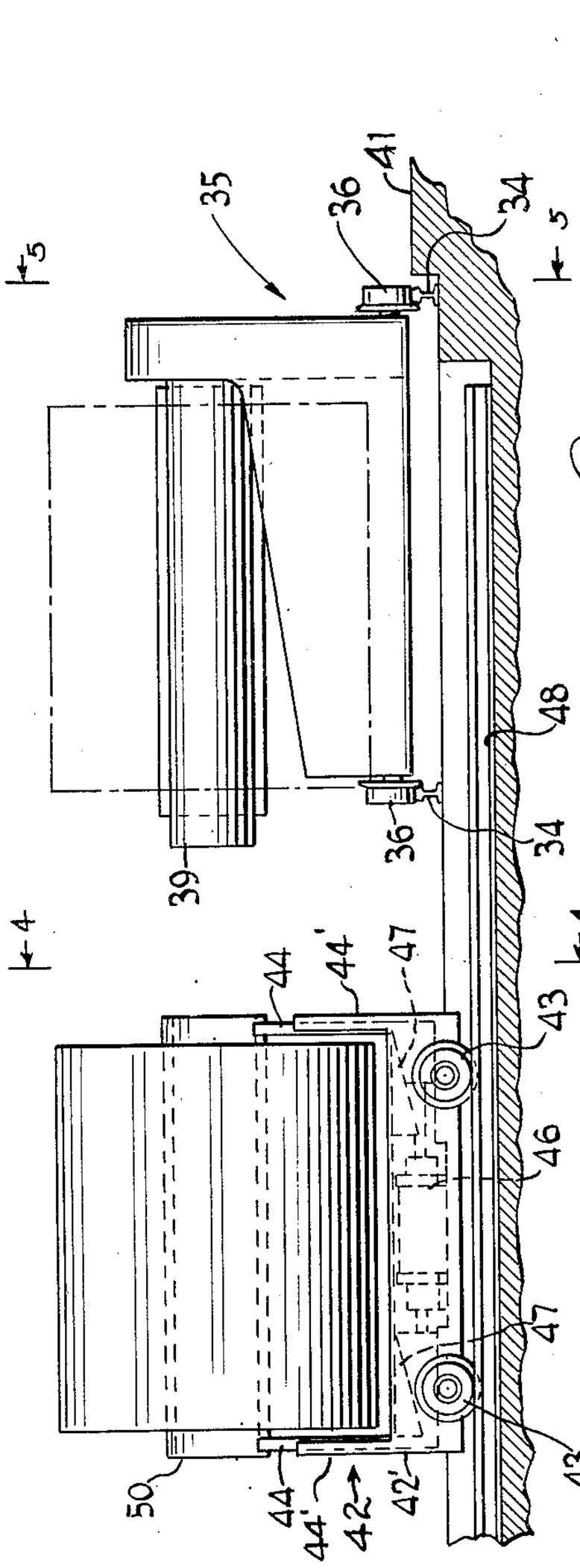

Fig. 3.

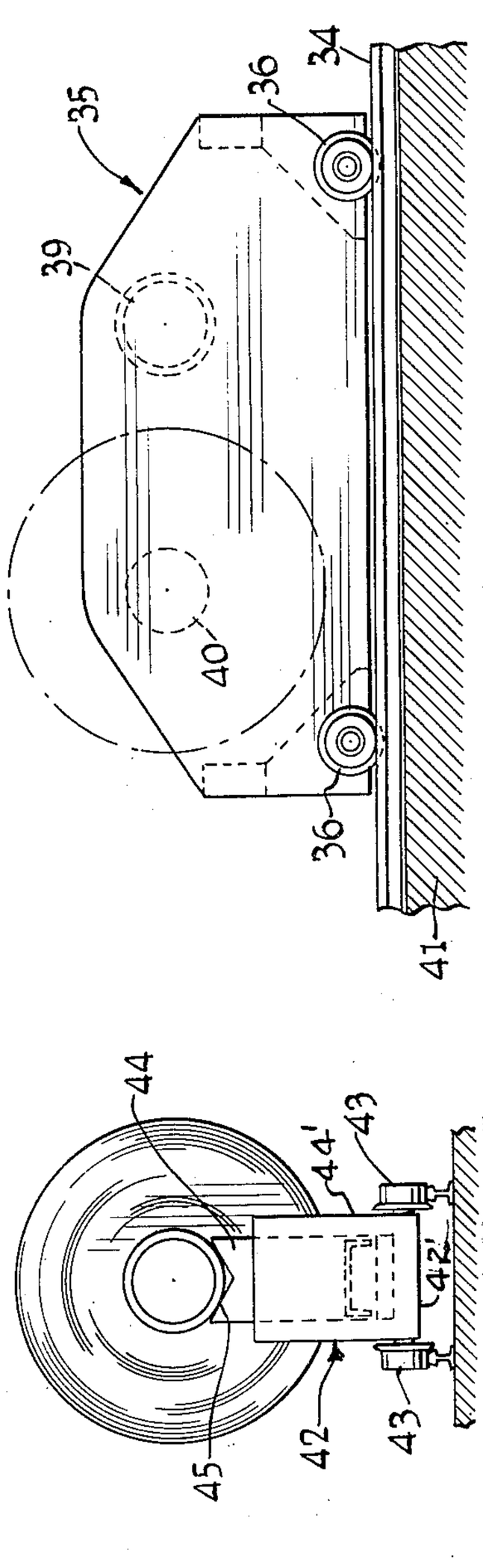

Fig. 5.

Fig. 4.

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ROLLING MILL MATERIAL HANDLING METHOD AND APPARATUS

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Fig. 9.

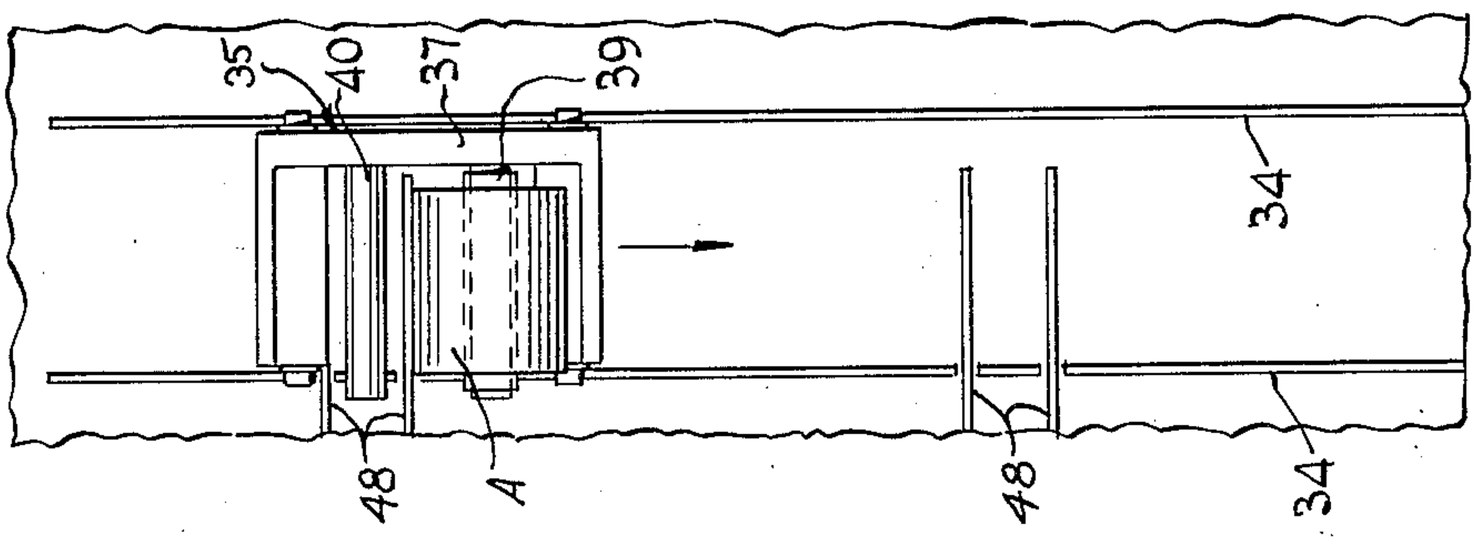


Fig. 8.

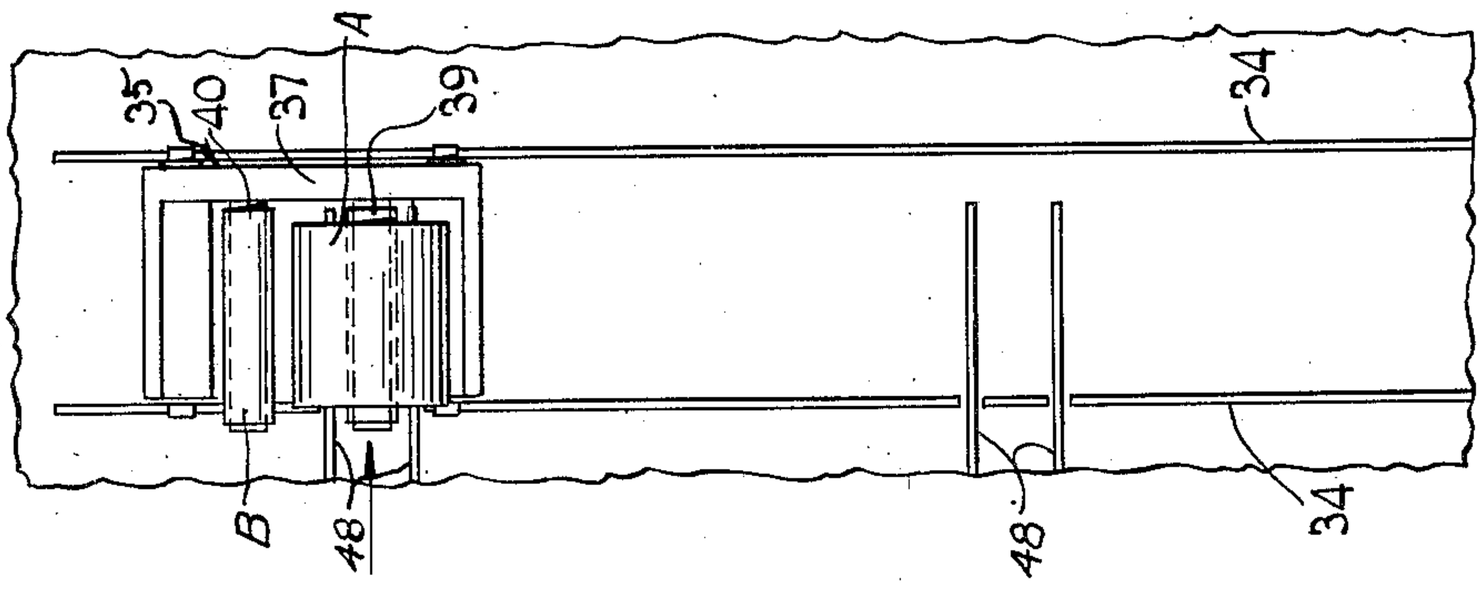
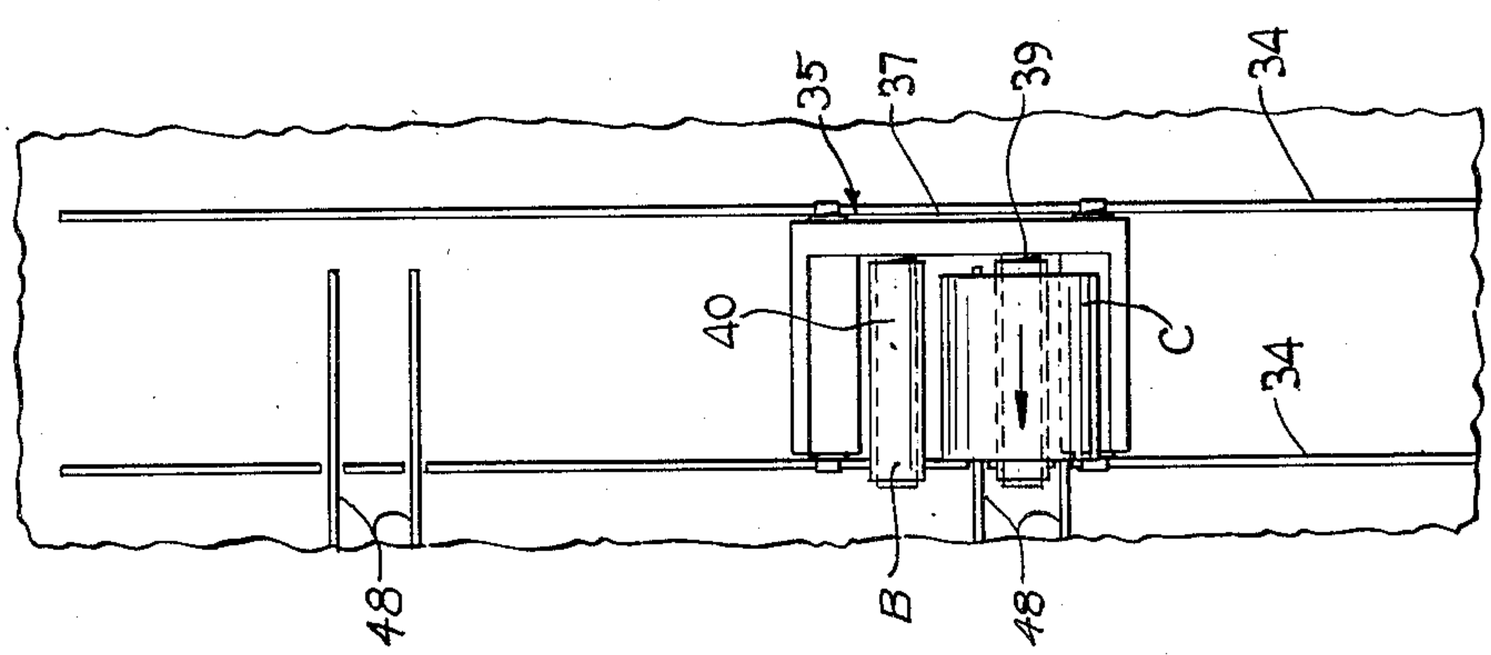


Fig. 7.



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UNITED STATES PATENT OFFICE

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ROLLING MILL MATERIAL HANDLING METHOD AND APPARATUS

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Application October 6, 1947, Serial No. 778,248

11 Claims. (Cl. 242—79)

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This invention relates to rolling mills or the like and especially to a material handling apparatus and method to be used in conjunction therewith.

In the rolling of material, such as foil or thin sheet material, the material normally is delivered to the mill in coil form, and it is desirable to wind the material into a coil after it has been processed by the mill. When the material is thin, such as in the common varieties of metal foil, care must be taken not to damage the material on the coils.

One of the objects of the invention is to provide an improved method and apparatus for handling material to be operated upon by a rolling mill, or the like, to reduce the time and labor required for exchanging new reels of material to be rolled for material which has been rolled.

In one aspect of the invention, a rolling mill having a material pay-off station and material wind-up station is employed, the material being threaded through the rolls of the mill. A shuttle carriage having arrangements thereon for receiving two drums is used, said carriage being movable to and from a drum receiving and discharge point to positions opposite said pay-off station and said wind-up station. At the pay-off station there is a spindle for receiving and holding the drum of material to be rolled, and at the wind-up station there is a spindle for receiving the drum upon which the rolled or finished material is to be wound. Suitable means, such as an electric generator, can be provided for serving as a brake on the drum at the pay-off station and an electric wind-up motor for the drum of the wind-up station. A coil transfer car is employed at the pay-off station and the wind-up station for transporting drums back and forth between the respective spindle and a drum receiving arrangement on the shuttle carriage.

In one sequence of operation, assuming that the mill has just completed a rolling operation and that there is an empty drum at the pay-off station, the shuttle carriage with a full drum thereon is brought opposite to the pay-off spindle. The transfer car is then manipulated to transfer the empty drum to the shuttle carriage. Following this, the carriage is moved so that the transfer car engages the full drum and said transfer car carries the full drum onto the pay-off spindle. The shuttle carriage then is moved to a point opposite the wind-up station where the full drum is transferred to the shuttle

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carriage and the empty drum on the shuttle carriage transferred to the wind-up spindle. Variations in the sequence may be made in accordance with the particular condition or position of the drums at the time the change is made.

These and other objects, advantages and features of the invention will become apparent from the following description and drawings which are merely exemplary.

In the drawings:

Fig. 1 is a plan view of a rolling mill arrangement employing one form of the invention;

Fig. 2 is an elevation taken approximately along the line **2—2** of Fig. 1;

Fig. 3 is an enlarged elevation of the transfer car and shuttle carriage;

Fig. 4 is an end view of the transfer car taken in the direction **4—4** of Fig. 3;

Fig. 5 is an elevation of the shuttle carriage taken in the direction **5—5** of Fig. 3;

Fig. 6 is a fragmentary side elevation of a rolling mill showing the pay-off and wind-up reels;

Fig. 7 is a fragmentary plan view of the shuttle carriage in position for transfer of a new drum to the pay-off station;

Fig. 8 is similar to Fig. 7 but with the shuttle carriage moved to the rear of the mill and the finished full drum of material thereon;

Fig. 9 is similar to Fig. 8 with the shuttle carriage moved to a position where the empty drum is in readiness to be transferred to the wind-up reel.

In a preferred form of the invention, a rolling mill is seen at **20** (Figs. 1, 2 and 6) having working rolls **21** and backing rolls **22**. It is to be understood, of course, that various types and arrangements of rolling mills can be used and also that other types of machines may be served by applicant's invention. Also mills having two rolls, three rolls, or any desired number of rolls can be employed with applicant's invention.

The mill may be driven in any conventional manner, such as, for example, by motor **23** through drive shafts **24**. The pay-off reel station **25** can have a hollow spindle **26** thereon, said spindle having conventional expanding jaws **27** at the outer end thereof. The pay-off spindle **26** can be connected through suitable gearing or other mechanism **28** to a suitable braking apparatus, such as direct current generator **29**. A similarly constructed wind-up spindle **30** can be located at the wind-up station **31**, said spindle being connected through gearing **32** with the wind-up reel motor **33**.

The coil handling shuttle carriage **35** movable on rails or guides **34** is shown in detail in Figs. 3 and 5, said carriage having four wheels **36** carried by the C-shaped frame **37**. The legs **37'** (Fig. 1) of the frame support the wheels nearest to the rolling mill (Fig. 1).

Two drum carrying projections **39** and **40**, or surfaces of any desired configuration, extend from the rear portion of the frame **37** toward the rolling mill, the projections **39** and **40** being for the purpose of receiving the coil drums, as will be explained hereafter. It is thus apparent that the shuttle carriage **35** has an open front in the direction of the wind-up and pay-off reel stations so as to be able to receive and discharge the material drums, as will be explained hereafter. Rails **34** preferably are flush with the floor **41**. The shuttle carriage also can be moved to a position in front of the mill for the purpose of placing new drums of material on the carriage and removing finished material therefrom.

The pay-off reel transfer car **42** is shown in detail in Figs. 3 and 4, the car having a frame **42'** with wheels **43** fastened thereto. The car **42** can be moved transversely of the mill by means of suitable air or hydraulic cylinders (not shown), or other apparatus not comprising a part of the present invention. At each end of the car **42** there are vertically movable slides **44** having V-shaped notches **45** (Fig. 4) therein for engaging the ends of a coil drum **50**. The vertically operable slides **44** can be moved by means of the air or hydraulic cylinders **46** and wedges **47**, but it is apparent that other apparatus can be provided for operating said slides.

The wind-up reel transfer car **51** can be made generally similar to the pay-off reel car and will not be described in detail.

The pay-off reel transfer car **42** and wind-up reel transfer car **51** are movable transversely of the rolling mill on tracks **48**, said tracks intersecting and crossing one of the longitudinal rails **34**. In the form shown, the bottoms of the transfer cars are lower than the bottom of the shuttle carriage, but such arrangement is a matter of choice. Various means can be employed to move the shuttle carriage along its tracks, such as hydraulic means, electric motors, etc. It also is apparent that the position of the drums on the projections **39** and **40** may be reversed and the shuttle carriage moved accordingly.

If desired, a conventional belt wrapping mechanism **49** can be provided to assist in the wrapping of the material at the wind-up reel station (Fig. 6).

In describing the operation of the device, it will be assumed that the mill has completed a rolling operation on a coil of material so that the drum A (Fig. 1) on the wind-up spindle is full and the drum B on the pay-off reel spindle is empty. The mill is thus ready for replacement of the empty pay-off drum B and removal of the full drum A of finished material at the wind-up station. With the shuttle carriage **35** moved to the front of the mill, a full drum C of coiled material to be rolled is placed on the hitherto empty drum carrying extension **39**. The shuttle carriage **35** then can be moved to a position (Fig. 1) such that the empty drum carrying extension **40** is opposite the pay-off spindle **26**. Previously thereto, or thereafter, with the transfer car **42** under the spindle **26**, air cylinders **46** are operated to raise slides **44** upwardly until they support the empty drum B. The drum engaging jaws **27** then can be released and the pay-off reel transfer car **42** moved to the right (Fig. 1), so as to transfer the empty drum B onto the drum carrying extension **40** of the shuttle carriage. It is apparent that the transfer car can enter between the legs **37'** or the open front portion of the shuttle carriage **35**. The air cylinder **46** of the car then can be operated to retract slides **44** so that the empty drum will rest upon the drum carrying extension **40**.

The shuttle carriage **35** then can be moved towards the rear of the mill to the second position seen in Fig. 7 wherein the full drum C of new material is opposite the pay-off spindle **26**, the transfer car **42** having been left in position so that the full drum C on the transfer carriage will move between the uprights **44'** of the transfer carriage. The air cylinder **46** then can be operated to raise slides **44** so as to lift the full drum C free from or concentric with the drum carrying extension **39** of the shuttle carriage. The pay-off coil transfer car **42** then can be moved to the left, carrying the full coil of material thereon until the drum C thereof is located on spindle **26**. At this time, the exanding jaws **27** can be operated and the slides **44** retracted so that a full drum is in position ready to be rolled.

The shuttle carriage **35** is now moved toward the rear of the mill until it is opposite the wind-up spindle **30** as shown in Fig. 8, Fig. 8 showing the shuttle carriage after the full coil A of finished material has been transferred thereto from the wind-up reel station. The wind-up coil transfer car **51** was previously operated similar to the pay-off car **42** so that full coil A of finished material on spindle **30** might be moved onto the empty coil carrying extension **39** of the shuttle carriage.

The vertical slides of transfer car **51** then can be retracted, following which the coil handling shuttle carriage **35** is moved toward the front of the machine to the position of Fig. 9. The transfer car slides are raised again and the empty drum B engaged thereby can be moved onto the pay-off reel spindle **30** in readiness for receiving the material threaded through the mill from the full coil on the pay-off reel.

It is thus apparent that an improved method and apparatus for handling material in conjunction with a rolling mill or the like has been described. The details of construction and use of the invention may be varied without departing from the spirit thereof except as defined in the appended claims.

What is claimed:

1. The method of operating a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, comprising the steps of removing an empty material drum from the pay-off station and replacing the same with a drum having material thereon to be rolled, moving said empty drum toward said wind-up station, removing a drum with rolled material thereon from said wind-up station, and replacing the same with said empty drum.

2. The method of operating a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, comprising the steps of removing an empty material drum from the pay-off station and replacing the same with a drum having material thereon to be rolled, moving said empty drum to a position adjacent said wind-up station, removing a drum with rolled material thereon from said wind-up station, replacing the same with said empty

drum, and threading material to be rolled from said drum at the pay-off station through said rolling mill to said empty drum at the wind-up station.

3. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, a material drum shuttle device movable to positions adjacent said stations, said shuttle device having drum carrying portions thereon, a first transfer means operable to move an empty drum from the material pay-off station to said shuttle device and to replace said empty drum with a full drum from said shuttle device, means to move said shuttle device with said empty drum thereon to a position opposite said material wind-up station, and a second transfer means operable to move a full drum of finished material from said material wind-up station to said shuttle device and to replace the same with the empty drum from said shuttle device.

4. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, a material drum shuttle carriage movable to positions opposite said stations, said carriage having material drum carrying surfaces thereon, a first transfer car movable between said pay-off station and said shuttle carriage, said car being operable to move an empty drum from the pay-off station to said shuttle carriage and replace the same with a full drum from said shuttle carriage, means for moving said shuttle carriage from a position opposite said pay-off station to a position opposite said wind-up station, a second transfer car movable between said wind-up station and said shuttle carriage, said second car being operable to move a full drum from said wind-up station to said shuttle carriage and replace the same with said empty drum.

5. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, material drum receiving spindles at the pay-off station and at the wind-up station, braking apparatus connected to the pay-off spindle, a wind-up motor connected to the wind-up spindle, a material drum shuttle carriage movable to positions opposite said spindles, said carriage having material drum carrying surfaces thereon, a first transfer car movable between said pay-off spindle and said surfaces on said shuttle carriage, said car being operable to move an empty drum from the pay-off spindle to a surface on said shuttle carriage and to replace the empty drum with a full drum from said shuttle carriage, means for moving said shuttle carriage from a position opposite said pay-off spindle to a position opposite said wind-up spindle, and a second transfer car movable between said wind-up spindle and said drum carrying surfaces on said shuttle carriage, said second car being operable to move a full drum from said wind-up spindle to said surfaces on said shuttle carriage and to replace said full drum on said spindle with an empty drum from the shuttle carriage.

6. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, a material drum shuttle carriage movable to positions opposite said stations, said carriage having a pair of material drum carrying projections thereon, a first transfer car movable between said pay-off station and said projections on said shuttle carriage, said car being operable to move an empty drum from the pay-off station to a projection on said shuttle carriage and to replace the empty drum at the pay-off station with a full drum transferred from the other projection on said shuttle carriage, means for moving said shuttle carriage from a position opposite said pay-off station to a position opposite said wind-up station, a second transfer car movable between said wind-up station and the projection on said shuttle carriage, said second car being operable to move a full drum from said wind-up station to one of said projections on said shuttle carriage and to replace the full drum with an empty drum carried by the other projection on said shuttle carriage.

7. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, a pay-off spindle at said pay-off station, a wind-up spindle at said wind-up station, a material drum shuttle carriage movable to positions opposite said stations, said carriage having material drum carrying surfaces thereon, a track extending longitudinally of said rolling mill upon which said shuttle carriage is movable, a first transfer car movable between said pay-off spindle and said shuttle carriage when the shuttle carriage is opposite the pay-off spindle, track means for said transfer car intersecting said shuttle carriage track means, means to move said transfer car between said pay-off spindle and said shuttle carriage to carry an empty drum from the pay-off spindle to one of said surfaces on said shuttle carriage and replace the empty drum on the pay-off spindle with a full drum on the other surface on said shuttle carriage, a second transfer car movable between said wind-up spindle and said shuttle carriage when the shuttle carriage is opposite said wind-up spindle, track means for said transfer car intersecting said shuttle carriage track, and means to move said second transfer car between said wind-up spindle and said shuttle carriage to move a full drum from said wind-up spindle to an empty surface on said shuttle carriage and to replace said full drum with an empty drum from the other surface on said shuttle carriage.

8. In a rolling mill, material handling apparatus having a material-pay-off station and a material wind-up station, a material drum shuttle carriage movable to positions opposite said stations, said carriage having drum receiving portions thereon freely accessible from one side of the carriage, and transfer means for freely moving drums between said stations and said drum receiving portions.

9. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, a material drum shuttle carriage movable to positions adjacent said stations, said shuttle carriage having a C-shaped frame with the open portion of the C facing said stations, a pair of drum receiving portions on said shuttle carriage in the open portion of the C-shaped frame, and transfer means for moving drums between said stations and said drum carrying portions of the shuttle carriage, said transfer means being enterable within the open side of the C-shaped frame of the shuttle carriage to move drums on and from said drum carrying portions of said carriage.

10. In a rolling mill, material handling apparatus, a material drum shuttle carriage comprising a C-shaped frame having an open portion at one side, a pair of horizontally extending drum carrying projections extending outwardly

relative to the base leg of the C of the frame mounted in and overlying said open portion of the frame adapted to have drums removed and placed thereon from the side of the carriage into said open portion, and carriage guiding means on each corner of the frame guiding movement of said carriage transversely of the axis of the drums.

11. In a rolling mill, material handling apparatus having a material pay-off station and a material wind-up station, material drum receiving spindles at the pay-off station and at the wind-up station, a material drum shuttle carriage comprising a frame having an open portion and a pair of horizontally extending drum carrying projections mounted in said open portion of the frame, said carriage being movable to positions opposite said spindles, a first material drum transfer car comprising a frame, a pair of vertically reciprocal slides adapted to support the ends of a drum, slide operating mechanism carried by said frame and connected to said slides for raising and lowering the same, said transfer car being operable to move an empty drum from the pay-off spindle to one of said drum carrying projections and to replace the empty drum with a full drum from the other

projection on said shuttle carriage, means for moving said shuttle carriage from a position opposite said pay-off spindle to a position opposite said wind-up spindle, and a second material drum transfer car comprising a frame, a pair of vertically reciprocal slides adapted to support the ends of a drum, slide operating mechanism carried by said frame and connected to said slides for raising and lowering the same, said transfer car being operable to move a full drum from said wind-up spindle to the empty drum carrying projection on said shuttle carriage and to replace said full drum on said spindle with the empty drum from the other projection on said shuttle carriage.

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