Dec. 12, 1944. W. D. SHIELDS 2,365,114

SHEET ROLLER LEVELER

Filed May 29, 1943 2 Sheets-Sheet 1

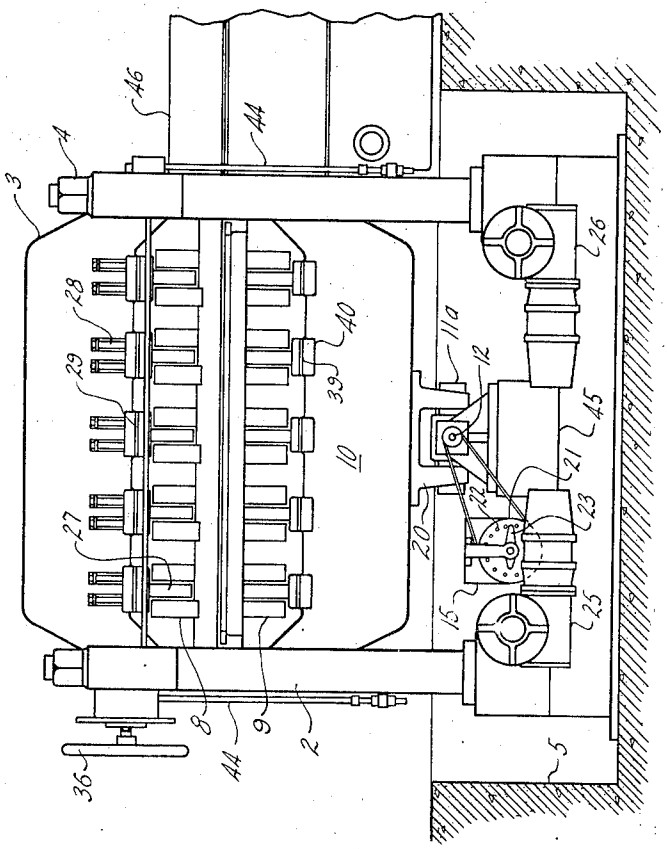


Fig. 2

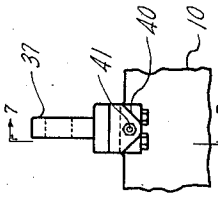


Fig. 8

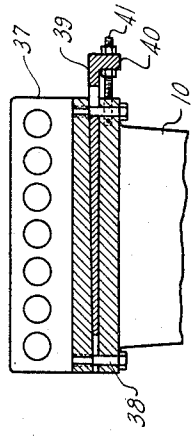


Fig. 7

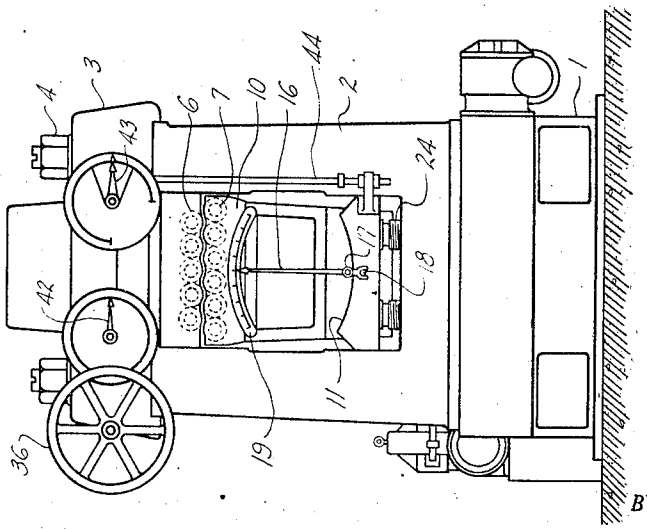


Fig. 1

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SHEET ROLLER LEVELER

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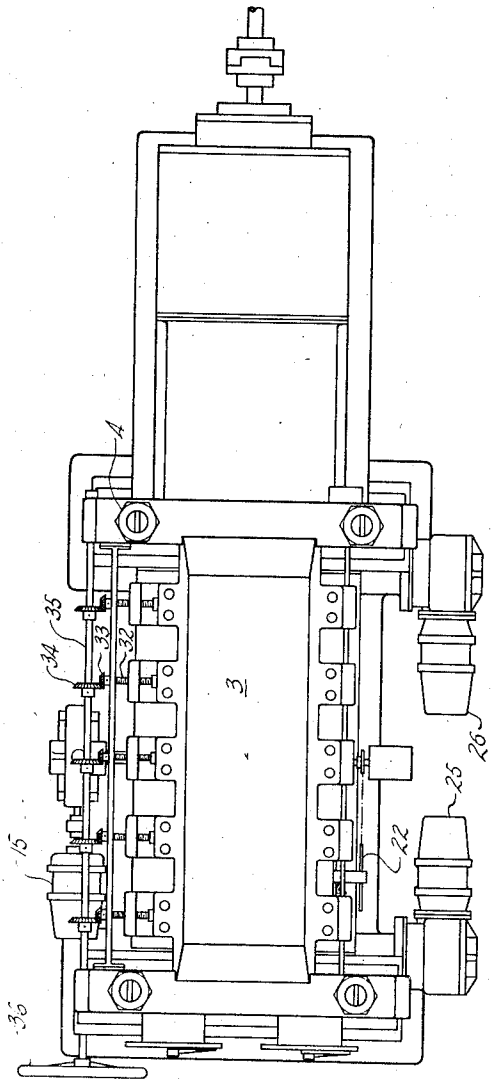


Fig. 3

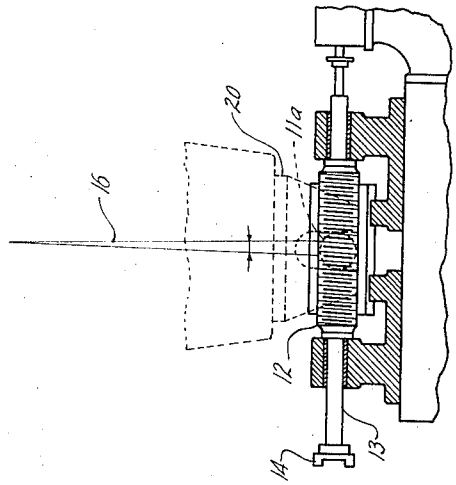


Fig. 6

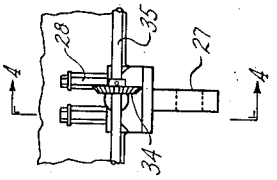


Fig. 5

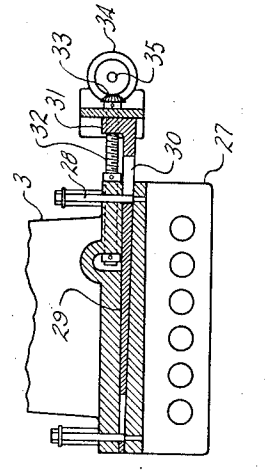


Fig. 4

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SHEET ROLLER LEVELER

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Application May 29, 1943, Serial No. 489,084

8 Claims. (Cl. 153—54)

This invention relates to new and useful improvements in roller levelers for straightening sheets, plates or the like of steel or other metals, which are adapted for use in conjunction with sheet or plate rolling mills or in special processing and fabricating plants.

Heretofore rollers levelers for straightening sheets or plates have utilized screw adjusting mechanism for the back up rolls which necessitated a machine frame construction of excessive height. In former leveling machines cooperating leveling rolls and back up rolls, only lower leveling rolls were adjustable to produce desired straightening effect. The adjusting screws were further subject to wear, which resulted in inaccuracies when a plurality of backing rolls were simultaneously adjusted.

Furthermore, these prior art structures did not provide the necessary rigidity and did not permit of rugged mounting of the roller frames.

In accordance with the present invention these difficulties are greatly reduced if not entirely eliminated, and it is among the objects thereof to provide a roller leveler of simple, compact construction, in which all the back up rolls are adjusted in a simple and expedient manner either individually or in groups simultaneously.

It is a further object of the invention to provide a roller leveler in which the upper levelling rolls and back up rollers are mounted in a yoke that is rigidly secured on the side frames of the apparatus, and in which the bottom levelling roll and back up rollers are journalled in a cradle which is mounted to be tiltable on saddle supports that are adjustably mounted in the side frames of the device.

It is a further object of the invention to provide a roller leveler in which the cooperating top and bottom levelling rolls and back up rolls are designed as a compact structure with adjusting mechanism that can be speedily regulated to produce the desired straightening effect on the sheet or plate material passing therethrough.

The invention further contemplates the use of movable wedges or slides for effecting adjustment of the back up rollers.

These and other objects of the invention will become more apparent from a consideration of the accompanying drawings constituting a part hereof in which like reference characters designate like parts and in which:

Fig. 1 is an end elevational view of a roller leveler embodying the principles of this invention;

Fig. 2 a front elevational view thereof;

Fig. 3 a top plan view;

Fig. 4 a cross-sectional view of the adjusting wedge taken along the line 4—4, Fig. 5;

Fig. 5 a front elevational view of one of the back up roller brackets with its adjusting mechanism;

Fig. 6 a detail partially in cross-section of a radial tilt mechanism for the roller cradle of Fig. 2;

Fig. 7 a cross-sectional view taken along the line 7—7, Fig. 8 of the bottom back up roller supports; and

Fig. 8 a front elevational view of one of the bottom back up roller brackets.

With reference to the several figures of the drawings, the structure therein illustrated comprises a base 1 having vertical end frames 2 mounted thereon, the end frames being connected by yoke 3 secured across the top of the end frames and fastened by screw nuts 4.

The base of the machine is embedded in a concrete pit 5 to bring the working plane or roll pass of the machine in line with the sheet mill.

As shown in Fig. 1, there are two sets of levelling rolls, an upper set 6 and a lower set 7. These rolls are supported by backing rolls 8 and 9 respectively. The upper set of rolls are mounted on the yoke 3 and the lower set in a cradle generally designated by the numeral 10, the cradle resting on saddles 11 disposed in windows of the end frames 2. The cradle 10 is tiltable by a pivot 11a which is adjustable by a screw 12, Figs. 2 and 6, that is rotated by shaft 13 having a coupling 14 through which it is driven by a rheostat controlled motor 15, Fig. 2.

As shown in Fig. 1, the cradle is provided with an indicator 16 pivoted to the cradle at 17 and engaging a trunnion or pin 18. Rocking movement of the cradle on the saddles 11 will effect displacement of the indicator 16 which indicates the angular position to which the cradle has been adjusted on a graduated scale 19. As is shown in Figs. 2 and 6, pin 11a is disposed in a yoke 20 that is attached to the bottom of the cradle 10. The motor 15 is controlled by a rheostat 21 having notches 22 and a control lever 23 by which the motor is controlled to drive the cradle to a predetermined degree of angularity. The rocking of the cradle determines the bite of the leveler rolls to effect an increasing gripping effect on the sheets passing between the rolls. The working pass of the top and bottom rolls 6 and 7, respectively, is adjustable by moving the cradle saddles 11 vertically by a plurality of adjusting screws 24 which are driven by motors 25 and 26.

The backing up rolls 8 and 9, respectively, are adjustable individually and in groups by means of the following mechanisms.

The upper back up rolls are carried on a support 27 which is suspended by adjustable links or bolts 28 from the yoke 3. The supports 27 are biased by coil springs (not shown) that are contained in the housing sleeve of bolt 28 and seat on the shoulder of the member 3. The support 27 may be adjusted vertically with reference to yoke 3 by movement of a wedge 29, having slots 30 for clearing the links 28. The wedge is provided with a lug 31 through which extends a shaft 32 that is journalled in the yoke 3, shaft 32 being a threaded screw shaft that interacts with the threaded opening in the lug 31 so that upon rotary movement of the screw shaft 32 the wedge will slide in a horizontal plane to extend or withdraw the adjusting wedge. Screw shaft 32 is connected by bevel gears 33 to bevel gears 34 mounted on a common actuating shaft 35, as shown in Figs. 3 and 4. Shaft 35 is operated by hand wheel 36 to simultaneously actuate all of the adjusting screws 32 for operating the roller support adjusting wedges 29 to set the bend of the levelling rolls.

As shown in Figs. 7 and 8, a similar means is employed for adjusting the bottom back up roller support which is designated by the numeral 37 and is connected by bolts 38 to the cradle 10, the bolts acting as loose linkage on which the supports 37 are slidable vertically. A wedge 39 having a lug 40 is disposed between the roller support 37 and the cradle 10, and is adjustable by a set screw 41. In this manner, the bottom back up rollers are individually adjustable to effect proper initial alignment of the bottom levelling rolls.

In Fig. 1 the numeral 42 designates the roll bend indicator as effected through the adjustment of the backing up roller supports by the hand wheel 36 and the numeral 43 designates a longitudinal tilt and height indicator and dial, this indicator being connected by push rods 44 to the cradle saddle 11.

In Fig. 2 the numeral 45 designates a speed reduction unit for operating the cradle tilt mechanism through motor 15 and the numeral 46 generally designates the roll drive mechanism, the details of which are not a part of the present invention.

The operation of the above described roller leveller is briefly as follows:

The bottom leveller rolls are adjusted by the set screws 41 operating wedges 39 to individually adjust the supports 37 of the bottom back up rollers 9 and the hand wheel 36 is rotated to adjust the wedges 29 for the upper back up rollers in accordance with the roll bend desired to produce the straightening effect on the sheets passed between the upper and lower leveling rolls 6 and 7, respectively. Indicator 42 will indicate the roll bend for which the adjustment has been made by hand wheel 36 and motors 25 and 26 are energized to adjust the gauge of the pass between the upper and lower set of leveling rolls as shown by the longitudinal tilt and height indicator and dial 43. The cradle 10 is then adjusted by energizing motor 15 through the control rheostat 21 which, as shown in Fig. 6, rotates screw 12 to move the fulcrum pin 11*a* to the position producing the desired tilt of the bottom leveling rolls, as indicated on the graduations 19 by the pointer to adjust the pass of the several sets of rolls.

As the sheets are processed by passing through the leveling rolls, further adjustment may be made of the roll bend or the tilt of the cradle by adjusting the hand wheel 36 or by the control rheostat 21, respectively, to produce the desired relation of the upper and lower leveler rolls for leveling the sheets passing therebetween.

From the foregoing description, it will be apparent that the system of wedges or gibs for adjusting the vertical position of the upper and lower back up rolls is positive and maintains solid support for the back up rollers. It is also apparent that the wedge adjusting means greatly contracts the space formerly required in the use of the screw jacks for the back up roll supports.

It is also apparent that the construction of the roller supporting cradle mounted on the saddles in the side frames of the levelling machines is a sturdy and compact construction that eliminates vibration and wear of the relatively movable parts.

The adjusting screws 24 effects speedy adjustment of the vertical height of the bottom leveling rolls which is indicated by the dial 43, and the motor 15 through the reduction gearing 45 effects a rapid adjustment of the tilt of the cradle through the screw mechanism as shown in Fig. 6.

It is a feature of this invention to provide for the adjustment of both the upper and lower back up rolls to flex either the upper or lower straightening rolls or both. By being able to adjust the upper leveling or straightening rolls, extra press straightening operations on the sheets are eliminated.

Although one embodiment of the invention has been herein illustrated and described, it will be apparent to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

I claim:

1. In a roller leveler, a set of upper and a set of lower leveling rolls, each consisting of a plurality of rolls of substantial length, the upper and lower rolls being mounted in staggered relation and the lower rolls being mounted to be tiltable on a cradle support; back-up rolls for said leveling rolls mounted on supports movable independently of said leveling roll supports and laterally adjusting means mounted in contact with the movable roll supports of the upper leveling rolls to adjust the back-up rolls to produce the desired roll bend in the leveling rolls.

2. In a roller leveler, a set of upper and a set of lower leveling rolls, each consisting of a plurality of rolls of substantial length, the upper and lower rolls being mounted in staggered relation and the lower rolls being mounted to be tiltable on a vertically movable cradle support; back-up rolls for said leveling rolls mounted on supports movable independently of said leveling roll supports, wedge-shaped slides mounted in contact with said movable roll supports to adjust the back-up rolls to produce the desired roll bend in the leveling rolls, and means for adjusting some of said slides.

3. In a roller leveler, a set of upper and a set of lower leveling rolls, each consisting of a plurality of rolls of substantial length, the upper and lower rolls being mounted in staggered relation; back-up rolls for said leveling rolls mounted on movable supports and wedge-shaped slides mounted in contact with said movable roll supports to adjust the back-up rolls to produce the desired roll bend in the leveling rolls, said slides being coextensive with the area of the back-up roll sup-

ports, the slides for the upper back-up rolls being adjustable simultaneously and the slides of the lower back-up rolls being individually adjustable.

4. In a roller leveler, a base having a plurality of side frames upstanding thereon, a yoke mounted on the top of said frames, saddles mounted for vertical movement in windows of said frames, and a cradle supported at its ends on said saddles, means for adjusting the saddles vertically and means for tilting said cradle on its saddle supports, said yoke having a plurality of leveling rollers mounted on the lower end thereof and said cradle having a plurality of leveling rollers mounted on the upper end in staggered relation and in alignment with the upper leveling rolls.

5. In a roller leveler, a base having a plurality of side frames upstanding thereon, a yoke mounted on the top of said frames, saddles mounted for vertical movement in windows of said frames, and a cradle supported at its ends on said saddles, means for adjusting the saddles vertically and means for tilting said cradle on its saddle supports, said yoke having a plurality of leveling rollers mounted on the lower end thereof and said cradle having a plurality of leveling rollers mounted on the upper end in staggered relation and in alignment with the upper leveling rolls, back-up rolls for said leveling rolls mounted to be adjustable relative to the latter, means for adjusting said back-up rolls individually or simultaneously, and means for adjusting some of said back-up rolls in groups to set the bend of the leveling rolls.

6. In a roller leveler, a base having a plurality of side frames upstanding thereon, a yoke mounted on the top of said frames, saddles mounted for vertical movement in windows of said frames, and a cradle supported at its ends on said saddles, each of said saddles being provided with a plurality of motor driven screws to adjust the saddles vertically in the windows of said frames, said yoke having a plurality of leveling rollers mounted on the lower end thereof and said cradle having a plurality of leveling rollers mounted on the upper end in staggered relation and in alignment with the upper leveling rolls.

7. In a roller leveler, a base having a plurality of side frames upstanding thereon, a yoke mounted on the top of said frames, saddles mounted for vertical movement in windows of said frames, and a cradle supported at its ends on said saddles, means for adjusting the saddles vertically and motor driven means for tilting said cradle on its saddle supports, said means comprising a fulcrum pin engaging a slot in the bottom of the cradle, and means for moving said pin transversely of its longitudinal axis to effect corresponding movement of the cradle on the saddle supports, said yoke having a plurality of leveling rollers mounted on the lower end thereof and said cradle having a plurality of leveling rollers mounted on the upper end in staggered relation and in alignment with the upper leveling rolls.

8. A roller leveler as set forth in claim 7 characterized by means for presetting the motor drive of the cradle moving means to effect a desired change in the working pass of the leveling rolls.

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