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PIPE AND ROD BENDING MACHINE

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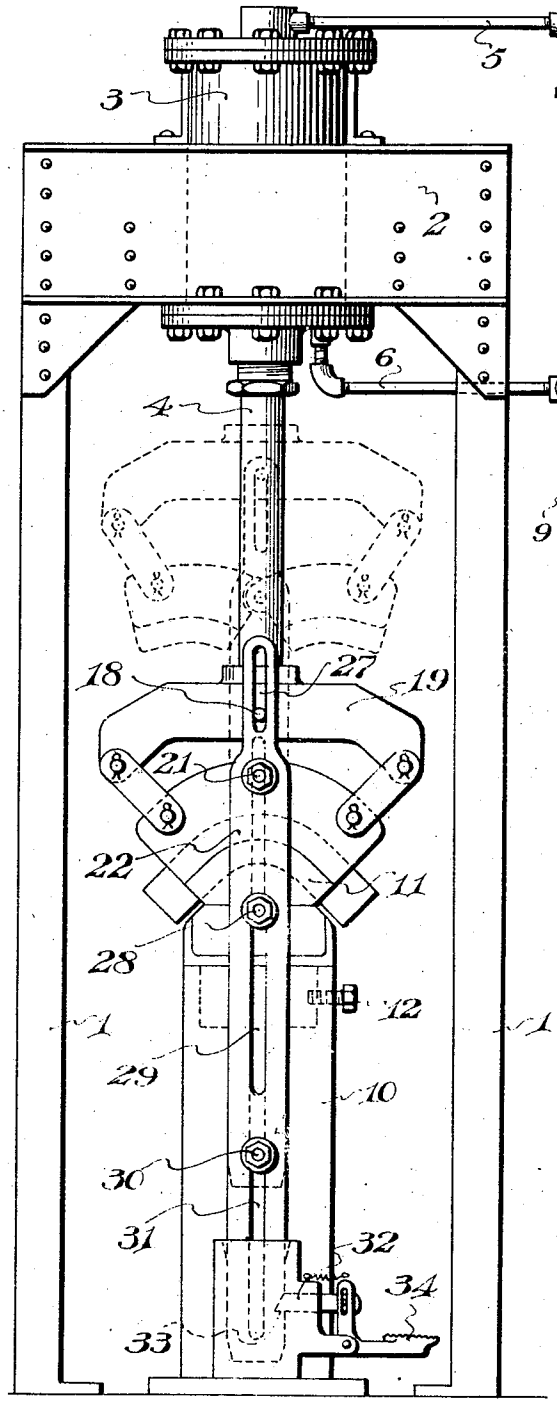



Fig. 1

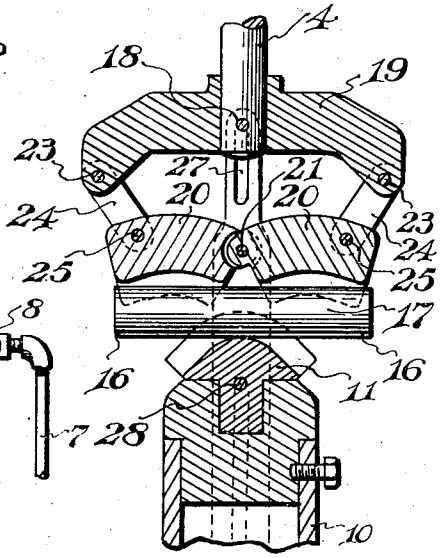



Fig. 2

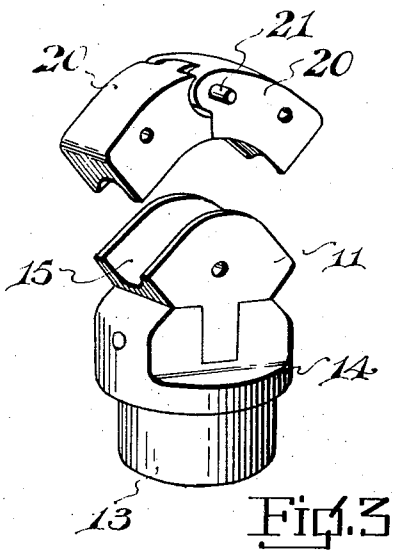



Fig. 3

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## PIPE AND ROD BENDING MACHINE

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3 Claims. (Cl. 153—44)

The invention relates to bending machines, particularly adapted for bending pipe sections into elbows, however the device may be used for various angular bending operations where it is desired to bend a piece of metal to angular form. The present device is particularly adapted for forming tubular elbows to be used as conduit fittings.

A further object is to provide an elbow forming and bending machine comprising a lower die support and hingedly connected segmentally shaped upper die members carried by an upwardly and downwardly movable yoke above the stationary lower die and having link connections to the segmentally shaped die sections and adapted to engage a straight hot nipple across the lower die and bend the same to angular form.

A further object is to provide the link connections between the yoke and outer ends of the segmental upper die section so that a maximum inward pressure will be applied to the ends of the straight nipple as the nipple is bent to angular form.

A further object is to provide lift links at opposite sides of the device, and to pivotally connect the lift links to the segmental dies at their hinging point, and to provide opposite sides of the yoke with limiting pins extending through elongated slots in the lift links, so that when the yoke is raised the outer ends of the segmental die sections will be raised on their hinged connection before the lift links are raised, thereby opening the upper die sections, before the upper die sections are lifted. Also to provide latching means for holding the lift links against upward movement for accomplishing the above result.

A further object is to provide the yoke with a reciprocating piston rod and means cooperating with the rod for reciprocating the same.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawing, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawing:

Figure 1 is a view in elevation of the machine.

Figure 2 is a transverse sectional view through a portion of the machine, showing the upper dies in position to start the bending operation.

Figure 3 is a detail perspective view of the lower die and the upper dies.

Referring to the drawing, the numeral 1 designates the uprights of the frame, and the uprights are connected together at their upper ends by means of the cross beams 2. Mounted between the cross beams 2 is a conventional form of hydraulic cylinder 3, and by means of the usual piston therein, the piston rod 4 is reciprocated upwardly and downwardly through pressure supplied either to the upper end of the cylinder 3 through pipe 5 or to the lower end of the cylinder through pipe 6. The pressure is supplied through pipe lines 7 and is controlled by a four-way valve 8 which may be positioned for supplying pressure above or below a piston in the cylinder. The exhaust, during these operations, is through the exhaust line 9.

Disposed within the frame is a lower die stand 10 in which the lower stationary die 11 is supported for a set screw 12, which screw cooperates with the reduced cylindrical portion 13 of the lower die holder 14. The lower die 11 is provided with an angularly shaped channel 15, into which channel the ends 16 of the hot pipe nipple 17 is forced by mechanism hereinafter set forth for forming the nipple into an elbow as shown in Figure 1. The starting of the operation is shown in Figure 2.

Secured on the lower end of the piston rod 4 by means of a transverse pin 18 is a die carrying yoke 19. The upper bending die is formed from segmentally shaped die sections 20, hingedly connected on a die hinge pin 21. The hinge pin 21 also extends through the lift links 22 on opposite sides of the stand, and this hinging point is moved upwardly and downwardly by said lift links. Hingedly connected at 23 to the other ends of the yoke 19 are downwardly and inwardly inclined links 24, which links are in turn hingedly connected at 25 to the outer ends of the upper die sections 20, and are adapted to hinge the outer ends of the die sections 20 downwardly and inwardly against the ends 16 of the hot nipple 17 and into the lower die groove 15 for forming the nipple into an L. During this operation the parts move from the position shown in Figure 2 to the position shown in Figure 1. It has been found with the links 24 inclining downwardly and inwardly that a maximum pressure is obtained on the die sections 20. As the die sections 20 are moved downwardly the yoke pin 18 moves downwardly therewith in the slots 27 of the lift links 22, and at the same time the die hinge pin 21 forces the lift links 22 downwardly until the lower die pan 28, which is stationary, is in the upper ends of the lift link slots 29. Said links are also guided by the headed members 30 in the slots 31.

When the links 22 reach their lower position at the ends of the bending operation, a spring actuated latching pin 32 is received in the notch 33 thereof.

After the bending operation the operator reverses the piston direction in the cylinder 3, thereby raising the yoke 19, and at the same time the operator releases the latching pin 32 by placing his foot on the pedal 34. When the yoke 19 moves upwardly the yoke pin 18 will move upwardly in the slots 27, however during this movement the lift links 22 are held against movement, consequently the yoke 19, acting through the medium of the links 24, will raise the outer ends of the upper die members 20 with the hinging point 21 remaining stationary. When the ends of the yoke pin 18 engage the upper ends of the slots 27, the lift links are again raised to the position shown in Figure 2, and the members 28 and 30 are in the lower portions of the slots 29 and 31. This reversal action is controlled by manipulating the pressure and exhaust control valve 8.

From the above it will be seen that an elbow bending machine is provided, which is simple in construction and one wherein the bending power is obtained through the medium of hingedly connected die sections, which are first brought into engagement with the upper side of the nipple in an open horizontal position, and thence forced downwardly and inwardly at their outer ends by a downwardly and inwardly applied pressure for obtaining the maximum bending power.

Although the device has been described for forming elbows from tubular nipples, it is to be understood that various other metallic items may be bent, to various shapes.

The invention having been set forth what is claimed as new and useful is:

1. The combination in a metal bending machine of a lower die support, a die on said lower die support, an upper die carrying yoke, means for moving said yoke towards and away from the lower die support, an upper die formed from hingedly connected sections, the inner ends of which upper die member are hinged together, link connections between the outer ends of the upper die sections and the yoke, means for holding the upper die sections in bending relation to the lower die, said means comprising a bar to the side of the support, said bar being pivotally connected to the upper die sections on their hinged connections, a slidable connection between the bar and the support and latching means cooperating with the bar for holding the same against movement in one direction at the end of the bending operation.

2. A device as set forth in claim 1 wherein the sliding connection between the support and the bar comprises lugs carried by the support, elongated guide slots in the bar, said lugs extending through said slots.

3. A device as set forth in claim 1 including a lug carried by the yoke, a vertically elongated slot in the upper end of the bar, said lugs extending through said slot and forming means whereby the yoke may freely move away from the support for a limited distance before the bar is longitudinally moved.

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