Dec. 7, 1965 R. D. SWALLOW ETAL 3,221,530

ROLLING MILLS HORIZONTAL-ROLL CHANGE

Filed Jan. 8, 1963 5 Sheets-Sheet 1

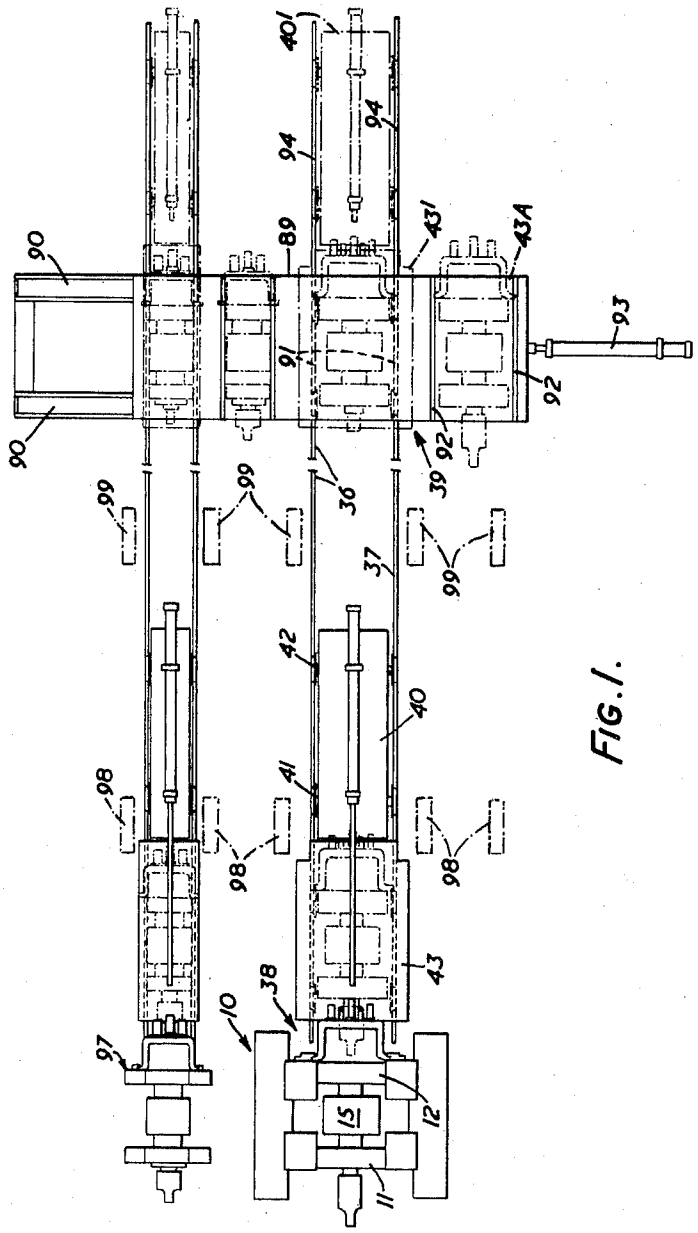


FIG. 1.

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ROLLING MILLS HORIZONTAL-ROLL CHANGE

Filed Jan. 8, 1963 5 Sheets-Sheet 2

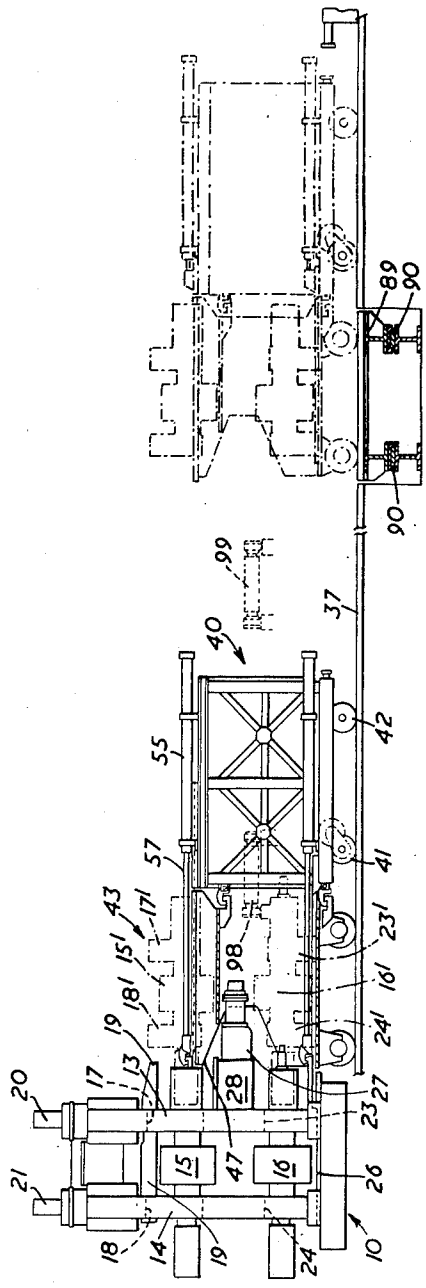


FIG. 2

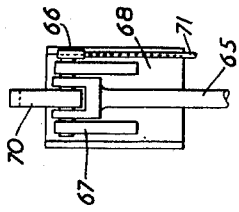


FIG. 7.

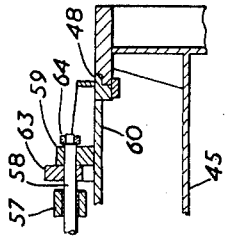


FIG. 6.

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ROLLING MILLS HORIZONTAL-ROLL CHANGE

Filed Jan. 8, 1963 5 Sheets-Sheet 3

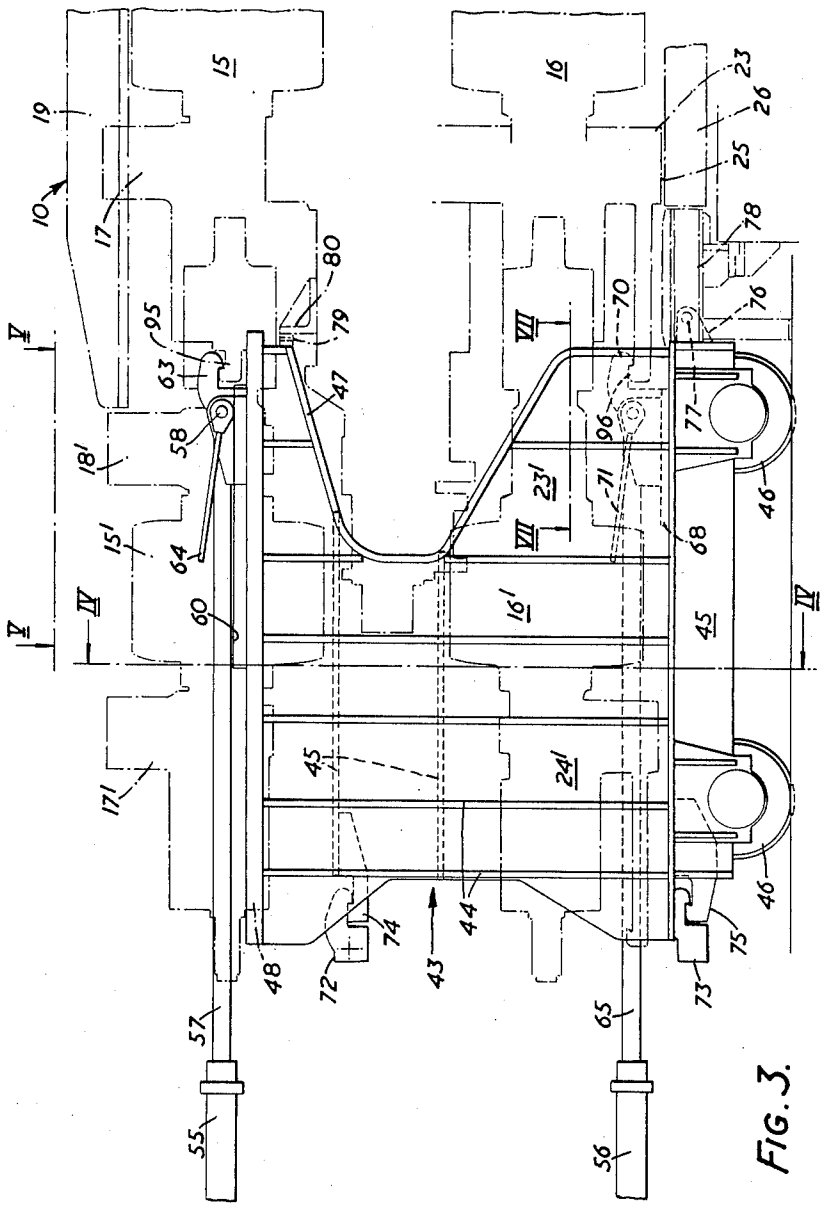


FIG. 3.

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Filed Jan. 8, 1963 5 Sheets-Sheet 4

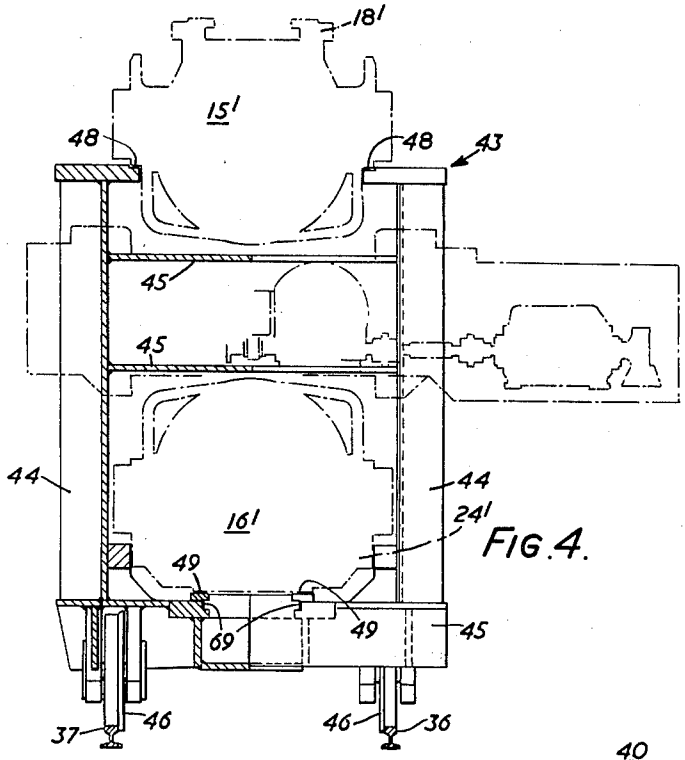


FIG. 4.

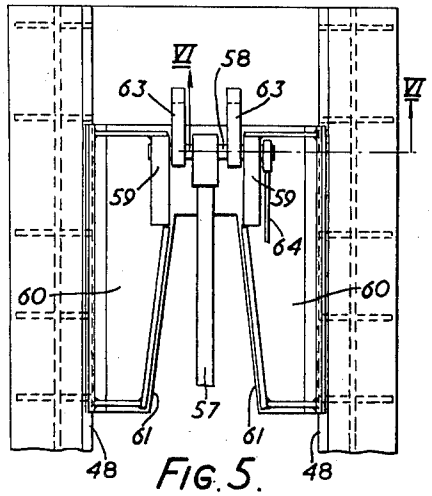


FIG. 5.

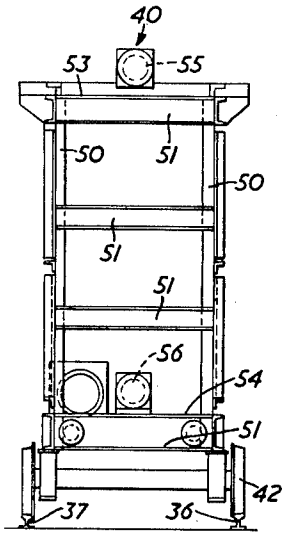


FIG. 9.

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ROLLING MILLS HORIZONTAL-ROLL CHANGE

Filed Jan. 8, 1963 5 Sheets-Sheet 5

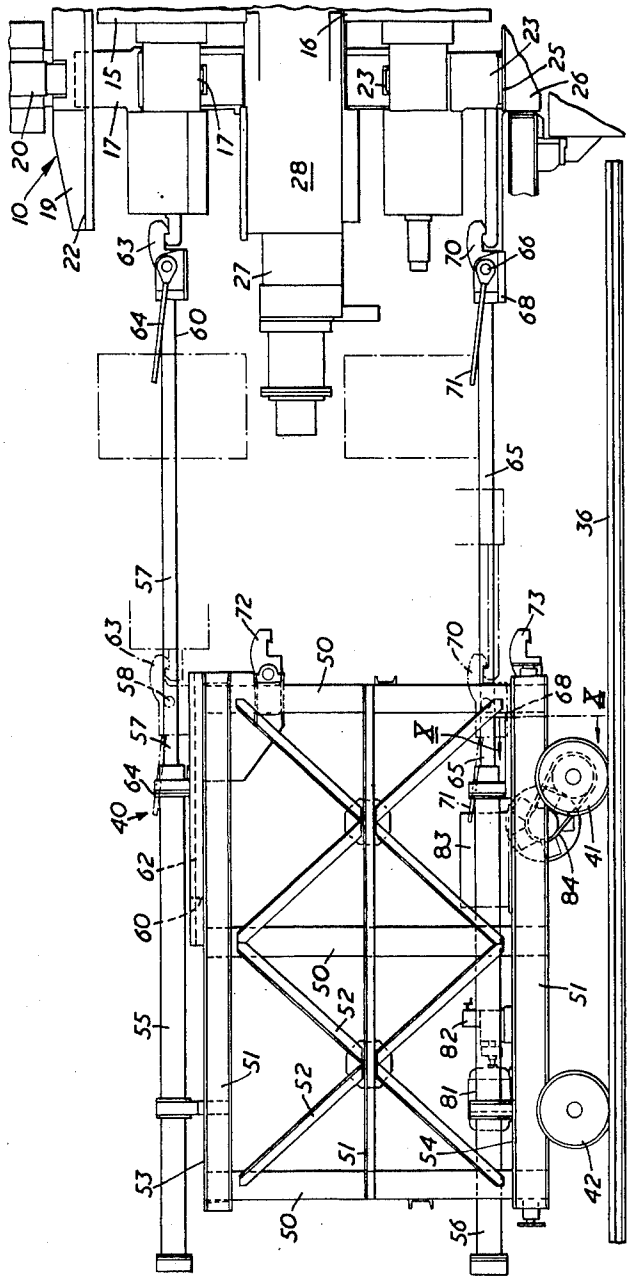


FIG. 8.

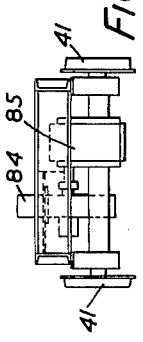


FIG. 10.

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ROLLING MILLS HORIZONTAL-ROLL CHANGE

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Filed Jan. 8, 1963, Ser. No. 255,423

Claims priority, application Great Britain, Jan. 8, 1962, 734/62

15 Claims. (Cl. 72—239)

This invention relates to rolling mills of the type including at least one pair of horizontal rolls so arranged that these rolls cannot be extracted from the rolling mill in the more usual manner, with the uppermost of the two rolls seated upon the other roll, but must be extracted separately, the rolling mill being provided with guide means arranged to support the rolls as they are extracted from the rolling mills; a rolling mill of this type will be referred to hereinafter as "a rolling mill of the type specified."

An example of a rolling mill of the type specified as a beam mill of the universal type having a pair of horizontal rolls and a pair of vertical rolls, the horizontal rolls being maintained in position within the rolling mill by two spreader beams which extend parallel to the horizontal rolls, respectively above and below the upper and the lower horizontal rolls. Because of the presence of vertical rolls at opposite ends of the horizontal-roll assembly, the upper and lower horizontal-roll assemblies must be respectively raised and lowered, before the horizontal rolls can be extracted from the rolling mill, through a window of the rolling mill housing. The two horizontal rolls are raised and lowered by raising and lowering the spreader beams, the spreader beams being provided with slideways or the like, constituting the guide means referred to above. One reason for the provision of spreader beams in such a beam mill, is to permit the pair of horizontal rolls to be easily exchanged for another pair of horizontal rolls of different barrel length, as is required for rolling a beam of a different width; such an operation is often required to be carried out quickly.

With known rolling mills of the type specified, and in particular with known beam mills of the universal type, the horizontal rolls are extracted from the rolling mill onto a roll-change assembly located adjacent to the rolling mill. The presence of this roll-change assembly prevents easy access to the rolling mill, and the assembly occupies valuable space adjacent to the rolling mill. Furthermore, with known arrangements the horizontal rolls must be extracted and exchanged separately by means of the roll-change assembly.

According to one aspect of the present invention, there is provided a method of changing a pair of horizontal rolls of a rolling mill of the type specified, which includes the steps of extracting the horizontal rolls from the rolling mill respectively onto upper and lower decks of a first mobile roll-change unit while the roll-change unit is located adjacent to the rolling mill, removing the unit from the vicinity of the rolling mill, moving to a position adjacent to the rolling mill a second mobile roll-change unit carrying respectively upon its upper and lower decks a second pair of horizontal rolls, and inserting the second pair of horizontal rolls into the rolling mill.

According to a second aspect of the present invention, there is provided for a rolling mill of the type specified, a mobile roll-change unit having upper and lower decks respectively arranged to receive the upper and the lower horizontal-roll assemblies of the rolling mill.

Preferably, the mobile roll-change unit includes a first roll-change mechanism capable of transferring the uppermost of the two horizontal-roll assemblies between the rolling mill and the upper deck of the roll-change unit, and a second roll-change mechanism capable of transferring the lowermost of the two horizontal-roll assemblies between the rolling mill and the lower deck of the roll-change unit.

The mobile roll-change unit may comprise a roll-carriage provided with the said upper and lower decks, and a locomotive unit capable of being coupled to the roll-carriage to move the roll-carriage towards and away from the rolling mill. In this case the locomotive unit preferably carries the said first and second roll-change mechanisms.

With this arrangement, at least two roll-carriages may be provided, each roll-carriage being capable of carrying a pair of horizontal rolls; a single locomotive unit may be employed to remove, from the vicinity of the rolling mill, one roll-carriage carrying a pair of horizontal rolls extracted from the rolling mill, and then to move to the rolling mill the other roll-carriage carrying a second pair of horizontal rolls for insertion into the rolling mill. The use of a single locomotive unit is a considerable economy.

Suitable disengageable couplings are preferably provided between the rolling mill and the roll-carriage or roll-carriages, and between the roll-carriage or roll-carriages and the locomotive unit, to resist the effects upon the mobile roll-change unit of moments and tensile forces generated during operation of the first and the second roll-change mechanism.

The upper and the lower decks of the roll-change unit, or of the roll-carriage or roll-carriages, are preferably provided with ramps to facilitate transfer of the horizontal rolls from the decks of the roll-change unit to the said guide means of the rolling mill.

The mobile roll-change unit may be provided with wheels arranged to run upon a track extending between the rolling mill and a roll-storage area relatively distant from the rolling mill.

Where such a track is provided, and where at least two roll-carriages are arranged to be driven by a single locomotive unit, the roll-storage area may include transfer means arranged for rapid transfer of a first roll-carriage away from the locomotive unit and substitution of a second roll-carriage. The transfer means is preferably in the form of a sliding table provided with short lengths of track upon which the roll-carriages are carried; alternatively a turn-table may be employed. The sliding table or turn-table is preferably hydrostatically lubricated. In another alternative, the transfer means may comprise a roller assembly along which the roll-carriages can be moved, or the transfer means may comprise a duplicated track provided with suitable points. In a further alternative arrangement of transfer means, the roll-carriages may be provided with retractable transverse wheels to permit the roll-carriages, when in the roll-storage area, to be rapidly moved sideways.

In the roll-storage area, suitable means may be provided to permit the removal of the horizontal-roll assemblies from the decks of the roll-carriages; this time-consuming operation therefore does not have to be performed adjacent to the rolling mill.

The locomotive unit may be provided with a motor which drives its wheels, or the locomotive unit may be driven by a rack-and-pinion arrangement or by a sprocket wheel which engages a pin-rack, the rack or the pin-rack being secured to the ground and the pinion or the sprocket wheel being carried by the locomotive unit and being driven by a motor.

In some cases, the mobile roll-change unit may be required to pass between the rollers of roller tables located adjacent to the rolling mill, the spaces between the rollers of such roller tables being commonly bridged by bridging plates. To permit the mobile roll-change unit to pass,

such bridging plates may be temporarily removed by suitable lifting means or, alternatively, relevant bridging plates may be formed in two tiltable portions, in the manner of a cantilever bridge.

The invention may be carried into practice in a number of ways, but one specific example will now be described with reference to the drawings accompanying the provisional specification of which:

FIGURE 1 is a plane view of a rolling mill of the type specified, a beam mill of the universal type, provided, according to the invention, with apparatus for changing a pair of horizontal rolls;

FIGURE 2 is a side elevation of the arrangement of FIGURE 1;

FIGURE 3 is a side elevation, taken in the opposite direction to that of FIGURE 2 of a roll-carriage according to the invention;

FIGURE 4 is a section taken along the line IV—IV of FIGURE 3;

FIGURE 5 is a plan view taken along the line V—V of FIGURE 3;

FIGURE 6 is a section taken along the line VI—VI of FIGURE 5;

FIGURE 7 is a plan view taken along the line VII—VII of FIGURE 3;

FIGURE 8 is a side elevation, taken in the same direction as that of FIGURE 3, of a locomotive unit;

FIGURE 9 is an end elevation taken along the line IX—IX of FIGURE 8; and

FIGURE 10 is a section taken along the line X—X of FIGURE 8.

The beam mill indicated generally at **10**, has two side housings **11** and **12**, the housing posts of which are indicated at **13** and **14**. The beam mill **10** has a pair of horizontal rolls **15** and **16**. The upper horizontal roll **15** is mounted in a pair of chocks **17** and **18** which are slidably suspended from an upper spreader beam **19**; opposite ends of the spreader beam **19** are acted upon by screws **20** and **21** of the rolling mill, and the arrangement is such that the spreader beam **19** can be raised to permit the upper horizontal roll **15**, with its chocks **17** and **18**, to be extracted from the rolling mill by sliding the chocks **17** and **18** along the spreader beam **19**, the spreader beam **19** having a suitable slideway **22** (FIGURE 8) provided at its lower edges.

The lower horizontal roll **16** is similarly mounted in a pair of chocks **23** and **24**, these chocks being seated in a slideway **25** formed upon the upper face of a lower spreader beam **26** located near the bottom of the beam mill **10**. The spreader beam **26** can be lowered a limited distance thus permitting the lower horizontal roll **16**, with its chocks **23** and **24**, to be lowered slightly.

At each of its opposite sides, the beam mill is provided with a U-shaped yoke **27** which extends horizontally outwards between corresponding housing posts **13** or **14**. Each yoke **27** is designed to hold in position a vertical-roll assembly of the beam mill **10**. For simplicity, the vertical rolls are not shown in the drawings, but a vertical-roll assembly is indicated at **28**. The vertical-roll assemblies constitute obstructions to the removal of the horizontal rolls **15** and **16**, and it is for this reason that the horizontal rolls **15** and **16** cannot be extracted in the more usual manner, that is with the roll **15** seated upon the roll **16**. The spreader beams **19** and **26**, which can be raised and lowered as described, permit the horizontal rolls **15** and **16** to be respectively raised and lowered sufficiently for them to be extracted through a housing window of the beam mill **10**, respectively above and below a vertical-roll assembly such as **28**. The spreader beams **19** and **26** are also employed to permit horizontal rolls of lesser width than those, **15** and **16**, shown in the drawing, to be used in the beam mill **10**; with horizontal rolls of lesser width, the chocks **17**, **18**, **23** and **24** are located closer to the ends of the horizontal rolls than is indicated in the drawings.

A track comprising a pair of rails **36** and **37** extends from the roll-change side **38** (FIGURE 1) of the beam mill **10**, to a roll-storage area indicated generally at **39**.

A locomotive unit **40** having wheels **41** and **42** can be driven along the rails **36** and **37**, and can transport between the mill **10** and the roll-storage area **39**, roll-carriages of which one is indicated at **43**.

Two identical roll-carriages **43** (FIGURE 3) may be provided, each comprising a framework of vertical girders **44** and horizontal girders **45**, each roll-carriage **43** being provided with four wheels **46** which run along the tracks **36** and **37**. Each roll-carriage **43** is provided with a cut-away portion **47** to prevent the roll-carriages fouling the vertical-roll assemblies **28**.

As may be seen from FIGURES 2, 3 and 4, each roll-carriage is formed to provide an upper deck to receive an upper horizontal-roll assembly **15'** together with its chocks **17'** and **18'**, and to provide a lower deck arranged to receive a lower horizontal-roll assembly **16'** together with its chocks **23'** and **24'**. The upper deck of the roll-carriage **43** is provided with slideways **48** along which the upper horizontal-roll assemblies can slide, as may be seen from FIGURE 4, and the lower deck of each roll-carriage **43** is similarly provided with slideways **49** along which a lower horizontal-roll assembly can slide.

The locomotive unit **40** comprises a framework of vertical girders **50**, horizontal girders **51**, and angled girders **52**. This framework is arranged to provide an upper deck **53** and a lower deck **54**. The upper deck **53** carries a longitudinally extending double-acting piston-and-cylinder arrangement **55**, and the lower deck **54** carries a similar piston-and-cylinder arrangement **56**.

The piston rod **57** of the piston-and-cylinder arrangement **55** is pivoted at its outermost end (FIGURE 5) about a rotatable shaft **58** which is carried by a pair of brackets **59** which extends upwards from a crosshead **60** having a cut-away portion **61**. As may be seen from FIGURE 6, the crosshead **60** is capable of sliding along the slideways **48** of the upper deck of the roll-carriage **43** and can also be retracted (FIGURE 8) along slideways **62** provided upon the upper deck **53** of the locomotive unit **40**, the slideways **62** being similar to the slideways **48**.

A pair of latches **63** are secured to the rotatable shaft **58** for rotation therewith, the shaft **58** being manually rotatable by means of a lever **64**.

The locomotive unit **40** is provided with a pair of latches **72** and **73**, capable, as shown in FIGURE 3, of being engaged with grooved members **74** and **75** provided at one end of each roll-carriage **43**. Each roll-carriage **43** is provided (FIGURE 3) at its other end with brackets **76** having a bore **77** through which a pin may be passed to secure the roll-carriage **43** to a member **78** secured to the base of the beam mill **10**, and each roll-carriage **43** is also provided with a buffer **79** which can engage a stop member **80** secured to the yoke **27** at the roll-change side **38** of the beam mill **10**.

The locomotive unit **40** carries a motor **81** arranged to drive a hydraulic pump **82** to maintain a supply of hydraulic pressure fluid in a tank **83**; this fluid is employed to drive the piston-and-cylinder arrangements **55** and **56**.

The locomtive unit **40** carries, as shown in FIGURES 8 and 10, a hydraulic motor **84** which, through a gearbox **85**, drives the wheels **41** of the locomotive unit **40**.

Referring to FIGURES 1 and 2, there is provided, in the roll-storage area **39**, transfer means comprising a sliding table **89** which is slidable, in the direction transverse of the rails **36** and **37** along slideways **90** which are preferably hydrostatically lubricated. The sliding table **89** carries two spaced tracks **91** and **92**, each track **91** and **92** being capable of carrying a roll-carriage **43**, and can be moved along the slideways **90** by means of a piston-and-cylinder arrangement **93** such that the tracks **91** and **92** may alternatively be aligned with the rails **36**

and 37. A track 94, in line with the rails 36 and 37, extends beyond the sliding table 89 and is intended to receive the locomotive unit 40.

In operation, when it is required to change the horizontal rolls 15 and 16 of the beam mill 10, an empty roll-carriage 43 is pushed out to the mill 10 by the locomotive unit 40 along the tracks 36 and 37. The empty roll-carriage 43 is secured to the mill 10 by passing a pin through the bores 77 of the brackets 76 (FIGURE 3), so that the roll-carriage 43 is held firmly against the mill 10 and in substantially rigid relationship therewith, by this connection and by the buffer 79, the locomotive unit 40 having previously been secured to the roll-carriage 43 by means of the latches 72 and 73. At this stage, the piston rods 57 and 65 of the piston-and-cylinder arrangements 55 and 56 are still retracted, so that the crossheads 60 and 68 lie respectively within the upper and lower decks 53 and 54 of the locomotive unit 40, as shown in FIGURE 8. The heights of the upper and the lower decks of the locomotive unit 40 and of the roll-carriage 43 are so arranged that when the cylinders 55 and 56 are operated to extend the piston rods 57 and 65, the crossheads 60 and 68 move smoothly from the slideways formed in the locomotive unit 40 respectively into and along the slideways 48 and 69 formed in the roll-carriage 43. The lengths of the piston rods 57 and 65 are such that, when these are fully extended, as shown in FIGURE 3, manual operation of the levers 64 and 71 will cause the latches 63 and 70 respectively to engage with grooved members 95 and 96 respectively secured to the ends of the upper end of the lower horizontal-roll assemblies 15 and 16. The piston rods 57 and 65 are then retracted, the roll assemblies 15 and 16 being thereby withdrawn from the mill 10 to the positions 15' and 16' where the assemblies 15 and 16 lie respectively upon the upper and the lower decks of the roll-carriage 43.

It may be seen from FIGURES 2 and 3, that the upper spreader beam 19 is arranged to overhang the upper deck of the roll-carriage 43; in the region of this overhang, the slideways 48 are very slightly curved downwards to form a ramp. The arrangement is such that as the upper horizontal-roll assembly 15 is withdrawn along the upper spreader beam 19, it engages the ramp-portion of the end of the slideways 48, so that the assembly 15, in ascending the ramp-portion of the slideways 48 is lifted easily from the spreader beam 19, the general level of the slideways 48 being thus slightly higher than that corresponding to the position of the roll assembly 15 when suspended from the upper spreader beam 19. A similar ramp-portion may be provided for the slideways 49 upon the lower deck of the roll-carriage 43.

The roll assemblies 15 and 16, being now in position and 15' and 16' respectively, upon the roll-carriage 43, manual operation of the levers 64 and 71 takes place to disengage the latches 63 and 70 respectively, and the piston rods 57 and 65 are then fully withdrawn, so that the crossheads 60 and 68 are withdrawn to the locomotive unit 40.

The pin-connection between the brackets 76 of the roll-carriage 43 and the mill 10 is withdrawn, and the locomotive unit 40 is actuated to withdraw the roll-carriage 43 to the position 43' (FIGURE 1), where the roll-carriage 43 is upon the track 91 of the sliding table 89 and the locomotive unit 40 lies at the position 40' upon the track 94. The latches 72 and 73 interconnecting the locomotive unit 40 and the roll-carriage 43 are then disengaged, whereafter the piston-and-cylinder arrangement 93 is operated to move the sliding table 89 to a position where a second roll-carriage 43A, upon the track 92, lies in the position previously taken up by the roll-carriage 43'. The roll-carriage 43A carries a new set of horizontal rolls for the mill 10, and it is coupled to the locomotive unit 40' by means of the latches 72 and 73 whereafter the locomotive unit is actuated to push the roll-carriage

43A towards the roll-change side 38 of the mill 10. The new roll-carriage is coupled to the mill by means of its brackets 76, whereafter the piston-and-cylinder arrangements 55 and 56 of the locomotive unit 40 are actuated to cause the piston rods 57 and 65 to move the new horizontal-roll assemblies from the positions 15' and 16' (FIGURE 3) into the rolling mill. The roll assemblies having been inserted, the roll-carriage 43A is uncoupled from the mill 10 and, empty, can be removed by means of the locomotive unit 40 to the roll-storage area 39.

In the arrangement of FIGURE 1, the beam mill 10 is located adjacent an edging mill indicated at 97. As may be seen from FIGURE 1, the horizontal rolls of the edging mill 97 may be changed in a similar manner to the horizontal rolls of the beam mill 10, additional suitable tracks, roll-carriages, and a locomotive unit being provided. Conveniently, a single sliding table 89 serves the roll-change apparatus of each of the mills 10 and 97.

It will be appreciated that many modifications of the invention are possible. In particular, instead of employing a single locomotive unit 40 and at least two roll-carriages 43, each roll-carriage 43 may be self-propelled and may be provided with roll-change mechanisms to permit the horizontal rolls to be transferred between the mill 10 and the roll-carriage.

The couplings between the roll-carriage and the rolling mill and between the roll-carriage and the locomotive unit, need not be of the form described, so long as the couplings are capable of resisting the effects upon the roll-carriage and the locomotive unit, of moments and tensile forces generated during operation of the roll-change mechanism.

The transfer means need not be in the form of a sliding table, but may be a turntable. Alternatively, the transfer means may comprise a roller assembly extending in the direction of the sliding table 89, which it replaces, and having rollers which extend parallel to the tracks 91 shown in the arrangement of FIGURE 1; in this case, the roll-carriages are moved sideways along the roller assembly. Alternatively, instead of the sliding table 89, duplicated tracks provided with suitable points may be employed. In a further alternative arrangement of transfer means, the roll-carriages 43 may be provided with retractable wheels arranged transversely to the wheels 46 shown in the drawings; when such a roll-carriage is withdrawn to the roll-storage area 39, the additional wheels are lowered to permit the roll-carriage to be moved sideways and similarly replaced by a second roll-carriage.

It will be appreciated that, with the arrangements according to the invention, the pairs of horizontal rolls are removed from the decks of the roll-carriages, after these carriages having been moved to the roll-storage area 39. This may be done in any suitable manner; for example, piston-and-cylinder arrangements similar to those 55 and 56, described above, may be employed to move the horizontal rolls from a roll-carriage to a roll-storage rack.

In another modification of the invention, a pin-rack extends parallel to the track 36 and 37, and the locomotive unit 40 is provided with a motor-driven sprocket wheel which engages with the pin-rack. Alternatively, a conventional rack may extend parallel to the rails 36 and 37, and the locomotive unit 40 may be provided with a motor-driven pinion which engages with the rack.

In some cases, as shown in FIGURE 1, the mobile roll-change unit according to the invention may be required to pass between the rollers 98 and 99 of roller tables located adjacent to the rolling mill; the spaces between the rollers of such roller tables are commonly bridged by bridging plates. To permit the mobile roll-change unit to pass, such bridging plates may be temporarily removed by suitable lifting means, or alternatively, relevant bridging plates may be formed in two tiltable portions in the manner of a cantilever bridge. The tiltable portions are thus raised, when it is required to permit the mobile roll-change unilt to pass.

In accordance with the provisions of the patent statutes, we have explained the principle and operation of our invention and have illustrated and described what we consider to represent the best embodiment thereof. However, we 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.

We claim:

1. In combination a universal beam mill stand and a mobile roll-change unit for changing the horizontal rolls thereof, the mill stand having means for lowering the lower horizontal roll assembly to a roll changing position in which that lower horizontal roll assembly can be removed horizontally to one side of the stand below a vertical roll assembly and having means for raising the upper horizontal roll assembly to a roll changing position in which that upper horizontal roll assemly can be removed horizontally to said one side of the stand above said vertical roll assembly, the mill stand having means for supporting the upper and lower horizontal roll assemblies as they are moved horizontally to said one side of the stand and the mobile roll change unit being positionable at said one stand side and including a carriage having integral upper and lower decks arranged to receive the upper and lower horizontal roll assemblies respectively; a track extending in a direction normal to the passline of the mill between said one side of the stand and a roll storage area; means for driving the carriage over the track between the roll storage area and said position at said side of the stand and roll transfer means for moving the horizontal roll assemblies between the mill stand and the carriage.

2. The combination, according to claim 1, in which the roll-change unit has a cut-away portion shaped to prevent the unit fouling said vertical roll assembly, when the unit is positioned at said one side of the mill.

3. The combination, according to claim 1, in which the roll transfer means are movable with the mobile roll-change unit.

4. The combination, according to claim 1, including means at the roll storage area for moving the carriage parallel to the pass line of the mill.

5. In combination a universal beam mill stand and a mobile roll-change unit for changing the horizontal rolls thereof, the mill stand having means for lowering the lower horizontal roll assembly to a roll changing position in which that lower horizontal roll assembly can be removed horizontally to one side of the stand below a vertical roll assembly and having means for raising the upper horizontal roll assembly to a roll changing position in which that upper horizontal roll assembly can be removed horizontally to said one side of the stand above said vertical roll assembly, the mobile roll-change unit being positionable at said one stand side integral upper and lower decks arranged to receive the upper and lower horizontal roll assemblies respectively, an upper spreader beam which overhangs the upper deck of the unit when that unit is located at said one stand side, slideways on the upper beam for supporting the upper horizontal roll assembly as it is moved horizontally to said one stand side, a lower spreader beam, slideways on the lower spreader beam for supporting the lower horizontal roll assembly on it is moved to said one stand side, the slideways on the lower spreader beam being substantially aligned with the lower deck, drive means for driving the mobile roll-change unit in a direction normal to the mill pass line between said position at said one stand side and a roll storage area, and roll transfer means mounted on the unit for movement therewith for transferring the horizontal roll assemblies between the mill stand and the mobile unit.

6. The combination, according to claim 5, in which the roll transfer means comprise piston and cylinder assemblies mounted on the side of the unit remote from the mill, the movable members of the assemblies being movable over the respective decks of the unit, and including latch means for latching the assemblies to the respective horizontal roll assemblies.

7. The combination, according to claim 5, in which the roll change unit has a cut-away portion shaped to prevent the unit fouling said vertical roll assembly when the unit is positioned at said one side of the mill.

8. The combination, according to claim 5, in which the upper deck is slightly higher than the lower surface of the upper horizontal roll assembly when that assembly is supported on the upper spreader beam in the roll change position.

9. A mobile roll change unit for a rolling mill of the type specified, comprising a roll carriage having integral spaced upper and lower decks respectively arranged to receive upper and lower horizontal roll assemblies of the mill, a first roll change mechanism carried by the unit, having latch means for coupling it to the upper horizontal roll of the rolling mill and being arranged for transferring that roll between the rolling mill and the upper deck, a second roll change mechanism carried by the unit, having latch means for coupling it to the lower horizontal roll of the rolling mill and being arranged for transferring that roll between the rolling mill and the lower deck, and locomotive means for moving the carriage and roll change mechanisms toward and away from the mill.

10. A mobile roll change unit, according to claim 9, in which the locomotive means comprises a separate member adapted to be coupled to the carriage, and on which the first and second roll change mechanisms are mounted.

11. A mobile roll-change unit according to claim 9 in which the roll-change unit is provided with a bracket co-operate with a similar bracket on the rolling mill and providing means for securing the unit and the mill in substantially rigid relationship.

12. A mobile roll-change unit according to claim 9, in which the unit is supported on wheels running on a track between the rolling mill and a roll-storage area.

13. A mobile roll-change unit according to claim 9, in which the track leads to a table slidable in a direction transverse of the track and carrying a second track for alignment with the track leading to the rolling mill, the second track being arranged to support a second roll-change unit.

14. A mobile roll-change unit according to claim 10, in which the horizontal roll assemblies are carried on slideways in the mill and are provided with grooved members, and the roll-change mechanisms comprise piston-and-cylinder arrangements having latches for engagement with the said grooved members for moving the horizontal-roll assemblies onto the upper and lower decks of the roll-change unit.

15. A mobile roll-change unit according to claim 10, in which unit the roll-carriage and the locomotive carry slideways providing guides for crossheads attached to the piston rods of the piston-and-cylinder arrangements, the said crossheads carrying the latches for engagement with the said grooved members.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,221,530 December 7, 1965

Reginald Dennis Swallow et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 21, for "as" read -- is --; column 7, line 55, after "side" insert -- and having --; column 8, line 36, for "co-operate" read -- co-operating --.

Signed and sealed this 20th day of September 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents