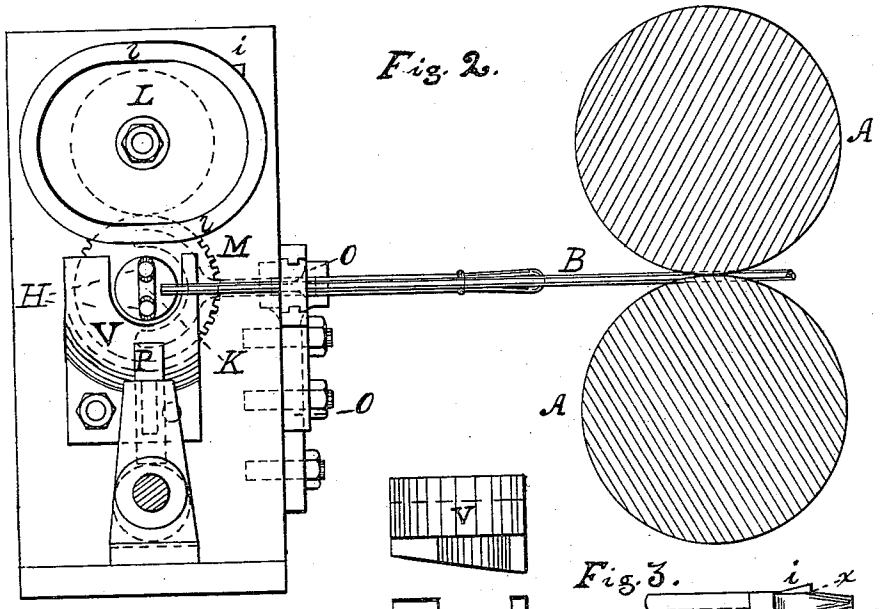
A. J. MOXHAM.

MACHINE FOR WINDING IRON.

No. 192,653. Patented July 3, 1877.

Fig. 2.







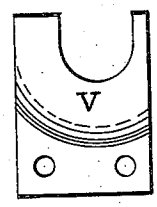



Fig. 3.

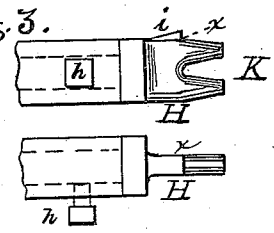
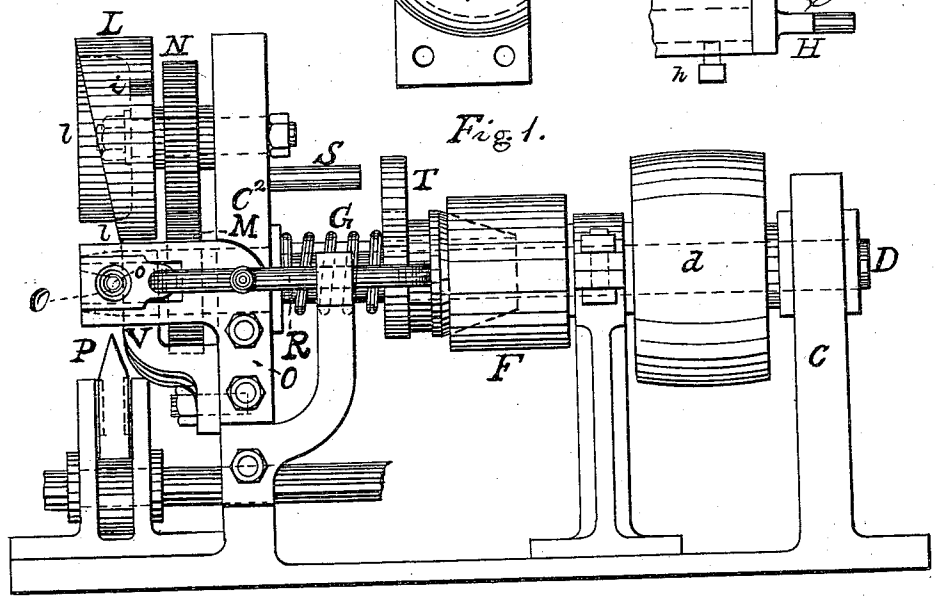



Fig. 1.




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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN MACHINES FOR WINDING IRON.

Specification forming part of Letters Patent No. **192,653**, dated July 3, 1877; application filed March 3, 1877.

*To all whom it may concern:*

Be it known that I, ARTHUR J. MOXHAM, of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Machines for Bending or Winding Iron hot from the roll-train, which improvements are fully set forth in the following specification, reference being had to the accompanying drawing, in which—

Figure 1 is a front elevation of the winding-machine, and Fig. 2 is an end elevation, showing the machine in combination with a roll-train. Fig. 3 illustrates details hereinafter explained.

The object of this invention is to bend or wind rod or bar iron, hot from the rolls, into certain partially-finished shapes, to be afterward completed for certain uses, hereinafter enumerated, thus utilizing the same heat imparted to the iron in preparing it for the roll-train, and also by hot-bending, preserving the strength of the iron in all articles, such as chain-links, heretofore bent cold, thus cheapening also the cost of all products so fabricated.

To this end, therefore, this invention consists of the winding or bending machine, hereinafter described, whereby the bending or winding of the iron is accomplished while feeding hot from the rolls.

In the drawing, forming part of this specification, A represents a train of rolls, for reducing the iron to the desired form of either rod or bar. B is the rod or bar passing hot from the rolls into the machine for bending or winding it into a suitable turn or coil.

The bending machine or mechanism will now be described.

In two pillars, forming a frame, C $C^2$, in suitable bearings, is mounted the winding-shaft D, divided into two sections, one of which is provided with a driving wheel or pulley, *d*. A friction or other suitable clutch, F, holds the two sections of the shaft united, by the action of the coiled spring G. The object of using this clutch is to allow the part of the shaft which carries the former H, hereinafter described, to be quickly stopped and started, while the other part of the shaft, carrying the driving-pulley *d*, continues in constant rotation. H is the coil-former or mandrel, inserted in the end of the shaft D, and secured therein by the set-screw *h*. This former or mandrel is for a part of its length, next the end of the shaft D, of any shape suited for bending the iron into the desired shape of coil, and has its sides parallel for a certain portion of its length; but at a certain point in its length, shown at *x*, it tapers or assumes the shape of an inclined plane, in order that the iron, while in process of bending, may readily free itself from the former, and be cut with facility into suitable lengths of coil preparatory to any further finishing operation desired.

The former H is forked, as shown in the drawing at K. In this fork the iron is inserted before being bent; but it is obvious that other means may be used for holding the iron upon the former H, though the fork forms a very ready method.

Mandrels or formers of various shapes can readily be substituted one for another, depending upon the shape of the coil intended to be formed. A long, continuous coil can thus be made, which can afterward be forged into a hollow column, girder, pipe, or shaft, without rivet, seam, or bolt, having all the strength due to the twist given it. Such twist of fiber makes the article possessing it necessarily much stronger than if either drawn or lap-welded, in which cases the fibers run longitudinally only.

For hydraulic pipes, where great strength is required, the twist of fiber would be particularly advantageous. By cutting off short coils or bends of the iron, as may be done by the devices next to be described, blank links for chains can be most readily and expeditiously formed, needing only welding for completion.

Horseshoe-blanks can also be bent ready for the finishing strokes of the blacksmith's hammer, or for any swaging operation.

Above the mandrel H is a roll, L, provided with an inclined or spiral outer side, *l*. The said roll is caused to revolve by the gear-wheels M N. The wheel M is mounted upon the shaft D and rotates therewith, and the wheel N is secured to the inner side of the roll L, having a common axis therewith in the frame of the machine.

It will be observed that the face of the roll L is not a true circle, but that it is so conformed as to continue equidistant from the irregular contour of the mandrel H throughout the entire revolution of itself and the mandrel, at a suitable distance therefrom.

O is a traveling guide for the insertion of the hot iron before it enters the fork of the mandrel H. The said guide is attached by a rod, R, to the clutch F, so that both it and the clutch may be operated by one and the same motion. P is a knife or chisel operated by a cam, which may be actuated by any suitable attachment to the shaft D, or otherwise.

The operation of this machine is as follows: The iron, hot from the adjacent roll-train, is fed through the eye of the guide O into the fork of the mandrel H. That portion of the shaft D to which the pulley *d* is attached being already in motion, the guide O, having the hot iron passed through its eye *o*, and inserted in the fork K, is moved so as to allow the clutch F, by means of the connecting-rod R, to couple the two parts of the shaft D, when both the mandrel H and the roll L will commence to rotate, and thus the movement of the guide O will draw or feed the iron from the roll-train directly under the roll L as fast as the mandrel will coil it.

It will be observed that the fork in the mandrel H stops at a point just outside of the face of the roll L, so that the mandrel is not weakened by the fork, all the work of coiling the iron being done upon, and the strain thereof being borne by, the solid part of the mandrel inside of the fork, and under the face of the roll L, the mandrel also having a good bearing and perfect support in the inclined plane V.

The iron as it is taken up by the mandrel H from under the roll L will tend to crowd off that already wound.

The taper in the mandrel and its fork will also assist the coils of iron in escaping from the mandrel, but the spiral outer side of the roll L will take into the coils of the iron and crowd it off.

As long a coil of iron may thus be made as desired; but when a shorter turn or bend is required the knife P is brought into operation, and the iron severed at will, thus making either chain-links or horseshoe-blanks, the mandrel H and roll L being changed to suit any shaped turn or coil required.

When it is desired to stop the machine the clutch F is thrown out by a reverse movement of the guide O, to which any suitable lever or arm may be attached for operating it. When the machine is stopped the fork in the former H will present a horizontal opening ready for the reception of another rod of iron. The fork thus assumes its position, by reason of the counter-balance T on the clutch F, which hangs vertically when the shaft is at rest. The counter-balance T also acts against the stop S when the clutch F is thrown out, should the momentum of the shaft after it is uncoupled tend to cause it to make more than one revolution. The counter-balance T will thus prevent the mandrel H from making more than one revolution after the shaft D is uncoupled.

An inclined plane, V, bolted to the frame of the machine, will also assist the inclined or spiral side *l* of the roll L to crowd the coils of iron off the former H. Care, however, must be taken not to feed the iron too straight against the inclined plane V, or it will be cut against its edge when the roll L and mandrel H commence to rotate.

The spiral *l* may make its convolution in either one-half or the whole of the circumference of the roll L, depending upon the desired angle to be given to it. The more acute the angle of the spiral, the slower the coils will be crowded off the mandrel H.

Instead of the knife P, a wedge-shaped knife, *i*, may be put at a suitable point upon the face of the roll L, or upon the former H.

By either plan the coils of iron can be cut according to the work desired to be turned out. If the knife point or edge *i* be formed upon the mandrel H, it must be overhung by the face of the roll L.

It may be desirable to more clearly state the interaction or co-operation of the spiral side *l* upon the roll L and the inclined plane V—that is, their joint and several special functions.

One use of the said inclined plane is as a bearing for the former H, the only office of the bevel given to the said bearing being that of assisting the inclined side *l* of the roll L in separating and forcing off the coils of iron from the mandrel H, which coils have been fed up from the point of the mandrel toward its rear end, and against the beveled edge of the bearing V, by the sliding guide O. Neither the inclined side *l* of the roll L nor the beveled bearing-block V performs any guiding functions. All guiding of the iron is performed by the sliding guide O.

In practice, instead of the beveled bearing-block V being below the mandrel H, and in which the said mandrel rotates, a duplicate of roll L, having a similarly-inclined or spiral side *l*, may be, and is sometimes, substituted, provided with similar gearing for operating it, when the work done upon the mandrel is just as evenly balanced upon each side thereof, and the coils of iron forced therefrom at a uniform speed by the joint operation of the inclined sides of the rolls L.

In practice, also, a number of these mandrels H are mounted in a suitable frame, and geared to a rate of speed as great as is consistent with durability and economy, so that the aggregate number of mandrels shall be capable of coiling all the iron, bar by bar, as fast as delivered by the rolls, without loss of heat to the bars in passing from the rolls, one mandrel always being free to receive a newly-rolled bar.

In all coiling-machines heretofore constructed the designs are such that it is impossible for such machines to do the work of coiling beyond a given low rate of speed, and this speed has heretofore been so slow that even if a large number of said machines were employed it would only be possible to partially utilize the heat existing in the bars after leaving the rolls, which partial utilization of heat would be little better than useless; but the said machines are so bulky that no number of them sufficient to coil the iron delivered by the rolls at ordinary speed can be brought near enough to the rolls without seriously impeding or practically preventing the work of rolling.

Superior distinguishing features of the machine constituting this invention are, therefore, its capability of very high speed, and occupation of very small space, thus, without impeding the work of rolling, utilizing all the heat derived from the primary fining process existing in the iron at it leaves the rolls.

Having thus fully described this machine for bending iron hot from the rolls, and the advantages thereby attained, as of my invention, I claim—

1. A bending or coiling machine, consisting of a rotary mandrel, a spiral-sided bearing roll or rolls, and a traveling feed-guide, all combined and operating substantially as and for the purposes specified.

2. The combination of the mandrel H, guide O, and clutch F, operating together by means of a suitable connection, substantially as and for the purpose specified.

3. The bifurcated mandrel or coil-former H, provided with tapering points, the bottom of the furcation extending up to, but not under, the coil-forming and strain-bearing part of the mandrel, substantially as and for the purpose specified.

4. The roll L, in combination with a coil-forming mandrel, H, both having irregular contours, as described, so conformed each to each as to remain equidistant while said roll and mandrel are rotated, substantially as and for the purpose specified.

5. The roll L, provided with a spiral side, *l*, in combination with a mandrel or coil former external to said roll, substantially as and for the purpose specified.

6. The beveled bearing-block V, in combination with a rotary mandrel or coil-former and the spiral-sided roll L, whereby the coils of iron wound upon said former are separated and discharged therefrom, and support given thereto, substantially as and for the purposes specified.

7. A coil-forming rotary mandrel, in combination with a bearing-roll, L, provided with a cutting-edge or knife, *i*, substantially as and for the purpose specified.

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