(No Model.) 2 Sheets—Sheet 1.

A. J. MOXHAM.

MACHINE FOR STRAIGHTENING RAILS OR OTHER METAL BARS.

No. 518,197. Patented Apr. 10, 1894.

Fig. 1.

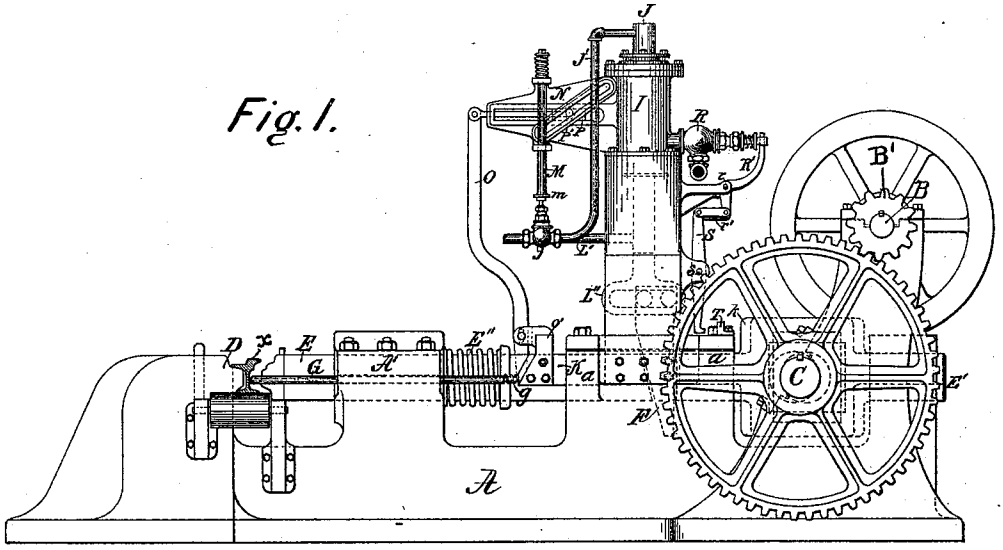
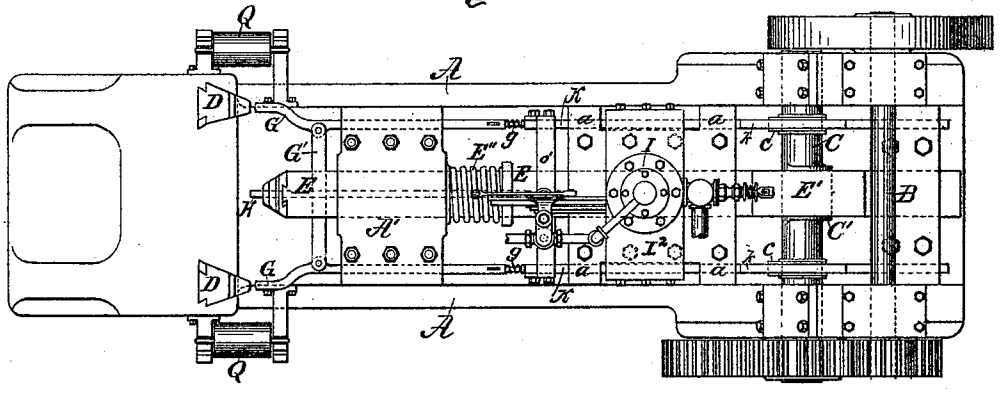


Fig. 2.



WITNESSES:
Francis P. Reilly.
W. F. Brickell.

INVENTOR
A. J. Moxham
BY R. H. Townley
ATTORNEY.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

A. J. MOXHAM.

MACHINE FOR STRAIGHTENING RAILS OR OTHER METAL BARS.

No. 518,197. Patented Apr. 10, 1894.

Fig. 4.

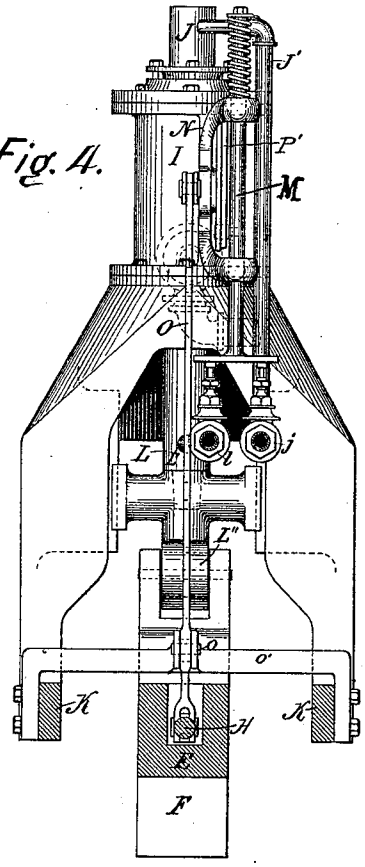


Fig. 3.

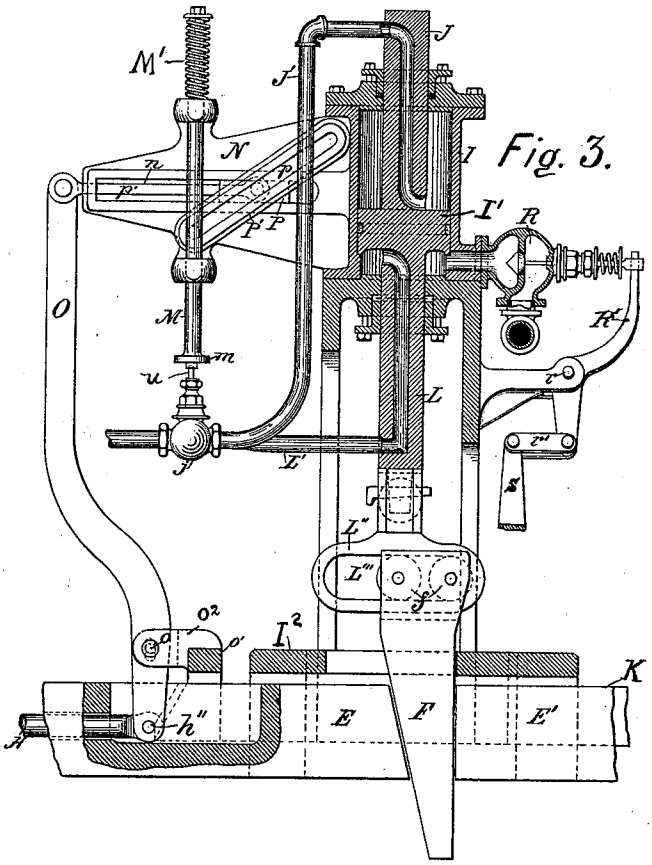


Fig. 5.

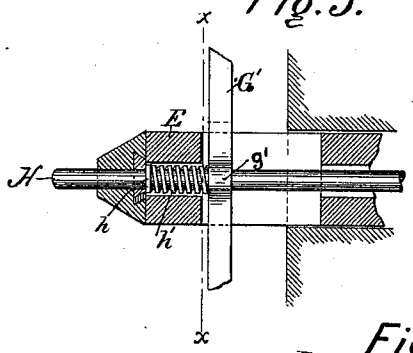


Fig. 7.

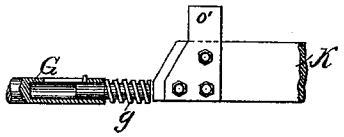
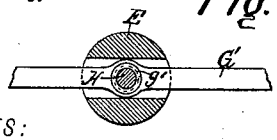


Fig. 6.



WITNESSES:

Francis P. Reilly.

W. F. Brückel.

INVENTOR

A. J. Moxham

BY R. H. Townley

ATTORNEY.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ARTHUR J. MOXHAM, OF JOHNSTOWN, PENNSYLVANIA.

MACHINE FOR STRAIGHTENING RAILS OR OTHER METAL BARS.

SPECIFICATION forming part of Letters Patent No. 518,197, dated April 10, 1894.

Application filed February 25, 1892. Serial No. 422,746. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR J. MOXHAM, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented a new and useful Machine for and Method of Straightening Rails or other Metal Bars, as hereinafter set forth.

This invention relates to machines for automatically straightening metal bars and has particular reference to machines for automatically removing kinks or bends from railroad rails.

The object of this invention is to provide a machine for straightening metal bars or rails in which the machine will be caused by a kink in the bar or rail to automatically govern the extent of the blow upon the rail or bar by varying the length of the plunger.

The invention consists of a machine for automatically straightening metal bars or rails and in details thereof as hereinafter described and claimed.

In the accompanying drawings: Figure 1 is a side view of the invention. Fig. 2 is a plan view thereof. Fig. 3 is a side view of a portion of the machine enlarged in vertical section. Fig. 4 is an end view of the machine enlarged, partly in cross section, looking to the right in Fig. 1. Fig. 5 is a plan view in horizontal section of a detail of the machine. Fig. 6 is a cross section taken on the line X—X Fig. 5. Fig. 7 is a side view of another detail of the machine.

The machine constructed in accordance with this invention comprises in its general features, a contact mechanism for locating the bend to be straightened, a plunger normally extended at full length and adjustable as to its length, and an automatic mechanism adjustable, through contact with the bend, to first shorten the plunger to a striking distance proportionate to the bend and then after each blow elongate the plunger in proportion to the diminished depth of the bend.

To set forth the invention I have shown and described as follows: An adjustable plunger, a central and side feelers, a wedge located between sections of the plunger, an eccentric mechanism for operating the feelers and plunger and an automatic mechanism, acted upon by the central feeler, to operate the wedge and adjust the length of the plunger proportionately to the extent of the curvature.

A indicates the main frame of the machine, having mounted in one end the driving shafts B and C, and on the top, adjacent to the other end, the anvils D, D, located at a suitable distance apart, against which anvils a rail to to be straightened is placed, as for example, the rail X. The plunger is formed in sections E, E′, the part E reciprocating horizontally in its support A′ and the part E′, being connected to an eccentric C′, on the shaft C, and serving as an eccentric rod. Between the sections E, E′ is located a wedge F, which acts to shorten and lengthen the plunger. The section E of the plunger is held against the wedge by means of a spring E″. The eccentric shaft C is geared with shaft B, through intermediate gear wheel B′.

G, G, are side feelers having their outer ends located opposite to the anvils D, D, and their inner ends connected by stiff springs *g* with connecting rods K, K, which are supported in bearings in the frame A in which they are adapted to reciprocate. The opposite ends of the rods K, K, and the corresponding end of the section E′ of the plunger are each provided with a yoke *k*, in which is located a vertically sliding housing or box embracing the eccentric.

H represents the central feeler, located between the side feelers and extending and adapted to reciprocate through the section E of the plunger, said feeler extending through the cross-bar G′ so as to have a movement through said cross bar and vibrate with said cross bar.

The side feelers G, G, are connected by a cross bar G′, preferably secured to each feeler by means of pins located in holes in the respective members named, so that when the faces of the feelers G are not in line, the parts are not cramped, but can adapt themselves to different positions. In order to more effectually accomplish this the holes in the cross bar G′ may be elongated, or slotted to allow for some lost motion in the pin connections. The stiff springs *g* connecting the side feelers G, G, with the eccentric rods K, K, play an im-

portant part in holding the side feelers in position when the outer ends of the feelers are not in a straight line.

The outward movement of the central feeler H is limited by means of a collar *h* which engages an internal abutting portion of the section E of the plunger, and serves as a stop. The said feeler is held in and returned to normal position by means of a coiled spring *h'* mounted on the feeler between the collar *h* and cross bar G'.

The outer ends of the feelers G, G, and H are normally in line with each other, and with a straight rail in position against the anvils D, D, the ends of the feelers merely touch the rail at the extreme of their forward movement. In the simultaneous advance of feeler H, with feelers G, G, owing to the connection with cross-bar G', the advance of the feeler H will be more or less according to the variation of a straight line between the feelers G, G. This variation will be measured by feeler H whether the rail be firmly seated against one or both anvils, because the springs *g g* permit the feelers G, G to accommodate themselves to the position of the rail. The springs *g*, *g*, are of such stiffness, that when the feelers G, G, are advanced they tend to hold the rail against the anvils D. The feelers having gaged and therefore determined the amount of straightening to be done on the rail between the anvils, the action of the central feeler, caused by the curvature is utilized to increase the striking distance of the plunger. Any suitable mechanism may be used for this purpose in conjunction with the central feeler and the eccentric mechanism for driving the plunger and side feelers. I have shown for this purpose a hydraulic mechanism constructed and operating as follows:

I is a hydraulic cylinder, mounted on a suitable frame, secured to a cross-head I^2 mounted on and bolted to the connecting rods K, K. The cylinder I is provided with piston I' having hollow piston rods J, L, the piston rod L being connected to the wedge F, preferably, in the following manner: Connected to the lower end of the piston rod L is a head L'', transverse thereto and provided with a horizontal, longitudinal slot L''', in which are located anti-friction rollers *f*, journaled on the top of the wedge F. By means of this connection of the wedge F with the piston rod L there will be no binding of the parts and the play of the rod L is not interfered with in the vertical adjustment of the wedge. The piston rod J connects with a supply pipe J' and the rod L with a supply pipe L', the pipes J' and L' being so bent that their outer ends are in close proximity to each other. These pipes are provided respectively with valves *j* and *l*, each of said valves opening upward and being held closed by the compression of springs (not shown) coiled about the respective valve stems at the points *u*. These valves, or the pipes near the valves, are preferably clamped together, or otherwise secured, so that the valves and their pipes carrying the valves with them will rise and fall together as the piston I' reciprocates.

M is a vertical rod which reciprocates in suitable guides on the bracket N, and has at its lower end a broad head *m* which simultaneously bears on the stems of both the above mentioned valves. Said valve stems when pressed by bar M, close the valves and when said pressure is removed by non-contact with the head *m* of said bar, the valves are instantly opened by the action of the springs upon the stems and the pressure of the water under the valves. With the upstroke of rod M both valves open, but close again in their seats, if their stems again make contact with the head *m* of rod M, by the rise of the piston I, or the descent of the rod M. Said rod may be entirely or partially counterbalanced by a spring M', arranged as shown.

The rod M, may be actuated as follows: The bracket N is provided with a horizontal slot *n*, in which slot operates a sliding block P, carrying an arm or lever P', provided with a slot *p*. In this slot operates a pin, or other suitable attachment of the rod M, and hence, by moving the sliding block P in the direction away from the cylinder I, the rod M is thereby elevated, allowing the valves to open, and a reverse movement of the block P depresses the rod M, and thereby closes the valves. For shifting the block P a link *p'*, is connected thereto, this link, in turn, being connected to the upper, and longer arm of an upright lever *o*. The lever O is fulcrumed at *o* to an attachment o^2 of the saddle or cross bar *o'*, the latter being rigidly secured to the connecting rods K, K. It will thus be seen that the desired motions are imparted to the cylinder, valves and attachments, including the lever O whenever the eccentric rods K are reciprocated. The rear end of the feeler H is pivotally connected at h^2 to the lever O, by which attachment said lever is actuated by the movements of the feeler H, independently of the connecting rods K, and hence, the opening of valves *j*, *l*, and the consequent elevation of the piston and wedge F, are controlled by the movements of said feeler.

The supply pipes for the valves *j* and *l* should be either jointed, or of the flexible variety, so that they will not interfere with the bodily movements of these valves. The valve *j* may be designated as the low pressure valve, because its water supply has little pressure, but enough to cause it to flow freely through said valve, hence this water supply might come from a tank, having a moderate elevation. The gravity of the piston I', and wedge F, and attachments, will usually depress said wedge, but to make certain, a low pressure above the piston I', is provided as hereinbefore described. The valve *l*, may be termed the high pressure valve, because the water supply through this valve must have pressure enough to lift the wedge F, promptly, and at the same time to back out the water above

the piston I′. The water supply for the valve *l* might come, for instance, from a water main, or from an accumulator, or from any source that would give necessary pressure or head. To allow the depression of the piston I′ and wedge F, I provide an eduction-valve R, opening inward. The valve-stem of said valve connects with, or is engaged by, a lever R′ fulcrumed at *r* and connected by a link or links *r*′, with a lever S, fulcrumed at *s*. Both of the levers R′, S, are fulcrumed to attachments of the cylinder framing so that they are carried bodily backward and forward with the movements of said cylinder, the lower end of the lever S engages a stationary, but adjustable, stop T, secured to the frame A or some other suitable fixed point by which engagement the eduction valve R, is opened, to allow the piston I′ and wedge F, to descend. The cylinder I and attachments and everything connected with, or moved by the rods K, K, have always a uniform stroke, forward and backward, and the eduction valve R, by means of the stop T always opens sufficiently to allow the water below the piston I′ to pass out in sufficient quantity to allow the piston to descend to the bottom of the cylinder.

The operation of the machine is as follows: In the normal position of the plunger E, the wedge F, is down to its full extent and said plunger is thereby extended its full length. The eccentrics C′, *c*, *c*, are so set that the feelers G, G, H, act in advance of the plunger E, and as soon as the parts commence their forward stroke the lever S is disengaged from the stop T and the eduction valve R is thereby closed. The valves *j*, *l*, are also at this time in their closed positions, the rod M being down and holding the valves closed by the compression of their opening springs. If, then the feeler H, acting in advance of the plunger E, is backed more or less by engaging a bend in the rail X, seated against the anvils D, said feeler will lift the rod M accordingly, through the instrumentality of the lever O, link *p*′, and lever P′. The valves *j*, *l*, will then open by the release of their springs consequent upon the rise of the bar M and the piston I′, and wedge F, will be elevated by the water entering through valve *j*, under the piston I′, thereby reducing the length of the plunger E more or less according to the rise of the wedge, and the bend in the rail, be the bend more or less. But the valves *j*, *l*, being also bodily elevated by the upward movement of the piston I′, to which their pipes are connected, as hereinbefore described, will force their springs against the bar M, as soon as it ceases to rise, thereby causing said valves to again close. The piston I′, is thereby locked by the water contained in the cylinder, above and below the piston I′, and from thence during its forward stroke, and while doing its work, the plunger E, is rigidly held to the adjustment of its length thus effected through the rise of the wedge F. Upon the return movement of the plunger the lever S strikes the stop *t* opening the eduction valve R allowing the water below the piston I′ to pass out and the piston to descend, returning the wedge to its normal position. If it is not desirable to straighten any considerable bend in a rail, by means of one stroke of the plunger, two or more impacts of the plunger may be had, more or less in number, according as the bend is more or less. Now, referring to the functions of feeler H, if, in the first instance, said feeler is moved against a large kink, it will be forced back thereby, and will lift the rod M as above explained, and elevate the wedge to such a height as to shorten the plunger in proportion to the depth of the curvature. When the feeler next engages the rail on a new stroke, the bend, having been reduced somewhat by the first stroke of the plunger, the feeler is not backed so far, by reason of which the wedge is not lifted so high as by the previous stroke, and consequently such lower position of the wedge presents a greater length of plunger. These operations are continued until the bend is reduced, whereupon the central feeler is no longer forced backward and the wedge remains stationary, so that in this condition or relation of parts, any succeeding blows that might be given would do no harm; and the rail, without stopping the machine, can then be removed endwise on rollers Q Q until another bend is brought in position between the anvils. With each stroke, the extent of movement of the plunger must be such that the rail will not fully recoil to the shape it had before receiving such stroke. For reducing the reverse bends, the rail may be turned end for end, and again passed through the machine, or if the machine were so constructed that the faces of the anvils and feeler H were reversible on their axis, the rail might be turned bottom upward. But where rails are manufactured, there is likely to be work enough to warrant a second machine for treating the reverse bends. The water discharged from the eduction valve R, may be returned to the tank, by means of a suitable pipe above the piston, and thus a saving of water, if desired, would be effected.

Having described my invention, I claim—

1. In a machine for straightening metal bars, a plunger formed in two parts, a wedge between the two parts of the plunger, a bend contact, and intermediate mechanism between said contact and the wedge, whereby the position of the wedge between the plunger sections is varied.

2. In a machine for straightening metal bars, the combination with an extensible plunger and mechanism to change the length of said plunger, of bend contact mechanism adapted to gage the extent of the bend, and connection between the bend contact mechanism and mechanism for changing the length of the plunger, whereby when the contact device strikes the bend in the bar the last mentioned mechanism is thrown into action and

the extent of its operation is governed by the gage of the bend.

3. In a machine for straightening metal bars, the combination with an extensible reciprocating plunger and mechanism to change the length of said plunger, of a reciprocating bend contact device secured so as to have a longitudinal movement independent of said plunger, and connection between said bend contact device and mechanism to change the length of said plunger, whereby when the contact device strikes the bend in the bar the last mentioned mechanism is thrown into action and the extent of its operation is governed by the gage of the bend.

4. In a machine for straightening metal bars, the combination with an extensible plunger, and mechanism to change the length of said plunger, of a bend contact device adapted to be moved against and away from the bar to be straightened and gage the extent of the bend, and connection between the contact device and mechanism to change the length of the plunger, whereby when the contact device strikes a bend in the bar said mechanism is thrown into action, and its extent of operation governed by the gage of the bend.

5. In a machine for straightening metal bars, the combination with an extensible plunger and mechanism to change the length of said plunger, of a central and side contact devices, the side feelers being adapted to be brought out of alignment with the central contact when a bend in the bar is struck by said contact, and connection between the central contact device and mechanism to change the length of the plunger whereby the extent of the operation of the last mentioned mechanism is governed by the extent the central contact is out of alignment with the side contacts.

6. In a machine for straightening metal bars, the combination with an extensible plunger, and mechanism to change the length of said plunger, of a central and side contact devices adapted to be moved against and away from the bar to be straightened, the two side feelers being adapted to be brought out of alignment with the central contact when a bend in the bar is struck by said contact, and connection between the central contact device and mechanism to change the length of the plunger, whereby the extent of the operation of the last mentioned mechanism is governed by the extent, the central contact is out of alignment with the side contacts.

7. In a machine for straightening metal bars, the combination with an extensible reciprocating plunger, and mechanism to change the length of said plunger, of bend contact mechanism adapted to gage the extent of the bend, and connection between the bend contact mechanism and mechanism for changing the length of the plunger, whereby the extent of operation of the last mentioned mechanism is governed by the extent of movement of the bend contact mechanism, and mechanism adapted in the return movement of the plunger to return the plunger to its normal length.

8. In a machine for straightening metal bars, the combination with an extensible reciprocating plunger and mechanism to change the length of said plunger, of a reciprocating bend contact device secured so as to have a longitudinal movement independent of said plunger, and connection between said bend contact device and mechanism to change the length of said plunger whereby the extent of operation of the last mentioned mechanism is governed by the extent of the independent movement of the bend contact device, and mechanism adapted in the return movement of the plunger to return the plunger to its normal length.

9. In a machine for straightening metal bars, a central and side feelers, an extensible plunger, an automatic mechanism, governed by the central feeler, to set the plunger at a striking distance, proportional to the depth of the bend to be straightened, and a main driving mechanism.

10. In a machine for straightening metal bars, as herein set forth, an extensible plunger, in combination with an automatic wedging mechanism, adjusted by contact with the bend to be straightened, whereby the plunger is first shortened in proportion to the depth of the bend and is then gradually elongated in proportion as the bend is diminished.

11. In a machine for straightening metal bars, as herein set forth, an extensible plunger, a feeler operating in advance of the plunger and an intermediate plunger wedging mechanism, which automatically reduces the length of the plunger before it advances, in proportion to the depth of the bend to be straightened.

12. In a machine for straightening metal bars, the combination with an extensible plunger and a wedge for adjusting the length of the plunger, of an automatic mechanism, adjusted by contact with the bend to be straightened, to operate the wedge.

13. In a machine for straightening metal bars, a feeler, an extensible plunger and mechanism for operating the feeler and plunger, in combination with a hydraulic mechanism connected with the wedge and feeler, whereby contact of the feeler with the bend to be straightened governs the hydraulic mechanism, causes the wedge to be adjusted and sets the plunger at a striking distance in proportion to the depth of the bend.

14. In a machine for straightening metal bars, the combination with an extensible plunger and operating mechanism, of a hydraulic wedge mechanism, acted upon by contact with the bend to be straightened, to set the plunger at a striking distance in proportion to the depth of the bend.

15. In a machine for straightening metal bars, the combination with an extensible plun-

ger, a feeler and mechanism for operating the plunger and feeler, of a wedge and hydraulic mechanism, intermediate to the wedge and feeler, and connected therewith, whereby contact of the feeler with the bend to be straightened acts on the hydraulic mechanism, to cause the plunger to be set by the wedge at a striking distance, in proportion to the depth of the bend.

16. In a machine for straightening metal bars, the combination with an extensible plunger, of a hydraulic wedge mechanism, and a feeler, which acts, by contact with the bend to be straightened to cause the wedge mechanism to set the plunger at a gaged striking distance, said wedge having a movable connection with the hydraulic mechanism, permitting of lateral play of the wedge.

17. In a machine for straightening metal bars, the combination with an extensible plunger and feeler, and mechanism for operating the plunger and feeler, of an automatic hydraulic wedge mechanism, which, by contact of the feeler with the bend to be straightened, sets the plunger at a striking distance proportionate to the depth of the bend and becomes automatically locked by water filling the cylinder on both sides of the piston head.

18. In a machine for straightening metal bars, an extensible sectional plunger, a feeler, a wedge located between sections of the plunger, and an automatic hydraulic mechanism, connected with the feeler and the wedge, and acted upon by the contact of the feeler with the bend to be straightened, to set the plunger at a gaged striking distance and to be automatically locked, so as to hold the wedge rigidly in its adjusted position, in combination with a main driving mechanism.

19. In a machine for straightening metal bars, the combination with a central feeler, of side feelers provided with stiff spring joints and a main driving mechanism.

20. In a machine for straightening metal bars, the combination of a central feeler or bend contact with side feelers connected together so as to have a vibratory movement.

21. In a machine for straightening metal bars, the combination with a central feeler, of side feelers, connected with their driving shafts by means of stiff springs, and a main driving mechanism, the spring joints of the side feelers serving to maintain them in a normally straight line with the central feeler.

22. In a machine for straightening metal bars, the combination with an extensible plunger, and a wedge for adjusting the length of the plunger, of an automatic mechanism, adjusted by contact with the bend to be straightened, to operate the wedge and lock it in adjusted position.

ARTHUR J. MOXHAM.

Witnesses:
WM. A. DONALDSON,
A. J. BRYAN.