Jan. 30, 1940. L. R. THOMAS 2,188,782

PROCESSING MACHINE

Filed April 19, 1939 3 Sheets-Sheet 1

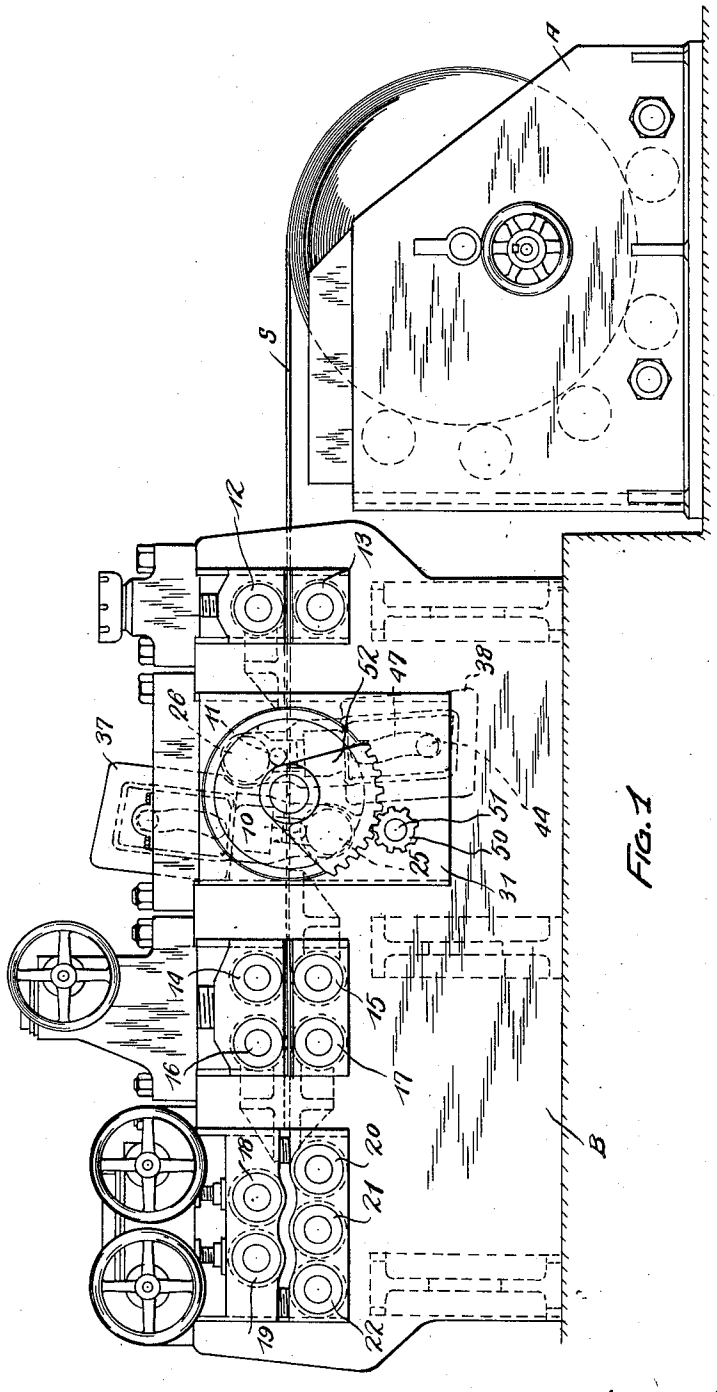


FIG. 1

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PROCESSING MACHINE

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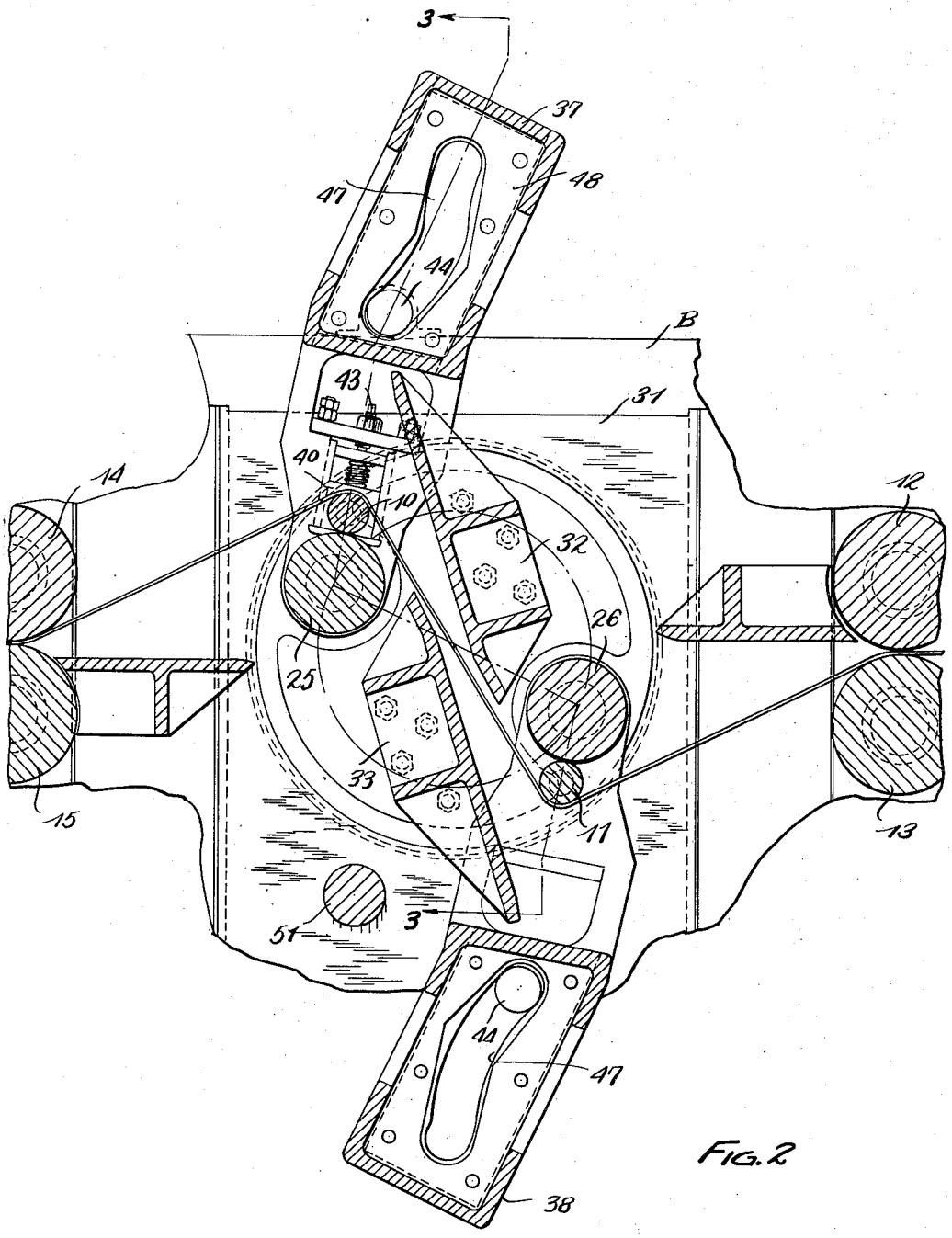


FIG. 2

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PROCESSING MACHINE

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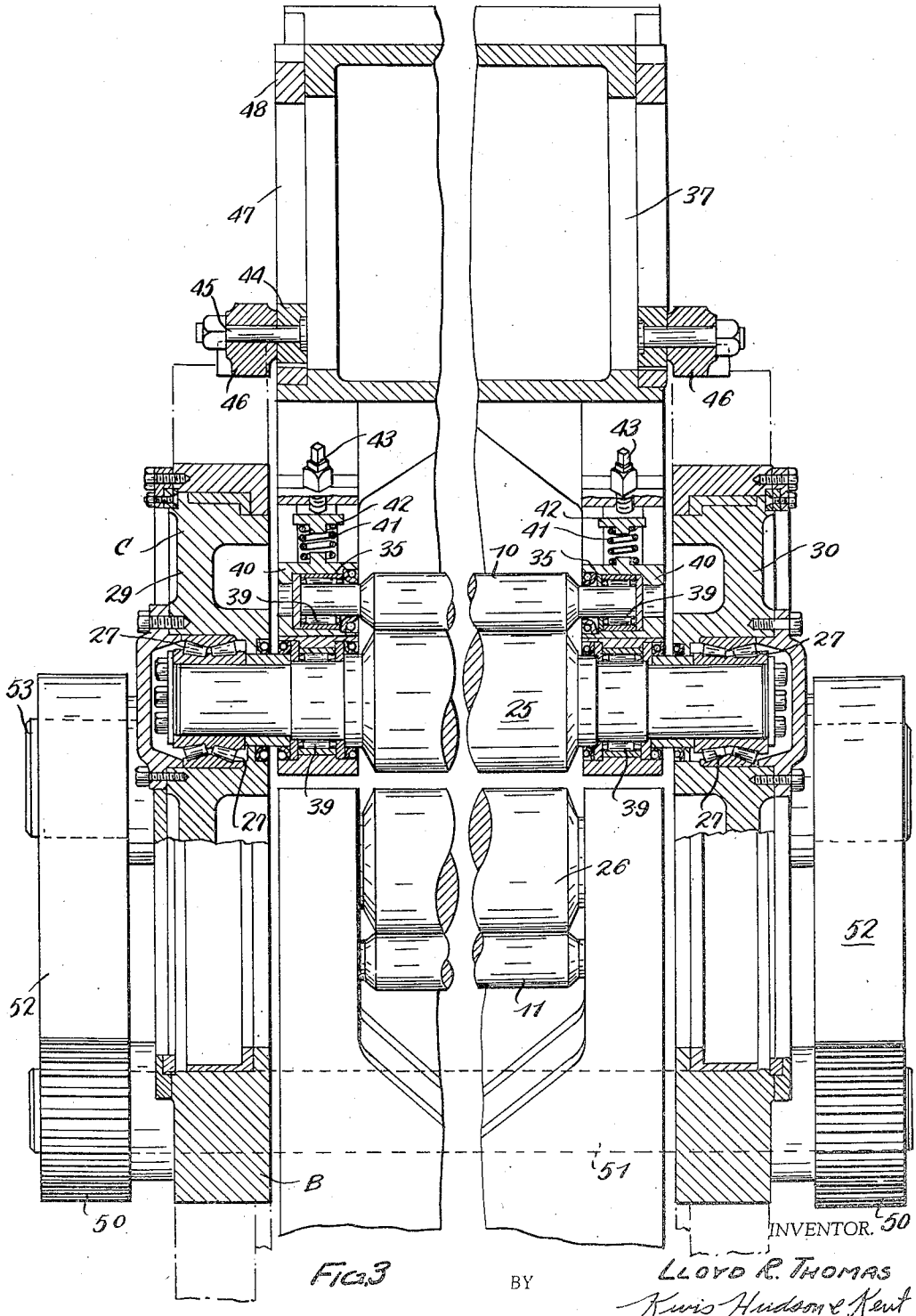


FIG. 3

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Patented Jan. 30, 1940

2,188,782

UNITED STATES PATENT OFFICE

2,188,782

PROCESSING MACHINE

Lloyd R. Thomas, Youngstown, Ohio, assignor to The Youngstown Foundry & Machine Company, Youngstown, Ohio, a corporation of Ohio

Application April 19, 1939, Serial No. 268,773

7 Claims. (Cl. 153—54)

The present invention relates to a machine for processing strip steel for the purpose of removing surface scale therefrom and/or relieving strains therein, etc.

An object of the invention is the provision of a novel and improved machine for processing strip steel comprising means for flexing the strip to be processed over a flexing roll of relatively small diameter backed up by a roll of larger diameter and including means for moving the rolls whereby the angle through which the strip is flexed can be varied and wherein a relative movement between the axes of said rolls is effected as the angle through which the strip is flexed is varied so that the force acting between the rolls always acts substantially along a line through their axes of rotation.

Another object of the invention is the provision of a novel and improved machine for processing strip steel comprising means for flexing the strip to be processed over a flexing roll of relatively small diameter backed up by a roll of larger diameter wherein the rolls are movable to vary the angle through which the strip is flexed and which machine includes means for producing a relative movement between the rolls as the angle through which the strip is flexed is varied so that the force acting between the rolls always acts substantially along a line through their axes of rotation.

Another object of the invention is the provision of a novel and improved machine for processing strip steel comprising means for flexing the strip to be processed over a flexing roll of relatively small diameter provided with a back-up roll of larger diameter wherein the rolls are movable to vary the angle through which the strip is flexed and which machine includes means for moving the flexing roll relative to the back-up roll as the rolls are moved to vary the angle through which the strip is flexed so that the force acting between the rolls always acts substantially along the line through their axes of rotation.

Another object of the invention is the provision of a novel and improved machine for processing strip steel comprising means for flexing a strip to be processed first in one direction and then in the other over flexing rolls of relatively small diameter provided with back-up rolls of larger diameter wherein the rolls are movable to vary the angle through which the strip is flexed and which machine includes means for producing a relative movement between the flexing rolls and their relative back-up rolls as the angles through which the strip is flexed are varied so that the force acting between the flexing rolls and their relative back-up rolls always acts substantially along a line through their axes of rotation.

The present invention resides in certain details of construction and combinations and arrangements of parts and further objects and advantages will be apparent from the following description of the preferred embodiment thereof described with reference to the accompanying drawings forming a part of this specification wherein similar reference characters designate corresponding parts and in which

Fig. 1 is a side elevational view of a processing machine embodying the present invention;

Fig. 2 is a longitudinal section through the center portion of the machine shown in Fig. 1, with the parts in a different operating position; and

Fig. 3 is a sectional view approximately on the line 3—3 of Fig. 2, with portions shown in elevation.

Although the invention is susceptible of embodiment in various constructions, it is herein shown and described as embodied in a machine similar to that disclosed in my Patent No. 2,163,504 issued June 20, 1939, and only those parts of the machine which are necessary to a complete understanding of the present invention are herein illustrated and described in detail. For a more complete description of the other parts of the machine, reference is made to the aforementioned application or patent.

Referring to the drawings, Fig. 1 is a side elevational view of a processing machine for processing strip steel. As shown, the strip S to be processed or being processed is in coil form and is supported in a coil box, designated generally by the reference character A, located adjacent to the entrance end of the machine proper. The coil box is similar to that shown and described in the above-mentioned application and will not be described in detail. The processing machine proper comprises a plurality of sets of rolls supported in a frame designated generally by the reference character B, and the processing is performed by flexing the strip S first in one direction and then in the other direction about flexing rolls 10 and 11 hereinafter more specifically described. A pair of pinch rolls 12 and 13 operatively connected to an electric motor (not shown) are initially employed to feed the strip S to be processed to the flexing rolls 10 and 11 until the forward end of the strip has been engaged

by the pinch rolls 14, 15, 16, and 17, which thereafter pull the strip through the machine. After the forward end of the strip S has been engaged by the pinch rolls 14 to 17, inclusive, the motor connected to the pinch rolls 12 and 13 is operated as a generator under load to effect a drag on the strip and thereby cause the strip to bend about the flexing rolls 10 and 11. From the pinch rolls 14 to 17, inclusive, the strip passes between a set of leveler rolls 18 to 22, inclusive, which perform the usual function of leveling the strip. The pinch rolls referred to and the leveler rolls may be of any conventional construction and operated in any convenient manner. The rolls shown are supported in the frame B and driven in a manner similar to that described in the above-mentioned application.

The flexing rolls 10 and 11 are provided with back-up rolls 25 and 26, respectively. As shown, the back-up rolls 25 and 26 are rotatably supported through the medium of anti-friction bearings 27 in a cradle designated generally by the reference character C and comprising disk-like end members 29 and 30 rotatably supported in the frame B through the medium of suitable members 31 for rotation about an axis intermediate the back-up rolls and connected together so as to rotate as a unit by members 32 and 33 which also serve to guide the entering end of the strip through the machine. The flexing rolls 10 and 11 are rotatably supported by anti-friction bearings 35 in frame members 37 and 38, respectively, comprising more or less U-shaped castings. The frame member 37 is rotatably supported by anti-friction bearings 39 upon the neck of the back-up roll 25 but inside of the main bearings. The frame member 38 is similar in construction to the frame member 37 and is rotatably supported on the neck of the back-up roll 26 in a similar manner. The anti-friction bearings 35 which rotatably support the flexing rolls are carried in suitable chocks 40 slidably supported in the frame members 37 and 38, which chocks are continuously urged in a direction to engage the flexing rolls with their respective back-up rolls by compression springs 41 which can be adjusted through the medium of screws 43. The angular position of the frame members 37 and 38 about the axis of rotation of the back-up rolls is controlled by a plurality of rollers 44 carried on suitable pins 45 fixed in brackets 46 bolted to the frame B, which rollers engage in suitable cam tracks 47 formed in plates 48 bolted to the frame members 37 and 38.

The cradle C is adapted to be rotated about its axis intermediate the flexing rolls 10 and 11 by pinions 50 keyed to a transversely extending shaft 51 and continuously in mesh with gear sectors 52 fixed to bosses 53 carried by the end members 29 and 30 of the cradle C. The shaft 51 is adapted to be rotated in opposite directions by a reversible electric motor (not shown) but in a manner similar to that shown in the above-mentioned application.

The strip is inserted in the machine with the cradle C in the position shown in Fig. 1 with the flexing rolls 10 and 11 below and above the path of the strip, as defined by the pinch rolls. After the strip has been engaged by the pinch rolls 14 to 17, inclusive, the cradle C is rotated by the electric motor connected to the shaft 51 a desired amount so that the strip in passing through the machine will be flexed first in one direction and then in another about the flexing rolls 10 and 11. As the cradle C is rotated to vary the angles through which the strip is flexed, the engagement of the rollers 44 in the cam tracks 47 moves the flexing rolls circumferentially about their respective back-up rolls so that a line connecting the centers of the flexing rolls and their respective back-up rolls bisects the angle formed by the strip passing over the flexing roll in all positions of the cradle, or in other words, the force acting between the back-up rolls and their respective flexing rolls always acts substantially along a line connecting their centers. Unless the axes of the flexing rolls are moved angularly about the axes of their respective back-up rolls as the angle is flexed, so that the force acting between the rolls due to the pull of the strip over the flexing rolls, acts substantially along a line connecting the centers of the respective flexing rolls and back-up rolls, the pull of the strip upon the flexing rolls will cause the same to be deflected in spite of the back-up rolls as the back-up rolls will not be in the proper position relative to the flexing rolls to resist the force tending to deflect the flexing rolls.

In the preferred embodiment of the invention shown and described herein, the flexing rolls are moved angularly relative to the axes of the back-up rolls as the angle through which the strip is flexed is varied. However, it will be understood that it is a relative movement between the axis of the flexing roll and the axis of its back-up roll which is desired and that the desired movement might be imparted to the back-up roll instead of the flexing roll or partly to both rolls. This latter arrangement could be readily accomplished by rotatably supporting each set of flexing and back-up rolls in a pivoted member similar to the members 37 and 38 which member would then be pivoted to the cradle C or some corresponding part.

While the preferred embodiment of the invention has been described with considerable detail, I do not wish to be limited to the particular construction shown which may be varied within the scope of this invention in ways other than those specifically mentioned herein and it is my intention to cover hereby all adaptations, applications and modifications that come within the practice of those skilled in the art to which the invention relates and I particularly point out and claim as my invention the following:

1. In a processing machine of the character described for processing strip steel, the combination of a frame, a member rotatably supported by said frame, a flexing roll of relatively small diameter over which the strip to be processed is adapted to be flexed, a back-up roll for said flexing roll, means for supporting one of said rolls in said member, means for rotatably supporting the other of said rolls in engagement with the last mentioned roll, means for guiding the strip to be processed to said flexing roll, means for pulling the strip to be processed over said flexing roll, means for rotating said member whereby the angle through which the strip to be processed is flexed is varied, and means for producing a relative movement between the axes of said rolls, as the angle through which the strip is flexed is varied, such that said rolls are maintained in a relationship in which the force acting therebetween always acts substantially along a line connecting their axes of rotation.

2. In a processing machine of the character described for processing strip steel, the combination of a frame, a member rotatably supported by said frame, a flexing roll of relatively small di-

ameter over which the strip to be processed is adapted to be flexed, a back-up roll engaging said flexing roll, means for rotatably supporting one of said rolls in said member, a second member pivotally connected to the first-mentioned member coaxially with the roll supported therein, means for rotatably supporting the other of said rolls in said second member, means for guiding the strip to be processed to said flexing roll, means for pulling the strip to be processed over said flexing roll, means for rotating the first-mentioned member whereby the angle through which the strip to be processed is flexed is varied, and means for moving said second member, as the angle through which the strip is flexed is varied, in such a manner that the rolls are maintained in a relationship in which the force acting therebetween always acts substantially along a line connecting their axes of rotation.

3. In a processing machine of the character described for processing strip steel, the combination of a frame, a member rotatably supported by said frame, a flexing roll of relatively small diameter over which the strip to be processed is adapted to be flexed, a back-up roll engaging said flexing roll, means for rotatably supporting one of said rolls in said member, a second member pivotally connected to the first-mentioned member coaxially with the roll supported therein, means for rotatably supporting the other of said rolls in said second member, means for guiding the strip to be processed to said flexing roll, means for pulling the strip to be processed over said flexing roll, means for rotating the first-mentioned member whereby the angle through which strip to be processed is flexed is varied, and means for rotating said second-mentioned member simultaneously with the rotation of the first-mentioned member in such a manner that the rolls are maintained in a relationship in which the force acting therebetween always acts substantially along a line connecting their axes of rotation.

4. In a processing machine of the character described for processing strip steel, the combination of a frame, a member rotatably supported by said frame, a flexing roll of relatively small diameter over which the strip to be processed is adapted to be flexed, a back-up roll engaging said flexing roll, means for rotatably supporting one of said rolls in said member, a second member pivotally connected to the first-mentioned member coaxially with the roll supported therein, means for rotatably supporting the other of said rolls in said second member, means for guiding the strip to be processed to said flexing roll, means for pulling the strip to be processed over said flexing roll, means for rotating the first-mentioned member whereby the angle through which the strip to be processed is flexed is varied, and cam means for moving said second member, as the first-mentioned member is rotated to vary the angle through which the strip is flexed, in such a manner that the rolls are maintained in a relationship in which the force acting therebetween always acts substantially along a line connecting their axes of rotation.

5. In a processing machine of the character described for processing strip steel, the combination of a frame, a member rotatably supported by said frame, a flexing roll of relatively small diameter over which the strip to be processed is adapted to be flexed, a back-up roll engaging said flexing roll, means for rotatably supporting said back-up roll in said member, a second member pivotally connected to the first-mentioned member coaxially with said back-up roll, means for rotatably supporting said flexing roll in said second member, means for guiding the strip to be processed to said flexing roll, means for pulling the strip to be processed over said flexing roll, means for rotating the first-mentioned member whereby the angle through which the strip to be processed is flexed is varied, and means for rotating said second-mentioned member simultaneously with the rotation of the first-mentioned member in such a manner that the rolls are maintained in a relationship in which the force acting therebetween always acts substantially along a line connecting their axes of rotation.

6. In a processing machine of the character described for the processing of strip steel, the combination of a frame, a member rotatably supported by said frame, a plurality of sets of rolls over which the strip to be processed is adapted to be flexed first in one direction and then in the other, each of said sets of rolls comprising a flexing roll of relatively small diameter and a back-up roll for said flexing roll, means for rotatably supporting one of the rolls of each set in said member, means for rotatably supporting the other roll of each set in engagement with the last mentioned roll of the set, means for guiding the strip to be processed to said flexing rolls, means for pulling the strip to be processed over said flexing rolls, means for rotating said member whereby the angles through which the strip to be processed is flexed are varied, and means for producing a relative movement between the axes of said flexing rolls and their respective back-up rolls, as the angles through which the strip is flexed are varied, such that the rolls are maintained in a relationship in which the force acting between said flexing rolls and their respective back-up rolls always acts substantially along a line connecting their axes of rotation.

7. In a processing machine of the character described for the processing of a strip steel, the combination of a frame, a member rotatably supported by said frame, a plurality of flexing rolls of relatively small diameter over which the strip to be processed is adapted to be flexed first in one direction and then in the other, back-up rolls engaging said flexing rolls, means for rotatably supporting said back-up rolls in said member, auxiliary members rotatably supported coaxially with said back-up rolls, means for rotatably supporting said flexing rolls in said auxiliary members, means for guiding the strip to be processed to said flexing rolls, means for pulling the strip to be processed over said flexing rolls, means for rotating said first-mentioned member whereby the angles through which the strip to be processed is flexed are varied, and means for moving said auxiliary members about their pivots, upon movement of said member, in such a manner that the rolls are maintained in a relationship in which the force acting between said flexing rolls and their respective back-up rolls always acts substantially along a line connecting their axes of rotation.

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