June 20, 1939. L. R. THOMAS 2,163,504

PROCESSING MACHINE

Filed Dec. 3, 1936 4 Sheets-Sheet 1

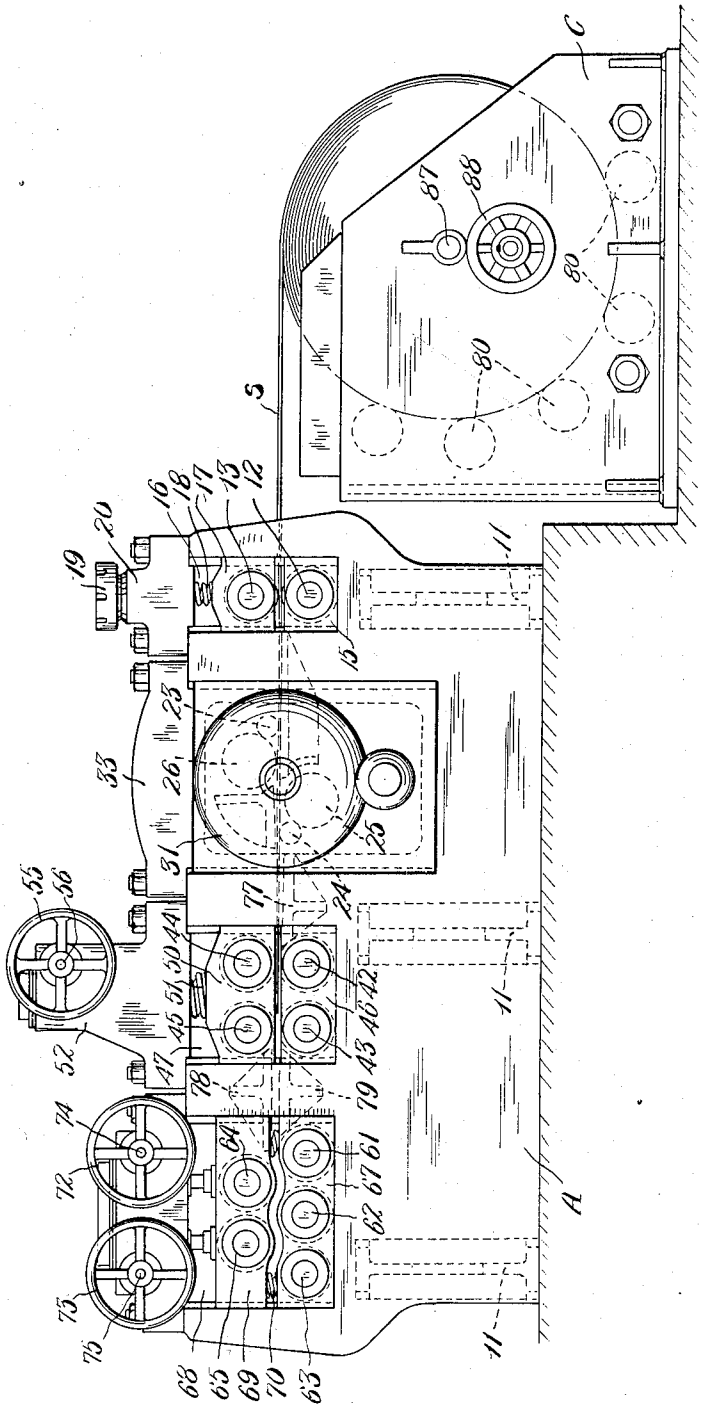

FIG. 1

INVENTOR.
LLOYD R. THOMAS

BY Kurs Hudson & Kent
ATTORNEYS

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PROCESSING MACHINE

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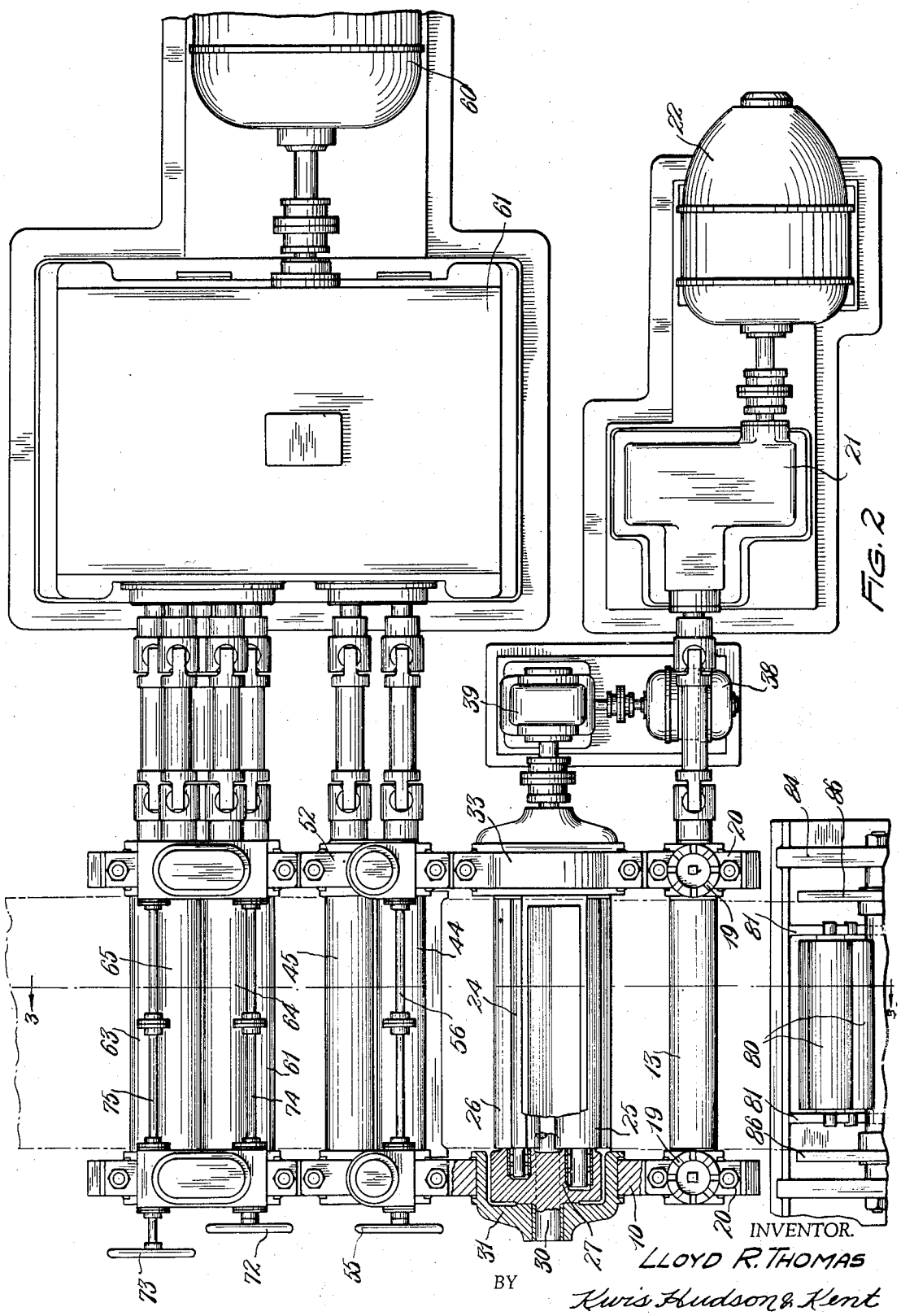

FIG. 2

INVENTOR.
LLOYD R. THOMAS

BY
Kuris Hudson & Kent
ATTORNEYS

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PROCESSING MACHINE

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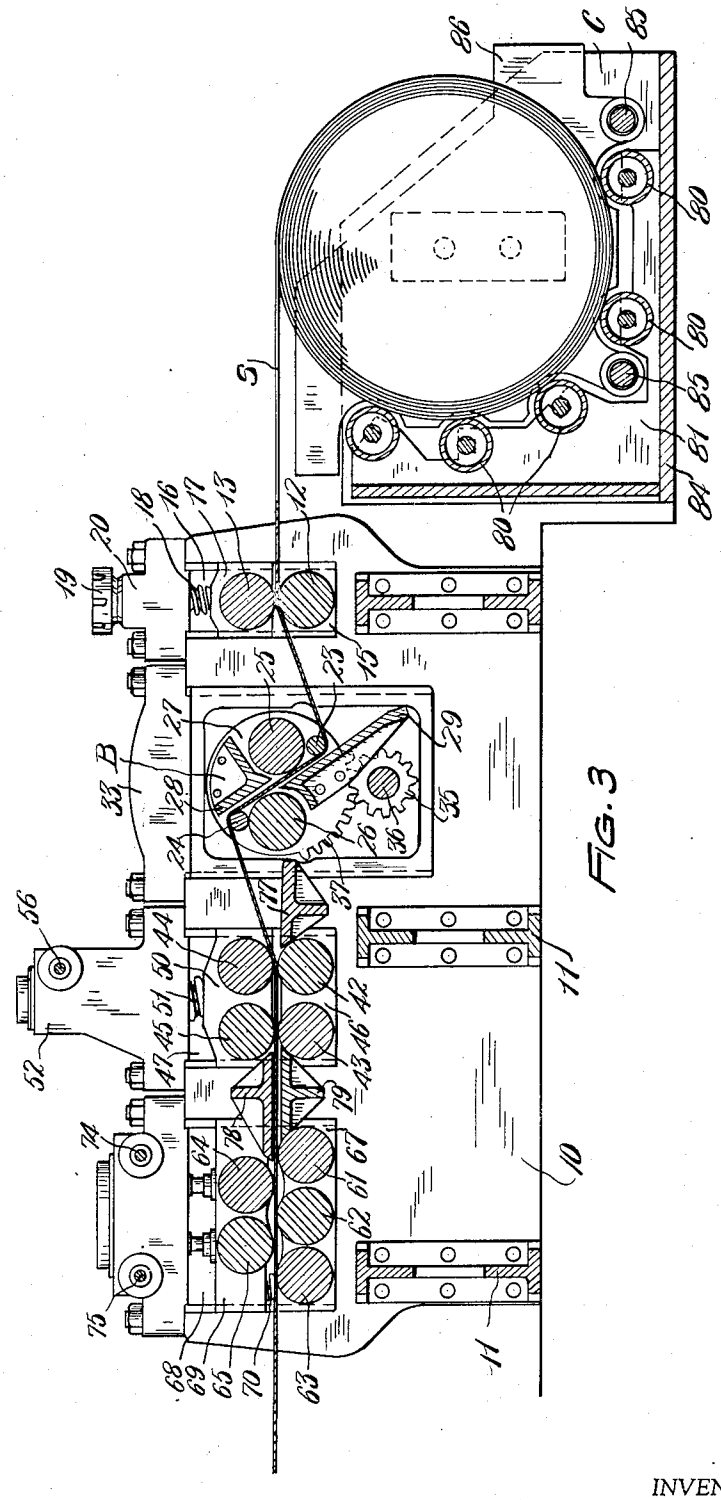

FIG. 3

INVENTOR.
LLOYD R. THOMAS

BY Kuris Hudson & Kent
ATTORNEYS

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Filed Dec. 3, 1936 4 Sheets-Sheet 4

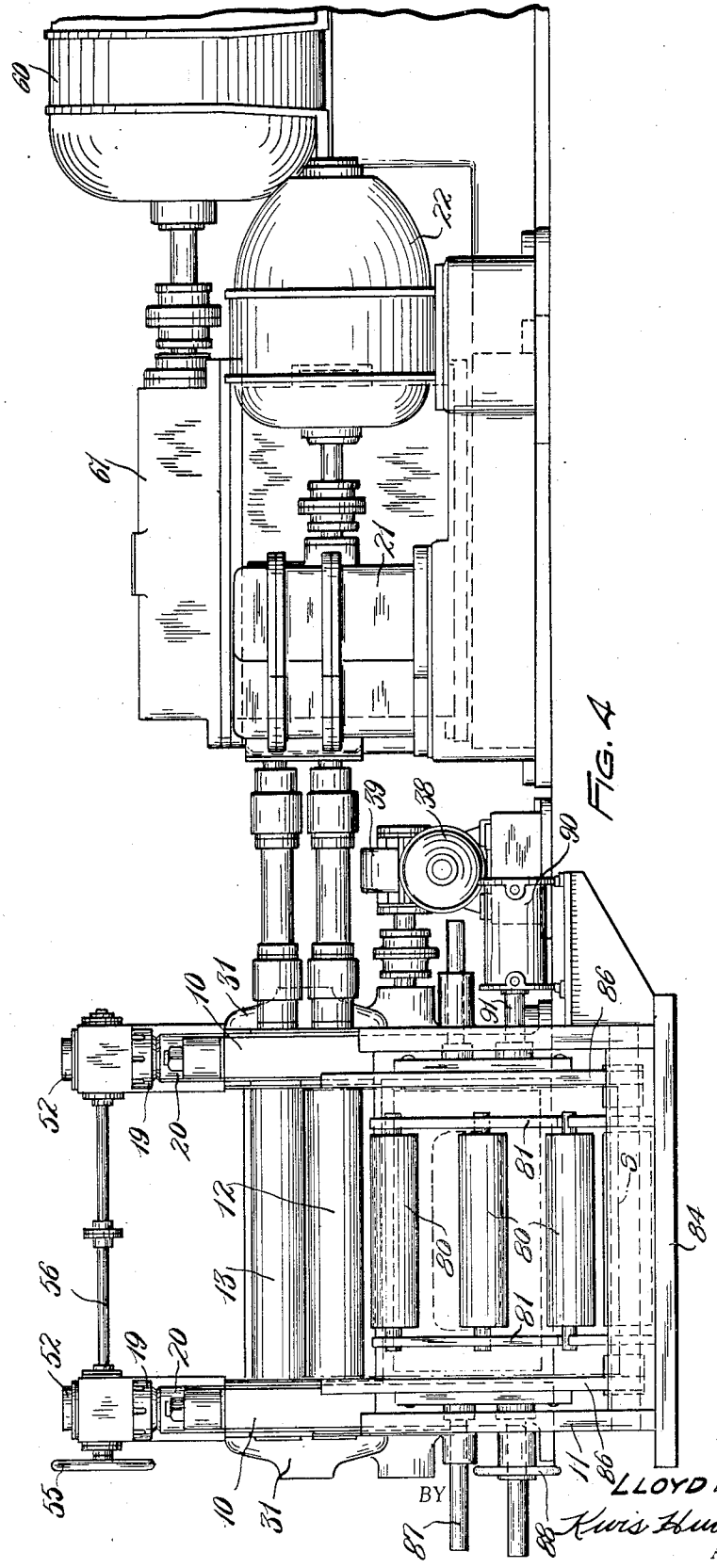

FIG. 4

INVENTOR.
LLOYD R. THOMAS
BY
Kuris Hudson & Kent
ATTORNEYS

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UNITED STATES PATENT OFFICE

2,163,504

PROCESSING MACHINE

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

Application December 3, 1936, Serial No. 114,015

4 Claims. (Cl. 153—54)

The present invention relates to the processing of strip steel to remove surface scale therefrom thus facilitating the production of a finely finished surface in the subsequent treatment of the material, etc., and/or to remove or relieve strain therein.

An object of the invention is the provision of a novel and improved machine for processing strip steel comprising means for flexing the strip over rolls of relatively small diameter first in one direction and then in the other, and means for readily adjusting or setting the angles through which the strip is bent.

Another object of the invention is the provision of a novel and improved machine for removing strain from strip steel.

Further objects and advantages of the present invention will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment thereof described with reference to the accompanying drawings forming a part of this specification in which similar reference characters designate corresponding parts throughout the several views, and in which

Fig. 1 is a side elevation of a processing machine embodying the present invention and a coil box for holding a coil of strip steel;

Fig. 2 is a plan view, with portions in section, of the processing machine shown in Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 2; and

Fig. 4 is an end elevation of the processing machine looking from the right of either Fig. 1 or Fig. 2.

According to present steel mill practice, processing machines of the character referred to are usually located at the entry end of continuous pickling lines and in their nature are process uncoilers. While processing machines are usually employed in the aforesaid manner, the present machine is not limited to use with a continuous pickling line, but may be otherwise employed, for example, it can be used alone to remove strain from a coil of strip steel, or it might be used with a cold strip mill, etc. Generally speaking, the preferred embodiment of the present invention comprises a plurality of rolls of relatively small diameter over which the steel strip is drawn to flex it first in one direction and then in the other direction so as to crack and remove the scale therefrom. Provision is also made for leveling or straightening the strip after it has passed over the flexing rolls and prior to its passage through the continuous pickling line.

Referring to the drawings, the frame of the machine is designated in general by the reference character A and comprises spaced upright side members 10 connected at intervals by transverse members 11 secured thereto in any convenient manner. The machine comprises a plurality of sets of rolls supported in the frame A, the first of which is a pair of entering pinch rolls 12 and 13. These rolls are initially employed to feed the strip, designated by the reference character S, past the flexing rolls and into the exit pinch rolls, after which they are operated to exert a drag on the strip and thus bend the same about the flexing rolls, all of which will be hereinafter more specifically referred to. Opposite ends of the lower roll 12 of the entering pinch rolls are rotatably supported in bearing chocks 15 removably positioned or slidable in slots 16 in the side members 10. The upper roll 13 is similarly supported in bearing chocks 17 also slidably positioned in the slots 16 but above the bearing chocks 15. The slots 16 open into the top of the side frame members 10, thus permitting the pinch rolls to be readily removed for the purpose of replacement, etc. The upper roll 13 is continuously urged toward the lower roll 12 by springs 18 interposed between the upper bearing chocks 17 and the lower ends of adjusting nuts 19 threaded in suitable apertures in brackets 20 bolted to the side members 10 and projecting or extending across the upper open ends of the slots 16. The entering pinch rolls 12 and 13 are operatively connected, through a gear reduction 21, to an electric motor 22 which can be operated either to drive the rolls or as a drag generator or a back tension so that they can be operated, as previously stated, to either advance the strip or create tension therein.

From the entering pinch rolls the strip passes underneath a flexing roll 23 and over a second flexing roll 24 spaced longitudinally of the travel of the sheet from the first flexing roll 23. The flexing rolls 23 and 24 are of small diameter and are provided with back-up rolls 25 and 26, respectively, of larger diameter. The flexing rolls 23 and 24 and the back-up rolls 25 and 26 are all rotatably supported by anti-friction bearings in a frame or cradle B consisting of cylindrical end members 27 connected by cross members 28 and 29 which also serve as guides for the entering end of the strip as it is fed past the flexing rolls 23 and 24 and on to the exit pinch rolls.

The cradle B is rotatably supported by journals 30 formed integral with the center of the end members 27, in bearing chocks 31 removably positioned in slots in the side members 10. Said slots open into the top of the side members 10, as do the slots 16, and the members 31 are secured therein by brackets 33 extending across the slots and bolted to the side members. The cradle B is adapted to be rotated about a horizontal axis by pinions 35 fixed to a horizontal shaft 36 journaled in the members 31, which pinions are continuously in mesh with gear sectors 37 formed on the under part of the annular end members 27 of the cradle. The shaft 36 is adapted to be rotated in either direction by an electric motor 38 through the medium of a worm gear reduction 39.

From the flexing roll 24 the strip S passes through exit pinch rolls, the lower rolls 42 and 43 of which are carried in bearing chocks 46 positioned in the lower end of a slot 47 similar to the slots in the side members 10 heretofore referred to. The upper rolls 44 and 45 of the exit pinch rolls are rotatably connected to upper bearing chocks 50 slidably supported in the slots 47 above the lower bearing chocks 46. The upper pinch rolls 44 and 45 are continuously urged toward the lower pinch rolls 42 and 43 respectively by springs 51 interposed between the upper bearing chocks and the lower ends of screw-downs 52. Both screw-downs 52 are adapted to be simultaneously operated to either increase or decrease the pressure between the upper and lower exit pinch rolls by a handwheel 55 connected to the front end of a shaft 56 extending across the machine and connected to the screw-down proper through the medium of worm and worm wheel in a manner well known in the art. The exit pinch rolls are adapted to be driven from an electric motor 60, which also drives the straightening or leveling rolls hereinafter referred to, through a power transmission 61 of conventional construction.

From the exit pinch rolls the sheet passes through the straightening or leveling rolls 61 to 65 inclusive. The bottom three rolls 61, 62, and 63 of the straightening or leveling rolls are rotatably supported in stationary bearing chocks 67 slidably or removably positioned in the bottom of slots 68 formed in the side frame members 10, and the upper two straightening or leveling rolls 64 and 65 are rotatably connected to upper bearing chocks 69 slidably supported in the slot 68 above the lower bearing chocks 67. The two sets of straightening or leveling rolls are held in spaced relation with reference to each other by spring 70 interposed between the upper and lower bearing chocks at opposite ends thereof. To permit adjustment of the straightening rolls, opposite ends of the bearing chocks 67 are provided with means for raising or lowering the same. In the preferred embodiment shown, this means is a screw-down comprising handwheels 72 and 73 connected to shafts 74 and 75 respectively, which shafts extend across the machine adjacent opposite ends of the bearing chocks and which are operatively connected through the medium of worms and worm wheels to the screw-downs proper. As previously stated, the leveling or straightening rolls are adapted to be driven from the power transmission 61 in a conventional manner. As shown suitable cross members 77, 78 and 79 are interposed between the various sets of rolls to assist in guiding the strip through the machine.

In operation, the coil of material to be processed is placed in a coil box designated generally by the reference character C. The coil box C comprises a plurality of rollers 80 supported in plates 81 secured in the box-like frame 84 having rods 85 extending across the inside upon which movable plates 86 are slidably supported. The plates 86 are also guided in their movement transversely of the box by shafts 87 which project through bosses in the sides of the frame 84. The left-hand plate 86 as viewed in Fig. 4 is adapted to be moved along the rods 85 by a handwheel 88, and the right-hand plate is adapted to be moved by a fluid pressure motor 90 the piston rod 91 of which is fixed to the plate. The plates 86 are adjustable for the purpose of accommodating coils of strip material of different widths and for centering the strip in the machine.

The operation of the machine is as follows:

After the coil to be processed has been placed on the rollers 80 in the coil box C, the outer end thereof is fed into the entering pinch rolls 12 and 13 which are now being driven by the motor 22. At the beginning of the operation, the cradle B is positioned with the flexing rolls 23 and 24 in the position shown in Fig. 1, and as the end of the strip is advanced by the entering pinch rolls, it passes underneath the first flexing roll 23 and over or above the second flexing roll 24, being guided in its travel through the cradle B by the cross-members 28 and 29. After the strip has entered the exit pinch rolls, the motor 22 is caused to operate as a generator and exert a drag on the strip. At or about the same time the motor 38 is energized to rotate the cradle B in a clockwise direction, as viewed in Figs. 1 and 3, moving the flexing rolls 23 and 24 from the position shown in Fig. 1 to one similar to that shown in Fig. 3 and causing the strip to be flexed first in one direction and then in the opposite direction an amount depending upon the angle through which the cradle B has been rotated. It will be readily apparent that the angles through which the strip is flexed can be set or adjusted depending upon conditions, etc., by merely causing the motor 38 to operate in one direction or the other. The amount of tension applied to the strip can be readily controlled by means of the motor 22.

From the foregoing description of the preferred embodiment of the invention, it will be apparent that the objects heretofore enumerated have been accomplished and that a new and improved machine for processing strip steel or the like to relieve strain and/or flex off the scale has been provided. While the preferred embodiment of the invention has been described in considerable detail, it is to be understood that the construction shown is merely illustrative of the invention and I do not wish to be limited thereto.

It is my invention to cover hereby all adaptions, modifications, and uses thereof, and I particularly point out and claim as my invention the following:

1. A processing machine for strip steel comprising a frame, a member rotatably supported by said frame, a plurality of flexing rolls of relatively small diameter carried by said member, back-up rolls carried by said member and engaging said flexing rolls, said flexing rolls being adapted to engage opposite sides of a strip passing through the machine and flex the same first in one direction and then in the other, reversible power means for moving said member about its

axis of rotation whereby the angle through which the strip is flexed may be varied, means for pulling the strip over said flexing rolls, and means for exerting a drag on the strip.

2. A processing machine for strip steel comprising a frame, a member rotatably supported by said frame, a plurality of flexing rolls of relatively small diameter carried by said member, back-up rolls carried by said member and engaging said flexing rolls, said flexing rolls being adapted to engage opposite sides of a strip passing thereby and flex the same first in one direction and then in the other, guide means carried by said member for guiding the entering end of the strip past said flexing rolls, reversible power means for oscillating said member about its axis of rotation whereby the angle through which the strip is flexed may be varied, means for pulling the strip over said flexing rolls, and means for exerting a drag on the strip.

3. A processing machine for strip steel comprising a frame, a member rotatably supported by said frame, a plurality of flexing rolls of relatively small diameter carried by said member, back-up rolls engaging said flexing rolls, means for guiding the strip to the flexing rolls, said flexing rolls being adapted to engage opposite sides of the strip passing through the machine and flex the same first in one direction and then in the other, means for moving said member about its axis of rotation, means for pulling the strip over said flexing rolls, and means for exerting a drag on the strip.

4. A processing machine for strip steel comprising a pair of rolls, a second pair of rolls spaced from the first mentioned pair of rolls, a member rotatably supported intermediate said pairs of rolls, a plurality of flexing rolls of relatively small diameter carried by said member, back-up rolls engaging said flexing rolls, means for moving said member about its axis of rotation, said first mentioned pair of rolls and said second mentioned pair of rolls being adapted to guide the strip to and from the flexing rolls and the flexing rolls being adapted to engage opposite sides of the strip and flex the same first in one direction and then in the other, means for pulling the strip over said flexing rolls, and means for exerting a drag on the strip.

LLOYD R. THOMAS.