Roller Leveler Having Means To Move Individual Rolls Into and Out of Work Engagement

Fig. 1

Fig. 2

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The present invention relates to roller levellers of the type which are used in steel mills and other metal producing plants to straighten plate.

A purpose of the invention is to make it possible to shift the operative thickness of the plate passing through the roller leveller mechanically and without difficulty or delay.

A further purpose is to accomplish shifting of the relation of centers of one group of roller leveller rolls to another mechanically and without the necessity of taking out certain rolls.

A further purpose is to permit raising and lowering of individual roller leveller rolls to move the rolls in or out of operative position mechanically and preferably by remote control.

A further purpose is to mount one group of rolls on a carriage, and to shift the carriage bodily to change the center to center distance.

A further purpose is to mount the bearing support of individual rolls separately on the carriage and to raise and lower the individual rolls with respect to other rolls mounted on the carriage by means of groups of wedges.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may be employed, selecting the forms shown from the standpoint of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a diagrammatic side elevation showing the roller leveller with the rolls arranged for operation on heavy plate.

Figure 2 is a diagrammatic side elevation showing the rolls arranged for straightening of light plate, the view being partly in section on the line 2—2 of Figure 4.

Figure 3 is a transverse section through the roller leveller showing one of the rolls having individual bearing support on the carriage, the section being taken on the line 3—3 of Figure 4.

Figure 4 is a top plan view of the roller leveller of the invention, partly in horizontal section on the line 4—4 of Figure 2 and partly in section on the line 4a—4a of Figure 2.

Figure 5 is a fragmentary transverse vertical enlarged section on the line 5—5 of Figure 4.

Figure 6 is an enlarged fragmentary longitudinal section corresponding in position to the line 6—6 on Figure 1.

Describing in illustration but not in limitation and referring to the drawings:

In the straightening or levelling of steel or other plate, it is conventional practice to use a nine roll leveller having five operative top rolls and four operative bottom rolls, with the bottom rolls staggered in their relation to the top rolls, for straightening plate of light gauge. For thicker plate a machine with three upper rolls and two lower rolls in staggered relation can be used. In shifting from the nine roll leveller to another type such as the five roll leveller is made mechanically under the control of the operator, who need not leave his pulpit. In accordance with the present invention, two bottom rolls and two top rolls are moved away from the work and then the bottom rolls are shifted bodily without removing any rolls from the machine to place them in symmetrical staggered relation with the three top rolls which are to be effective.

The bottom rolls are desirably mounted together in a carriage, but those bottom rolls which are to be backed away from the work are individually mounted on the carriage so that they can move away from the work.

When the change is to be made from the nine roll leveller to the five roll leveller, the carriage is shifted bodily, and the individual bearing supports of certain of the bottom rolls are manipulated as by shifting wedges to move the bottom rolls away from the work. The two top rolls which are to be withdrawn from the work are likewise moved away from the work without withdrawing them from the machine.

The carriage for the bottom rolls is likewise designed so that when desired it can be moved bodily out of the machine for inspection or repair.

Considering now the drawings, the machine is supported on a foundation 20 by longitudinal frame members 21. At each corner the frame members support uprights 22 which are suitably cross connected above the upper rolls, and support suitable bearings for journaling the upper rolls 23, 24, 25, 26 and 27.

The frame has longitudinal frame elements 28 which interconnect the front and back members 21 at each side.

The lower rolls 30, 31, 32 and 33 are in all cases staggered with respect to the adjoining upper rolls which are in operating position, and equidistant from the adjoining upper rolls which are operative.

The lower frame elements 28 support ways 34 which support and guide a carriage 35 which is slidable on top of the lower frame elements.

The movement permits the carriage sufficient freedom so as to adjust the center distance of the operative bottom rolls in unison.

The carriage 35 has pillow supports at 36 extending laterally of the carriage and journaling sets of backing-up rolls 37 and operative rolls 30 and 32 which are bodily movable with the carriage but do not have adjustment toward and away from the work, remaining always in contact with the work.

The carriage also has lateral ways 38 and 40 which mount a slider 41 (Figure 3) which extends along the ways 38 and is made up of transversely spaced wedges 42 secured together and all operating in the same direction and cooperating with a set of opposed wedges 43 all operating in the same direction and secured to the journal support 44 of one of the rolls 31 or 33, mounting the backing-up rolls and the individual operative roll. The slider 41 and the wedges 42 are manipulated by a double-acting hydraulic piston having a piston rod 45 and operating in a double-acting cylinder 46 mounted on the carriage.
The bearing support 44 has at intervals along its upper surface anti-friction bearings 47 which support a series of backing-up rollers 48. At the two sides of the machine, motor applied, the bearings 50 which journal the operative roll 31 or 33.

The driving connection to each individual roll is made at 51 (Figure 3), suitably through universal joints.

The carriage is moved back and forth in any suitable manner, desirably by a cross shaft 52 journaled in suitable bearings and suitably driven by a motor, having worms 53 which mesh with worm wheels 54 journaled in bearings 55 supported on the frame, and turning a nut 56 which threads with a screw portion 57 of a thrust screw 58 (there are two such screws provided, one in each side frame), connected with the carriage 35.

A flexible boot 60 desirably prevents the dust from entering the mechanism as the pusher screw moves back and forth.

The machine is provided with suitable inlet and outlet guiding rollers 61 and 62 and suitable inlet and outlet guiding shoes 63 and 64 for handling the work.

The mechanism for the upsetting the upper rolls and removing individual upper rolls from operative engagement with the work and returning them to engagement with the work is best seen in Figures 5 and 6. As shown each upper roll 23, 24, 25, 26 and 27 is journaled at the ends at 65 and the journal pivotally connects at 66 to a hanger rod 67 which is upwardly urged by spring 68 from an abutment on a longitudinal overhead beam 70 individual to each of the upper rolls. Each beam 70 journals at 71 on its lower surface a series of upper backing up rolls 72 which respectively engage and support the corresponding upper roll.

Each beam 70 is held in its proper downward adjusted position by hold-down screws 73 mounted on the top frame 74.

Each beam 70 intermediate its ends is pivotally connected at 75 to a yoke 76 which extends through the top frame 74 and at the top connects with piston rod 77 which carries a piston operating in hydraulic cylinder 78 on the frame.

Thus the operator by admitting hydraulic fluid to any one of the pistons after releasing the hold-down screws, which are suitably motor driven, can raise the desired upper roll to a position remote from the work.

In operation, let us assume that the machine is set up as in Figure 2 to straighten plate in the range from one-half inch to one inch gage. It is now desired to rearrange the rolls in order to straighten thicker plate, for example one to three inches gage. Lower rolls 31 and 33 must be withdrawn from the work, and this is accomplished by the operator who applies hydraulic pressure suitably from a valve located at the pulpit to the side of the pistons which retracts the wedges 42, allowing the rolls 31 and 33 and their backing-up rolls to lower in unison. Desirably simultaneously by starting the motor turning the shaft 52, the nuts 56 are turned and move the carriage to a position to bring operative roll 30 intermediate between the line of centers of operative rolls 23 and 25, likewise bringing operative roll 32 intermediate between the line of centers of operative roll 25 and 27 of the upper group.

At the same time by any suitable means, rolls 24 and 26 of the upper set are retracted away from the work.

The rolls now assume the position as shown in Figure 1, without bodily removing any rolls.

The carriage or separator which supports the lower rolls is desirably bodily movable out of the machine for inspection and repair. This is desirably accomplished by providing extensions on the ways 38 which can be temporarily applied.

In the example given, the rolls of each set in Figure 2 are on sixteen inch centers, and the operative rolls of each set in Figure 1 are on thirty-two inch centers, so that the distance of movement of the carriage in shifting from the arrangement of Figure 2 to that of Figure 1, or vice versa, is eight inches. It will be understood that the principles of the invention are applicable to machines requiring various distances of movement. It is also apparent that intermediate distances between work rolls 30 and 23; and 25 and 32, can be obtained by moving the slide less than eight inches, if desired. Similarly, the spacing of the rolls with all rolls operative, per Figure 2, can be varied by moving the carriage on intermediate distance.

The distance that the rolls 24, 26, 31 and 33 should be moved away from the work to make them inoperative will vary, but in the installation under discussion it has been found that the rolls are ineffective when they are removed away from the work approximately two inches.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a roller leveller, a first group of rolls, a second group of rolls respectively in staggered relation to the first group, means for moving certain rolls of the first group away from the line of the active faces of the rolls of the second group, a carriage supporting the rolls of the second group, means for shifting the carriage bodily to change the center-to-center relationship between the rolls of the first group and the rolls of the second group, individual bearing mountings for certain of the rolls of the second group on the carriage, and automatic means operative between the carriage and the individual bearing mountings for selectively moving certain of the rolls of the second group away from the rolls of the first group.

2. In a roller leveller, one group of rolls having means for selectively moving certain of the rolls away from the work, in combination with a cooperating second group of rolls respectively staggered with respect to the rolls of the first group, a carriage supporting the rolls of the second group, guides for the carriage permitting movement of the carriage in the direction to change the center-to-center relation between the rolls of the first group and the rolls of the second group, means for shifting the carriage to change the center-to-center distance, individual bearing mountings for certain of the rolls on the carriage, wedges acting between the carriage and the individual bearing mountings and means for shifting the wedges to change the relation of the rolls on the individual bearing mountings in the second group with respect to the work.

3. In a roller leveller, a group of rolls of a first group arranged side by side, journal means for mounting the rolls of the first group, backing up rolls behind the rolls of the first group, journal means for the backing up rolls, beams individual to the rolls of the first group connected with the journal means for the rolls of the first group and for the backing up rolls, hold down means engaging the individual beams, fluid operated means connected to the individual beams and adapted to move the same to manipulate individual rolls of the first group toward and away from the plane of the axes of the other rolls of the first group, a group of cooperating rolls arranged side by side and in staggered relation to the rolls of the second group, a carriage supporting the rolls of the second group, means for moving the carriage bodily in a direction transverse to the axes of the rolls of the second group, and means for moving individual rolls of the second group on the carriage toward and away from the plane of the axes of the rolls of the first group.

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