(No Model.)

2 Sheets—Sheet 1.

# W. J. MUNCASTER.

## METAL BENDING AND STRAIGHTENING MACHINE.

No. 319,603. Patented June 9, 1885.

Fig. 1.

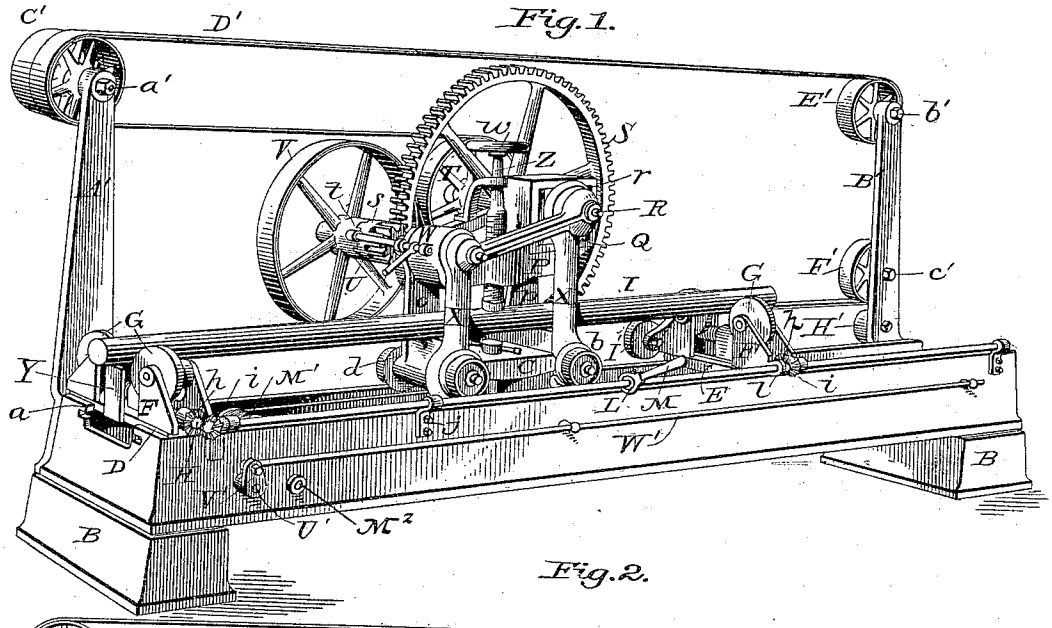


Fig. 2.

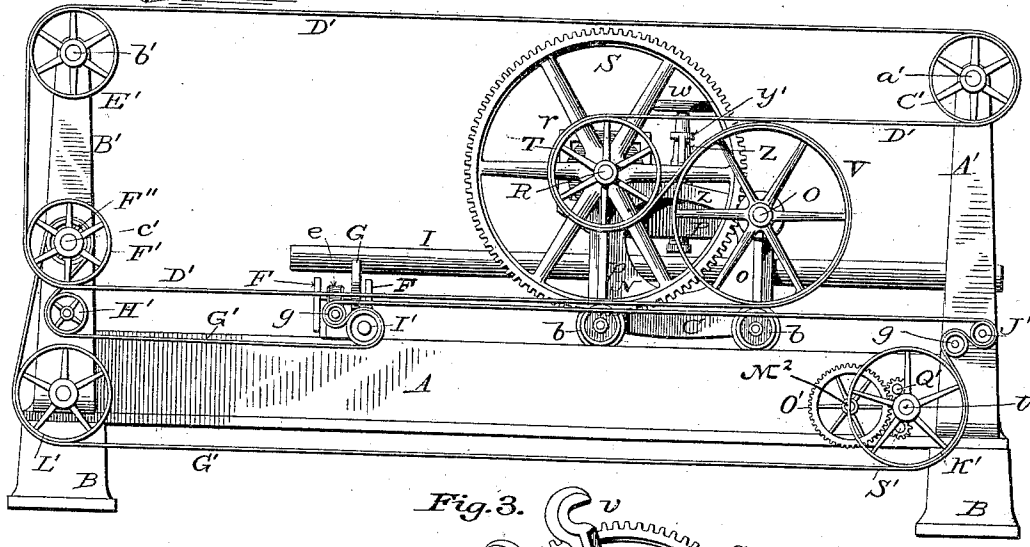
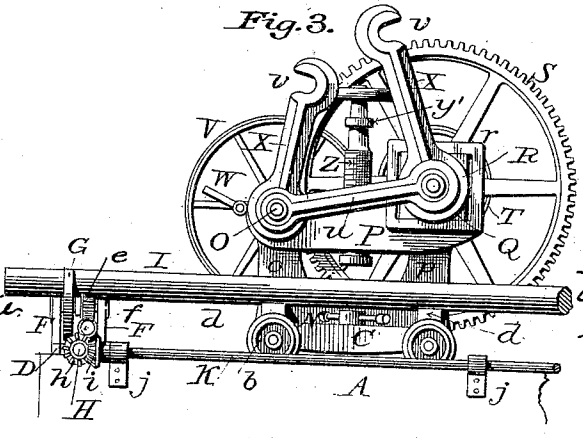


Fig. 3.



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Inventor:
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by Dodger Son,
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N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

# W. J. MUNCASTER.

## METAL BENDING AND STRAIGHTENING MACHINE.

No. 319,603. Patented June 9, 1885.

Fig. 4.

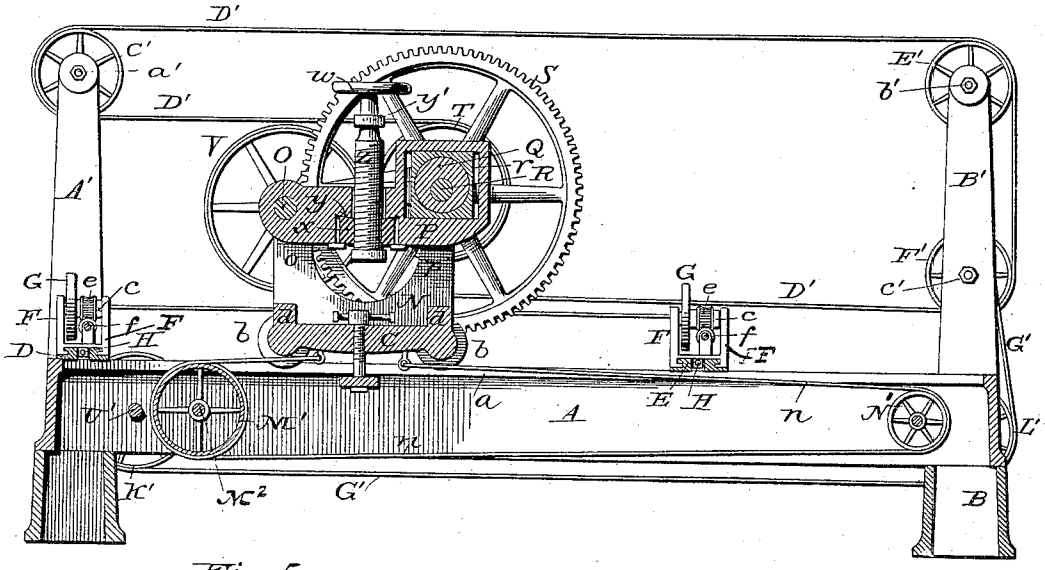



Fig. 5.

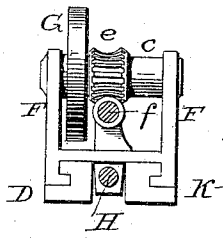



Fig. 6.

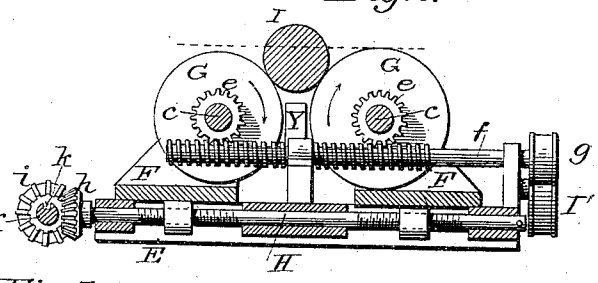



Fig. 7

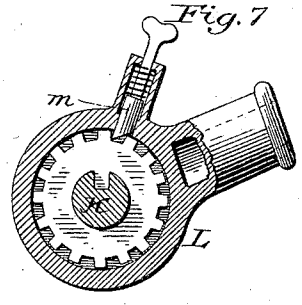
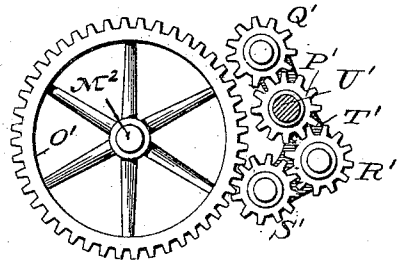



Fig. 8.




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# UNITED STATES PATENT OFFICE.

WALTER J. MUNCASTER, OF CUMBERLAND, MARYLAND, ASSIGNOR OF ONE-HALF TO MERWIN McKAIG, OF SAME PLACE.

## METAL BENDING AND STRAIGHTENING MACHINE.

SPECIFICATION forming part of Letters Patent No. 319,603, dated June 9, 1885.

Application filed March 14, 1885. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER J. MUNCASTER, of Cumberland, in the county of Allegheny and State of Maryland, have invented certain new and useful Improvements in Metal Bending and Straightening Machines, of which the following is a specification.

My invention relates to apparatus or machinery for straightening shafting; and it consists, primarily, in a traveling press adapted to sustain the shaft and to exert the required pressure or force thereon, the press being adapted to travel lengthwise of the shaft and thus to act upon every portion thereof.

The invention further consists in various features and details which will be hereinafter fully set forth.

In the drawings hereto annexed, Figure 1 is a perspective view of the machine from the front; Fig. 2, a similar view thereof from the rear; Fig. 3, a view of the press and a section of the bed or frame, showing the manner of inserting and removing a shaft; Fig. 4, a vertical central longitudinal section of the press and the supporting bed or frame; and Figs. 5, 6, 7, and 8, views illustrating various details.

Prior to my invention machines of this class have been constructed either with a traveling carriage supporting the shaft to be straightened, and adapted to carry the same through or under the press, or rolls which operate upon the shaft, or with a stationary support and a traveling press adapted to move along the shaft and act upon different parts thereof successively.

The present invention relates to machines of the latter class, the traveling press in the present case being so constructed as to support the shaft each side of the point at which pressure is being applied, wholly independent of the bed or frame upon which the press is mounted and travels. By this construction I am enabled to build the machine with a very light bed, and otherwise to cheapen and simplify the construction.

A indicates the bed or frame of the machine, which for ordinary lengths may be cast in one piece, as shown, and which is supported upon feet or base-blocks B. The top and bottom of the frame A are open, the sides being formed with inwardly-turned flanges or ribs *a*, which form supporting and guiding rails for the wheels *b* of the traveling press C.

D indicates a stationary plate, and E a sliding plate, each resting upon the bed or frame A, the former fixed thereon at or near one end and the other being movable from end to end.

Upon each of the plates D E are mounted two sliding heads or frames, F, movable lengthwise of the plates or transversely to the length of main frame A, and these heads or frames are each furnished with a wheel or roller, G, turning loosely upon an axle, *c*, in a plane parallel with the line of movement of the head or frame in which it is mounted. The heads or frames F are formed with horizontal flanges which enter grooves in the edges or sides of the plate that guide the frames in their movements and to hold them to their seat.

H H indicate screws, one journaled in each of the plates D E, and each formed with a right and left thread. These screws pass through correspondingly-threaded openings in nuts or lugs beneath the heads or frames F, the right-threaded portion through the opening of one head or frame and left-threaded portion through the opening of its companion, so that in turning the screw in one or the other direction the heads or frames may be made to approach or to recede from each other.

The movable plate E, with its heads or frames F, is set at such point upon the frame A as will bring its wheels or rollers G beneath one end of the shaft I to be straightened when the other end is placed upon the rollers G of the heads or frames of fixed plate D. When the wheels or rollers G are brought close together, they serve to raise the shaft I, and when separated they permit it to descend until it rests upon supports *d*, formed upon the lower part of the traveling press C, thus relieving the wheels of any strain that might otherwise be occasioned by the action of the press, and preventing the shaft from being rotated by the wheels, which rotate constantly while the machine is in action. To effect this

motion or rotation of the wheels G they are each formed with a projecting worm-wheel or hub, *e*, to mesh with a worm, *f*, journaled in a support rising from the plate D or E at a point between the two heads or frames F and in a second support at or near the outer end of the frame, as shown in Fig. 6. This arrangement permits the wheels to be rotated by turning the worm, and offers no obstacle to the movement of the frames F to and from each other, the worm-wheels in such case working in the same manner as a pinion works in a rack-bar.

The purposes of the wheel G are to support and rotate the shaft in order that the high places, bends, &c., may be readily indicated, then to lower the shaft to the supports provided for it in the press, where it rests free from the action of the wheel G, and again to raise the shaft clear of said supports and rotate it to bring into proper position the next place needing the action of the press, the press being meanwhile moved to the required point in the length of the shaft.

To cause the rotation of the shaft it is of course necessary that the two wheels of each pair shall rotate in the same direction, which will cause their opposing faces to move past each other in opposite directions. If, now, the wheels travel with like surface-speed, and they be brought together to raise the shaft, the downwardly-moving surface having the weight of the shaft coacting with it will tend to force the shaft down between the wheels, thus causing it to prevent the proper approach of the wheels and the elevation of the shaft. To prevent such cramping or binding action, I make the wheel which travels upward against the shaft of larger diameter than its companion, so that it shall rotate more rapidly, though driven by the same worm. This same result may be attained by forming the worm with two sections of different diameter or pitch, and making the worm-wheels to correspond therewith; but the arrangement shown is deemed best.

The worm shaft or spindle is furnished with a belt-pulley, *g*, through which motion is imparted to it, as more fully explained further on.

It is of course desirable to raise and lower the shaft uniformly and simultaneously at both ends, and hence the screws H H are geared together to rotate in unison, thus permitting both to be controlled by a single operation and from the same point. This gearing is shown in Figs. 1 and 6, in which each screw is shown provided with a bevel-pinion, *h*, meshing with a similar pinion, *i*, mounted upon a shaft or rod, K, journaled in brackets, *j*, on the front of frame A, along which it extends from end to end. The pinion *i* at one end of the shaft or rod K is fixed, and meshes with the pinion of the screw H of the fixed plate D, but the second pinion *i* is arranged to slide lengthwise of the rod, which is longitudinally grooved. This pinion is provided with a feather or spline, *k*, which prevents rotation independently of the shaft or rod, and the sleeve of the pinion is held between two arms, *l*, projecting from the movable plate E, as shown in Fig. 1, so that it always moves with said plate and remains in mesh with the pinion *h* of screw H thereof.

To place the machine under control of a single attendant it is important that means be provided whereby the shaft or rod K may be rotated by the attendant while standing directly in front of the press, whatever the position of the press upon the frame A may be. I therefore provide the said shaft or rod with a sliding ratchet-wheel, L, provided with a spline or feather to enter the groove in the shaft, and having square teeth with upright front and rear faces, and I combine with said ratchet a hand-lever, M, carrying a reversible pawl, *m*, which may be set to rotate the ratchet-wheel in one or the other direction, as required.

The construction of the reversible pawl-and-ratchet mechanism is not in itself new, and may be varied as desired, the novelty consisting in arranging the ratchet to slide along the shaft, and in combining these parts with the traveling press.

With the parts thus constructed the attendant merely slides the ratchet-wheel along the rod as he follows the press, and when at the desired point sets and operates the pawl as required to lower the shaft to the support *d* of the press, reversing the pawl and turning the ratchet in the opposite direction when necessary again to raise the shaft.

Referring now to Fig. 4, the construction of the press C will be explained. As shown in said figure, the press is made with a frame, N, of cast-iron, of strong and solid construction, mounted upon wheels or trucks *b*, which travel upon the guiding and supporting ribs *a* of the frame A. At the rear side of the frame A uprights or standards *o p* rise, and from the standards, rests or supports *d* extend forward to the front of the frame at or near each end thereof. These supports, upon which the shaft rests while being acted upon by the press, are slightly hollowed at the middle to cause the shaft to retain its position, and they are of such height as to hold the shaft in proper relation to the wheels G, already described.

From the upright or standard *o*, a fixed shaft or spindle, O, projects forward and rearward, and upon the forwardly-projecting portion is hung a vertically-moving beam or lever, P, the opposite end of which is formed with an enlarged head containing a rectangular opening, *r*. Within the opening *r* is placed an eccentric, Q, secured upon a shaft, R, journaled in the upright or standard *p*, and furnished with a large gear-wheel, S, and with band-wheel T, the former fast and the latter loose upon shaft R. From this construction it fol-

lows that a rotation of gear-wheel S and shaft R will cause a rotation of eccentric Q, and a consequent rise and fall of beam or lever P.

Motion is given to gear-wheel S through a pinion, U, loose upon the rear projection of axle or spindle O, said pinion being provided with a clutch-collar or hub, *s*, to engage with a similar hub, *t*, formed upon a band-wheel, V, which is also loose upon the spindle O. A shifting-rod, W, mounted in guides on the end of beam P, and having its end forked to straddle the neck of the clutch-collar *s*, serves to throw the pinion U into or out of connection with wheel V, so that the band-wheel may rotate continuously without necessarily operating the press.

The forward ends of the spindle O and of the shaft R are connected and prevented from spreading apart by means of a link or bar, *u*, and similar links or bars, X, each having its lower end fashioned into a hook, *v*, to lock around the axles of the truck-wheels, serve to support the spindle and shaft and to prevent them from being forced upward by the action of the press. By being thus hung upon the spindle and shaft O and R, the links or bars may be swung up out of the way to permit the shaft I to be passed laterally into or out of the press C, as will be readily understood upon reference to Fig. 3.

Z indicates a heavy screw passing through the beam P, the lower end of which screw is dressed true and smooth to act upon the shaft, and the upper end of which is furnished with a hand-wheel, *w*, by which it may be set up or down, as required for larger or smaller shafting. The screw passes through a heavy nut, *x*, the upper surface of which is dished or made concave to fit a corresponding bearing-face, *y*, in the beam, the nut being held in its seat by clips or tongues extending beneath it, and secured to the beam, or in any other convenient manner. This arrangement of the nut is necessary, in order to permit the screw to preserve always a vertical position, which of course it could not do without such provision, since it is carried by the beam P, pivoted at one end and moving through the arc of a circle.

The upper end of the screw-stem Z passes through a guide arm or bracket, *y'*, bolted to the rear brace, *z*, of the press-frame N, and is thereby caused to rise and fall in a vertical position.

The manner in which motion is given to the various parts will be readily understood upon referring to Figs. 1 to 4, inclusive.

At opposite ends of the frame A are uprights or standards A' B', each bearing at its upper end a fixed axle or spindle, *a' b'*. The axle *a'* carries a double belt-pulley, C', to which motion is given by belt from the engine or prime motor and from which a second belt, D', passes to and around a pulley, E', turning loosely upon the axle *b'*, thence downward to and around a band-pulley, F', turning upon a fixed axle, *c'*, projecting from the side of upright B', thence to the under side of band-wheel V, around said wheel and downward between it and band-wheel T, thence around the latter and from the upper side thereof back to double-pulley C'. The belt D' is guided and supported by the wheels C', E', F', V, and T, and gives motion to the wheel V and its clutch-collar *t*, which, engaging with the clutch-collar *s* of pinion U, gives motion thereto and through it to gear-wheel S, eccentric Q, and beam P, causing the latter to rise and fall regularly and to press its screw with great force against the shaft placed in its path.

Whenever it is desired to throw the press out of action, the shifting-rod W is moved to unclutch wheel V and pinion U, and by observing when the screw is at its highest point and unclutching the parts at that moment, the screw-stem will be left at such height as not to interfere with the travel of the press, and hence it will not be necessary to run the screw back for this purpose. This feature is important, because it enables the press to be kept in use without the slightest variation of adjustment, and thus insure perfect accuracy in its work.

The band-pulley F' is double or is formed with a smaller pulley, F'', upon the same hub, as shown in Fig. 2.

G' indicates a belt which passes around the pulley F'', thence downward and about an idler-pulley, H', thence lengthwise of the frame A to and around an idler-pulley, I', thence around the pulley *g* of worm *f* of the sliding-roll carriage, thence to the further end of frame A, around an idler-pulley, J', over and around pulley *g* of the stationary-roll carriage, around a belt-pulley, K', beneath the same, thence to the opposite end of frame A to and around an idler-pulley, L', and back to pulley F''. This arrangement gives motion to both worms *f* so long as pulley F' F'' rotates, and it permits the sliding block E with its roller-frames and rollers to be moved lengthwise of frame A at will without interfering with the operation of any part of the machine.

To effect the travel of the press C along the frame A, I provide at one end of said frame a drum, M', upon which is wound a sufficient length of wire rope or other flexible band or chain, *n*, to give or permit the full travel of the press to which the rope is firmly attached, and at the other end of the frame I place a sheave or pulley, N', about which the rope or band passes and from which it is carried back to the drum M', both ends of the rope or band being firmly attached to the drum. If, now, the drum be rotated, the rope or band will wind on at one side and pay off at the opposite side, and the press will travel along the bed at a like rate.

To give motion to the drum when required its axle or shaft $M^2$ is furnished with a gear-wheel, O', at the rear side of frame A, to which motion is imparted through intermediate gearing from a pinion, P', formed upon or secured to band-pulley K', which pulley rotates con-

stantly, as above explained. The intermediate gearing mentioned is shown in Fig. 8, and consists of a single pinion, Q′, at one side of and meshing with pinion P′, and two pinions, R′ S′, at the opposite side of pinion P′, pinion R′ meshing with pinions P′ and S′.

The three pinions are carried by studs or axles projecting from a rocking plate, T′, secured upon a rock-shaft, U′, passing through the frame A, and the end of which forms the axle for pinion P′ and band-wheel K′. The rock-shaft carries at its opposite end a radial arm, V′, to which is attached a rod, W′, running lengthwise of frame A, by which the shaft U′ and its plate T′ may be rocked, and caused to place either the pinion Q′ or the pinion S′ into mesh with gear-wheel O′, thereby causing said gear-wheel and the drum M′, with which it is connected, to rotate in one or the other direction, as will be readily understood.

When rotation is not deemed important, inclined blocks may be substituted for the rollers G, and the shaft or bar will be raised and lowered in substantially the same manner as by the rollers. The inclined blocks would thus be the partial but not the full equivalents of the rollers.

Levers or belts may be employed to connect the carriages F to produce a simultaneous and equal movement to and from each other, and therefore while I prefer the right-and-left hand screws I do not mean to restrict myself thereto, but consider these other devices as the mere equivalents of the screws, but inferior in operation.

Plates Y, carried by the blocks D E, prevent the shaft from falling too low between the rollers G.

The machine thus arranged operates as follows: The sliding block E with its roller-carriages is moved along the bed or base to a distance from the fixed block somewhat less than the length of the shaft or bar to be straightened. The arms X X are then swung upward to permit the shaft to be passed laterally into the press and laid upon the rollers G of the two carriages. This done the arms X X are again swung down and hooked over the axles, ratchet-lever M is moved up and down, and the rollers G of each pair caused to advance and raise the shaft clear of the supports *d* of the press C. The rollers G being continuously rotated through the worm-gear *e f*, pulleys *g*, and belt G′ cause the shaft to rotate as it lies upon them, and the high portions are chalked. The rod W′ is then moved to throw the drum M′ into gear, and cause its rotation in whichever direction required to move the carriage-press C to the required point, and when there the rod W′ is again moved to throw the drum out of connection with the gearing which rotates it, and the press is clamped in position, if deemed necessary. The ratchet-lever M is then worked to throw the rollers G apart, the pawl *m* being first reversed, and as the rolls separate the shaft is let down and caused to rest upon the supports *d* of the carriage. Shifting-rod W is then moved to put the press in gear, and motion is then given to the press by belt D′, the screw-stem Z being set up or down, as required for the special work to be done. After one place is thus acted upon the shaft is raised, the press moved to the next point, and the several operations repeated until the work is completed.

I am aware that it is not broadly new to provide a straightening-machine with a traveling press having supports for the bar or shaft to be straightened, wholly independent of the base or bed on which the press is mounted, and I disclaim this idea, broadly considered. I am not aware, however, that such supports have ever been made open at the top, so that the shaft or bar might be inserted or removed laterally, and I confine my claim to such supports. The distinction is important, for the reason that, if annular supports be used as heretofore, the shaft or bar must be inserted lengthwise, and to do this necessitates a space equal or nearly equal to the length of the entire machine and the length of the shaft or bar in addition, whereas my construction avoids such necessity and greatly facilitates such insertion and removal.

Having thus described my invention, what I claim is—

1. In a machine for straightening metal, the combination of a frame and a traveling press provided with rests or supports for the metal to be straightened, wholly independent of the bed or frame of the machine upon which the press is supported, and open at the upper side to permit the shaft or bar to be placed upon or removed from the rests laterally.

2. In a machine for bending and straightening metal, the combination of a main frame, supporting devices mounted upon said frame and serving to sustain the shaft or metal to be acted upon during adjustments of the press, and a traveling press mounted upon the frame and provided with supports for the shaft or metal to be acted upon independent of the main frame, said supports extending across the lower side only of the shaft or bar to be operated upon.

3. The combination of a frame or bed, a traveling press mounted thereon and provided with supports wholly independent of the frame to sustain the shaft or bar to be operated upon, and devices, substantially such as shown, adapted to raise and sustain the shaft or bar while the press is being moved upon the frame, and to lower the same to the supports on the press when the press is brought to the required point for operation.

4. In combination with a supporting-bed and a traveling press mounted thereon and provided with rigid supports for the bar or shaft to be acted upon, carriages mounted upon the frame and movable transversely thereon to and from each other, each presenting an inclined surface to the shaft or bar, substantially as shown and described, where-

by said shaft or bar may be raised from or lowered to the supports on the press by causing the carriages to approach or to recede from each other.

5. In combination with a supporting frame and with a traveling carriage mounted thereon and provided with fixed supports to sustain a bar or shaft to be acted upon, carriages mounted upon the frame and adjustable transversely thereof, each carriage presenting an inclined surface to the shaft or bar between them, and right-and-left screws connecting the carriages in pairs and serving to move them to or from each other simultaneously.

6. In a machine for bending or straightening metal and shafting, the combination of a frame, a press movable thereon and provided with rigid supports for the metal or shaft to be acted upon, and mechanism for raising and lowering the metal or shaft, consisting of transversely-movable carriages F, provided with wheels or rollers G, and connected in pairs by right-and-left screws.

7. In a machine for straightening shafting, the combination, with a frame and press, of mechanism for rotating and raising the shafting to be acted upon, consisting of sliding carriages F, provided with wheels G at opposite sides of and below the shaft, said wheels geared to rotate in the same direction transversely to the shaft, the upper face of one wheel being raised above that of the other wheel, and means, substantially such as described and shown, for moving the wheel-carriages together or apart.

8. The combination, substantially as set forth, of frame A, a press mounted thereon, wheels G, arranged in pairs journaled in bearings upon the frame and provided each with a worm-wheel, *e*, and worms *f*, connecting and serving to give motion to the worm-wheels of each pair, substantially as set forth and shown.

9. In combination with a frame and with a press mounted thereon, transversely-movable carriages F, arranged in pairs, right-and-left screws connecting the carriages of each pair, rollers G, journaled in the carriages and provided each with a worm-wheel, *e*, and worms *f*, connecting the worm-wheels of each pair, substantially as and for the purpose set forth.

10. In combination with frame A and press C, carriages F, arranged in pairs and connected by right-and-left screws H, connecting the carriages of each pair, wheels G, journaled in said carriages and each provided with a worm wheel or hub, *e*, and rotary worms *f*, connecting the worm-wheels and serving to rotate the wheels G in the same direction, whereby one roll of each pair is caused to move upward and the other downward at the point where they support the shaft to be acted upon, the upwardly-moving roller being of larger diameter than the other, substantially as and for the purpose set forth.

11. The combination, substantially as described and shown, of frame A, transversely-movable carriages F, rollers G, journaled in said carriages, right-and-left screws H, connecting the carriages in pairs, grooved shaft K, and pinions *h i*, connecting the screws and the shaft, whereby all the carriages may be operated simultaneously and equally.

12. In combination with frame A, transversely-movable carriage F, screw H, grooved shaft K, and gearing *h i*, connecting the screws and shaft, reversible ratchet-lever M, movable along the shaft, whereby the carriage may be controlled from any point in the length of the frame.

13. In combination with frame A, press C, and means for supporting a shaft or bar in the press, fixed block D, provided with transversely-adjustable carriages F, and movable block E, carrying transversely-adjustable carriages F.

14. In combination with a supporting bed or frame, a traveling press, C, consisting of frame N, having uprights *o p*, supports *d*, spindle O, provided with pinion U and band-wheel V, beam P, having opening *r*, and shaft R, provided with eccentric Q, gear-wheel S, and loose band-wheel T.

15. In combination with a supporting bed or frame, a press, C, mounted thereon and having a frame consisting of casting N, uprights *o p*, supports *d*, link or bar *u*, and links or bars X, pivoted to frame N, and having hooked ends to engage with the axles thereof, substantially as described and shown.

16. In combination with a supporting bed or frame, a press mounted thereon and having a frame provided with supports *d*, uprights *o p*, shafts O R, and links X, hung upon said shafts and serving to open and close the front of the frame, as set forth.

17. In combination with frame N, having uprights *o p*, supports *d*, and shafts O R, eccentric Q, beam P, and screw Z.

18. In combination with frame N, shaft O, provided with pinion U, band-wheel V, and clutch *s t*, shaft R, provided with gear-wheel S, loose band-wheel J, and eccentric Q, and beam P, pivoted at one end in the frame N, having its opposite end carried by the eccentric Q, and provided with screw Z, all substantially as described and shown.

19. In combination with frame A and press C, pulleys C′ E′ F′, and belt D′, passing about said pulleys and about the pulleys of the press, substantially as and for the purpose set forth.

20. The combination, with frame A, roller-carriages F, worms *f*, and pulleys *g*, of a driving-belt, G′, passing about said pulleys and about pulleys at the ends of the frame, whereby motion is imparted to the worms and adjustment to the sliding-roll carriage and its worm is permitted.

21. In combination with frame A and traveling press C, fixed block D, and movable block E, each bearing transversely-adjustable carriages F, each containing wheel G, worm *f*, and pulley *g*, pulleys C′ E′ F′ F″, belt D′, pulleys H′ I′ J′ K′ L′, and belt G′, all substantially as described and shown.

22. In combination with frame A, press C, drum M′, sheave N′, and rope or band *n*, gear-wheel O′, shaft U′, rocking plate T′, pinions P′ Q′ R′ S′, and band-wheel K′, substantially as shown.

23. In combination with frame A, press C, drum M′, sheave N′, and rope *n*, gear-wheel O′, rock-shaft U′, plate T′, and pinions P′ Q′ R′ S′, all constructed and arranged to operate substantially as explained.

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