(No Model.)

W. S. RALYA & R. COYLE.

METAL STRAIGHTENING MACHINE.

No. 529,956. Patented Nov. 27, 1894.

Fig. 1.

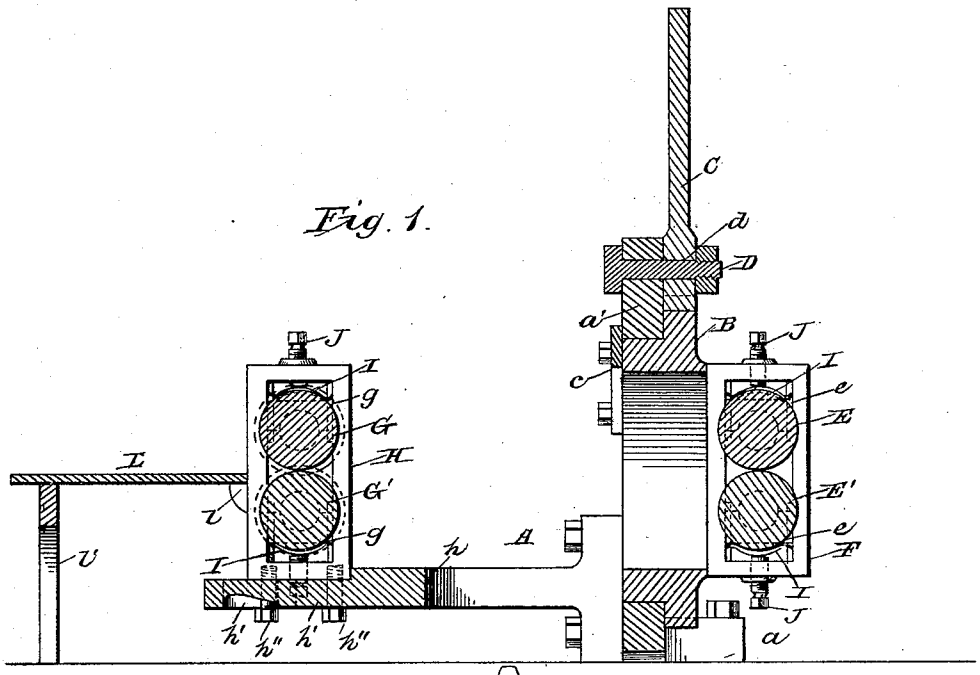


Fig. 3.

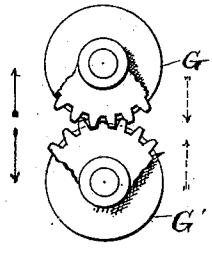
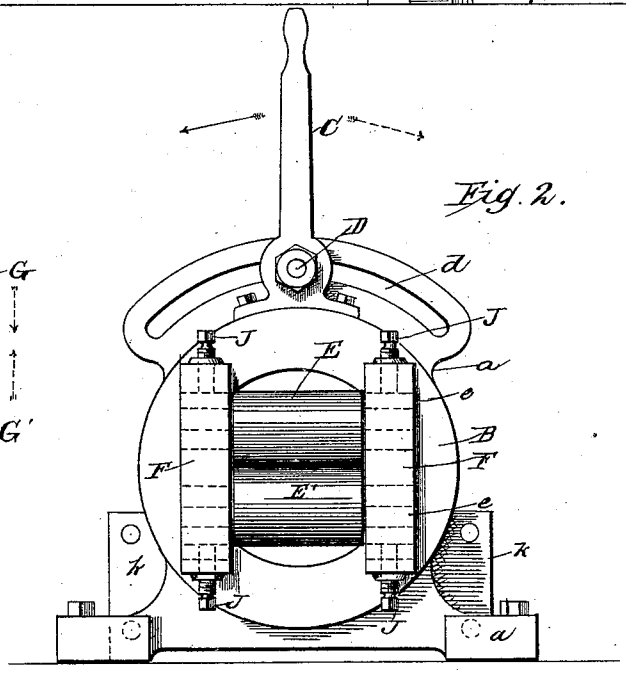


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM S. RALYA AND ROBERT COYLE, OF INDIANAPOLIS, INDIANA.

METAL-STRAIGHTENING MACHINE.

SPECIFICATION forming part of Letters Patent No. 529,956, dated November 27, 1894.

Application filed January 30, 1894. Serial No. 498,505. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM S. RALYA and ROBERT COYLE, citizens of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Metal-Straightening Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The nature of this invention is a machine for straightening metal, such as saws, spring steel, or other strips of metal, by subjecting the same to torsional strain and roll pressure so as to overcome the twist in the saw, or other metal strip, and make the same true and straight.

With these ends in view, the invention consists in the combination with a stationary or fixed set of coacting pressure rolls through which the metallic strip is drawn, of mechanism for subjecting the twisted metal to torsional strain as it passes therethrough and through the set of pressure rolls, whereby the twisted metal strip is strained in the reverse direction to the twist therein between the straining devices and the set of rolls and at the same time the metal strip is subjected to heavy pressure between said rolls, to make the metal strip true and straight as it leaves the machine. In one embodiment of our invention, the torsional straining mechanism consists of a guide mounted to turn or tilt in a direction at right angles to the line of feed of the metal strip and constructed to bear thereon as the strip passes through said guide in a manner to impart torsional strain to the strip. The mechanically twisting or straining device for the metallic strip may consist of a tiltable guide having a transverse slot for the passage of the metallic strip; but in the preferred embodiment of our invention, we prefer to provide the tiltable straining mechanism with a frame in which is journaled a set of coacting pressure rolls adapted to be positively forced together and upon the work as it passes through or between said rolls, the rolls of the straining device being movable with the tiltable guide or frame to be adjusted at an angle to the horizontal position occupied by the fixed set of rolls.

The invention further consists in the combination with a set of pressure rolls, and a torsional straining mechanism, substantially such as described, of a leveling table situated at one side of said set of pressure rolls in the line of feed of the metallic strip and serving to indicate to the attendant the extent of deflection or twist in the saw or strip of metal, whereby the attendant is enabled to regulate the pressure of the set or sets of rolls so as to force them upon the strip of metal with such pressure, as, in conjunction with the torsional strain of the twisting device, to straighten the strip of metal.

The invention further consists in making the fixed or stationary set of rolls adjustable toward or from the torsional straining device to adapt the machine to properly operate upon strips of metal or saws of different resistances or tension; in the construction of the pressure rolls to obviate injury to the teeth of saws; and the invention finally consists in the novel combination of devices and in the construction and arrangements of parts which will be hereinafter fully described and particularly pointed out in the claims.

The machine of our invention is especially designed for taking out the twist in saws, such for instance as narrow band saws which vary in width from one eighth of an inch ($\frac{1}{8}''$) to two inches ($2''$), although the machine can be advantageously used for straightening metal strips generally.

The usual method at present in vogue of straightening saws is to place the saw on a table and mechanically straighten it by blows of a hammer on both sides of the blade, but this method is slow, expensive and unsatisfactory.

By the use of our machine, a saw or other metallic strip can be perfectly straightened in a comparatively brief time and at small cost.

We have illustrated one embodiment of our machine in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical longitudinal sectional view through our straightening machine for metal strips. Fig. 2 is an elevation looking at the end of the machine having the tiltable torsional mechanism to more clearly indicate the construction of the latter. Fig. 3 is a de-

tail view, in end view, of a set of coacting rolls, to show one method of gearing them together.

Like letters of reference denote corresponding parts in all the figures of the drawings, referring to which—

A designates a suitable frame which may rest upon a bed plate or stand upon legs or standards at a suitable distance above the floor of the shop. This frame A is provided with a segmental bed *a*, see Fig. 2, and with a ring-like or annular guide, *a'* which is concentric with said segmental bed, *a*, to accommodate the disk, B, which forms a part of the tiltable torsional mechanism of the machine. This disk, B, is fitted snugly within the segmental bed *a*, and the annular guide, *a'*, of the frame, A, so as to be capable of turning or tilting freely therein, and the disk, B, is held in place by said bed and the guide, and by means of a plate, *c*, which is fixed to the guide *a'* or the frame A to bear against one face of the disk. See Fig. 1.

The disk, B, and the parts carried thereby, can be turned or tilted by means of the hand-lever, C, which is fixed to or made rigid with the disk at the upper end thereof and which extends or projects a suitable distance above the disk and the frame A to be grasped and operated by hand. The disk and lever are held in their proper positions relative to the frame by the bed and guide hereinbefore referred to and by means of a bolt D which passes through the lever and is movable therewith, said bolt extending through a segmental slot, *d*, formed in the upper part of the annular guide, *a'*, concentric with the axis of the disk, B. As hereinbefore stated, this disk B, may be constructed with a transverse slot of such dimensions as to permit the saw or strip of metal to pass through the slot, and when the disk is tilted to one side or the other, the edges or walls of the slot bear or impinge upon the saw or metallic strip to impart torsional strain thereto in order to take out the twist in the metal; but we prefer to provide this tiltable device for imparting torsional strain to the metallic strip with a set of coacting pressure rolls, E, E', which serve the dual purpose of exerting pressure upon the strip and for torsionally straining the same as it passes through or between them. The rolls E, E' of the set are arranged one above the other and have their journals fitted to the bearings, *e*, said bearings being fitted to slide vertically on the bars or sides of the upright frames, F. These frames, F, are made rigid or fast to the tiltable disk, B, in any desired way, and the frames and the set of pressure rolls are movable or tiltable with said disk or support B, in order that the tiltable set of pressure rolls may be turned to an inclined position with reference to the line of feed of the metallic strip which is designed to pass through or between said rolls E, E', to enable the latter to impart torsional strain to said metallic strip.

At one side of the torsional straining mechanism just described, we provide another set of coacting pressure rolls, G, G', which have the plane of their axes parallel to the plane of the axes of the rolls E, E' carried by the tiltable disk or support, B. This second set of pressure rolls, G, G', have their journals or shafts fitted in the vertically movable bearings, *g*, which slide in an upright frame, H; and this frame is normally held in a fixed or stationary position on lateral supports or arms, *h*, which are bolted to the frame, A, although said stationary frame and its set of rolls are made adjustable toward or from the tiltable device to vary the distance between the two sets of rolls for the purpose of accommodating the machine to metal strips of different tension or resistances. For instance, if it is desired to take out the twist in a piece of mild steel, the stationary frame and its set of rolls are adjusted close to the torsional straining device, but if the steel is highly tempered and has considerable torsional resistance, the fixed frame and its set of rolls are adjusted to the full limit permitted by the machine away from the tiltable set of rolls. This adjustment of the frame and rolls is effected by providing the arms or supports *h* with longitudinal slots, *h'*, through which are passed the bolts, *h''*, which fasten the frame H to the arms *h*.

The rolls, E, E', and the rolls G, G', are yieldingly pressed together by means of the tension springs, I, preferably of the "leaf-spring" variety and adjusted to bear upon the upper sliding bearings, as shown in Fig. 1; and the pressure of the rolls upon each other may be regulated by means of the adjusting screws J, J, fitted in tapped holes in the frames and arranged to bear against the lower sliding bearings and against the tension springs I which rest upon the upper sliding bearings. Power is communicated to the machine by means of a belt running around a driving pulley which is made fast to the shaft of the lower roll, G', of the fixed set of coacting pressure rolls, G, G', whereby the metallic strip is fed through the two sets of rolls. The rolls which we prefer to employ consist of steel shafts faced with hard rubber, but this particular material is not essential as the rolls can be made of paper, metal, or other suitable material, although it is preferable to employ a material which will not injure the saw teeth when the machine is to be used for the purposes of taking the twist out of saws.

The frame A is provided with lugs, *k*, *k*, see Fig. 2, to which the lateral or horizontal arms, *h*, *h*, are bolted for supporting the upright frame H and its set of rolls, G, G'; and this frame H is in turn provided with the lugs, *l*, *l*, upon which are designed to rest the inner edges of the leveling table, L. This leveling table is supported by the lugs, *l*, and the standards, *l'*, in a perfectly horizontal position and just a very slight distance below the line of feed of the metallic strip as it

passes through the rolls, G, G'. The leveling table is thus situated on one side of the fixed or stationary set of rolls, and it serves to indicate to the attendant the extent or degree of deflection in the piece of metal which it is desired to straighten, so that the attendant can adjust the screws, J, to regulate the rolls and make them exert the pressure necessary to remove the twist in the strip of metal. This leveling table is readily removable from the upright frame H as it simply rests upon the lugs, *l*, thereof; and in practice it may be found desirable to employ the leveling table only when long strips of metal are to be passed through the machine.

This being the construction of our improved metal straightening machine, the operation may be described as follows: Power is communicated, by the belt and driving pulley or equivalent gearing, to the fixed set of coacting pressure rolls, and the metal strip to be straightened is passed first through the rolls G, G', and then to the rolls, E, E'. The operator manipulates the lever C to turn the disk and the set of rolls E, E', to an inclined position at right angles to the line of feed of the metallic strip. The strip is thus subjected to pressure between the rolls forming the two sets of the rolls, and to torsional or twisting strain by the inclination of the rolls, E, E', to the line of feed of the material, whereby the twist is effectually taken out of the strip of metal and the latter is made true and straight.

By constructing the coacting rolls with yielding surfaces they perform another function in addition to yielding to the teeth on a saw blade, that is to say, said yielding rolls obviate stretching the straight edge of the saw blade or metal strip. If we employ rolls with metallic or other hard surfaces for exerting pressure on a saw blade, the straight edge of the blade, or that edge opposite to the twisted portion of the blade or strip, is liable to be stretched by pressure of the coacting rolls. Hence we find it desirable to employ rolls with yielding surfaces which not only avoid injury to the saw teeth but act to prevent stretching the untwisted or straight edge of the blade.

We prefer to provide gearing to connect the upper and lower rolls G, G', of the fixed set of rolls in order that both of the rolls G, G', may be positively rotated on their axes and operate to better advantage in feeding or drawing the metallic strip or saw blade through said rolls G, G', and to the rolls E, E'. This gearing is indicated by dotted lines in Fig. 1, of the drawings, and it may be of any preferred construction suitable for the purpose of rotating the upper roll by power derived from the lower roll and to permit of the necessary adjustment of the rolls G, G', relative to each other.

We are aware that changes in the form and proportion of parts and in the details of construction of the mechanisms herein shown and described as an embodiment of our invention can be made by a skilled mechanic without departing from the spirit or sacrificing the advantages of the invention. We therefore reserve the right to make such modifications and alterations as fairly fall within the scope of our invention.

Having thus fully described and explained the nature of our invention and in what manner the same is to be performed, we declare that what we claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a metal straightening machine, the combination with a frame having an annular support, and a set of positively rotated feed rolls, of a tiltable disk fitted to said annular support and movable freely thereon, a set of rolls carried by said tiltable disk, and manually operated devices for turning said tiltable disk and its rolls at right angles to the line of feed of the metallic strip or plate through the two sets of rolls, substantially as and for the purposes described.

2. In a metal straightening machine, the combination with a feed mechanism, and a main frame provided with a fixed annular support, of a tiltable disk fitted and movable freely in said annular support, means for holding said tiltable disk in said support and permitting it to turn therein, a set of rolls carried by said tiltable disk, and a manually operative device for turning said disk and its set of rolls in a plane at right angles to the line of feed of the metal strip or plate through the feed mechanism and the set of rolls substantially as and for the purposes described.

3. In a metal straightening machine, the combination of a main frame having a fixed annular support, a feed mechanism, a tiltable disk fitted to turn freely in said annular support and held against displacement by a guide plate, a lever connected with said disk to move the same, and a set of rolls carried by the tiltable disk, substantially as described.

4. In a metal straightening machine, the combination of a main frame provided with a fixed annular support, a tiltable disk fitted to and movable freely on said annular support, a set of rolls mounted in said tiltable disk with their axes parallel to each other, means for moving said tiltable support in a plane at right angles to the line of feed of the metallic strip through the machine, a longitudinally-adjustable frame supported on the main frame at one side of the tiltable support, and a set of feed rolls journaled in the said adjustable frame, substantially as and for the purposes described.

5. In a metal straightening machine, the combination with a set of feed rolls, of an axially movable disk supported at one side of the feed rolls, a second set of rolls journaled in said axially movable disk with their axes parallel to each other and said rolls movable with said disk in its adjustments, and manually operated devices connected to said tiltable support to move the latter and

its rolls at will in a plane at right angles to the line of feed through the feed rolls and the straining rolls, substantially as described.

6. In a machine for straightening metal, the combination of a main frame provided with a fixed annular support, a tiltable disk fitted to and movable freely in said annular support, a set of rolls journaled on the tiltable disk, means for moving the tiltable disk and its rolls at will in a plane at right angles to the line of feed through the machine, a feed mechanism, and a leveling table supported on the main frame adjacent to the feed mechanisms and in substantially the plane of feed of the work to said feed mechanisms, substantially as described.

7. In a metal straightening machine, the combination of a main frame having a fixed annular support, a tiltable disk fitted to said annular support and movable therein, a set of rolls journaled on said tiltable disk, means for moving the disk and its rolls in a plane at right angles to the line of feed through the machine, a set of feed rolls supported on the main frame, and a removable leveling table supported on the main frame adjacent to the set of feed rolls, substantially as described.

8. In a machine for straightening metal, the combination with a set of coacting pressure rolls, and a suitable main frame, of a tiltable disk fitted in suitable guides on said main frame and having its lever provided with a pin which works in a segmental way on said frame-guides, a frame rigid with said tiltable disk, and a second set of rolls journaled within said frame, for the purposes described, substantially as set forth.

9. In a machine for straightening metal, the combination with a main frame, of an upright frame fixed thereon and supporting a set of pressure rolls, a tiltable support guided on the main frame to turn at right angles to the line of feed of the work through the machine, another upright frame carried by the tiltable support, and a second set of pressure rolls journaled in the frame which is carried by said tiltable support, the rolls of the two sets being adjustable and yieldingly held together and each roll being constructed of yielding material in the manner and for the purposes described.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM S. RALYA.
ROBERT COYLE.

Witnesses:
JACOB KROPP,
GEORGE W. THOMPSON.