July 19, 1932. A. H. MARIETTA 1,867,581

ROD BENDING MACHINE

Filed July 18, 1929

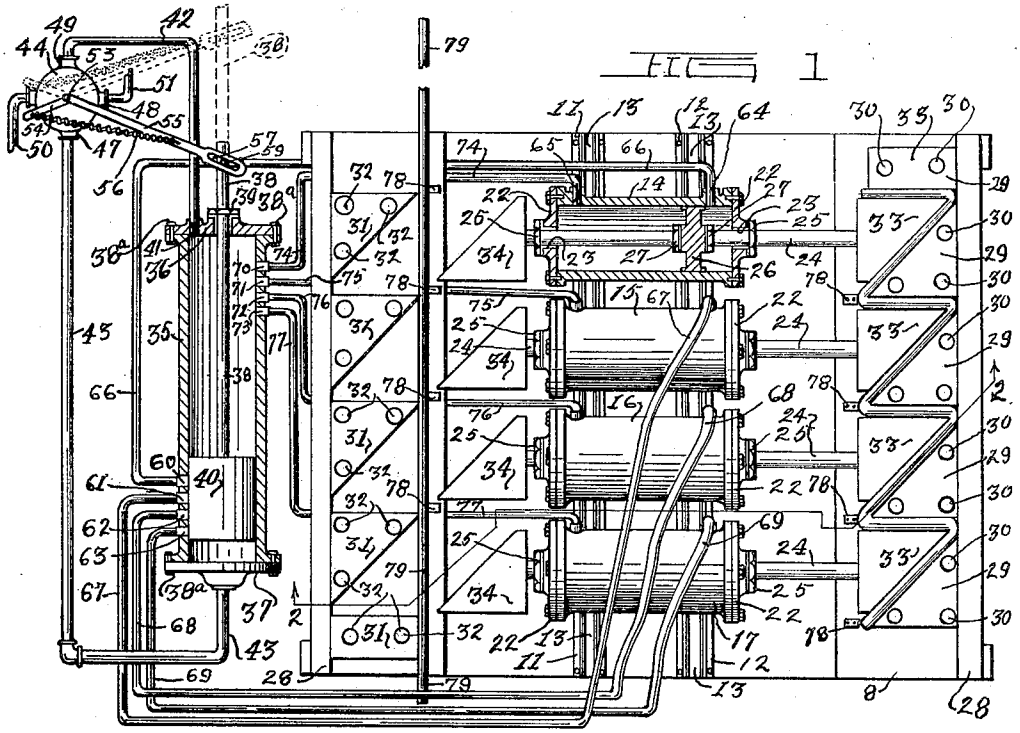


FIG 1

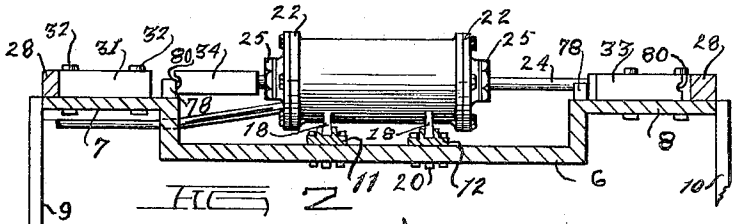


FIG 2

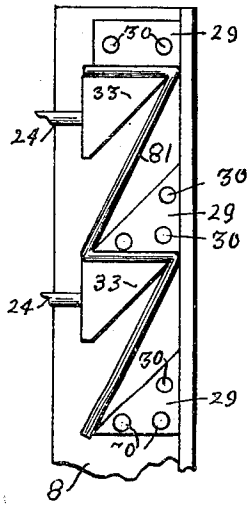


FIG 5

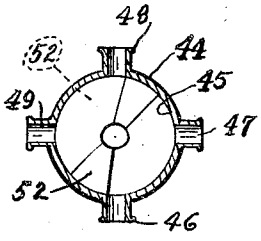


FIG 3

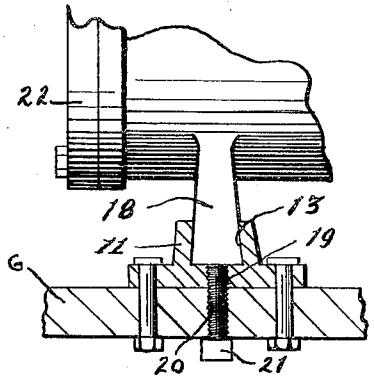


FIG 4

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ROD BENDING MACHINE

Application filed July 18, 1929. Serial No. 379,133.

This invention relates to new and novel improvements in apparatus for bending rods and while intended for use generally wherever it may be advantageously applied, the invention is particularly adapted for use in machines for bending truss rods for fabricated joints in which connection it will be hereinafter illustrated and described.

Objects of the invention are to provide a strong, durable rod bending apparatus of simple, economical construction which may be conveniently and economically operated and which will be very efficient in use.

A particular object is to provide a machine for bending elongated metal members into zig-zag shape whereby the same may be welded or otherwise connected between two or more members to form a truss or brace therebetween.

Another object is to provide a new and novel apparatus whereby a rod may be progressively bent into a regularly recurring series of steps.

A further object is to provide apparatus in which fluid pressure is employed to progressively bend a rod into a series of steps and to provide new and improved means whereby the same may be operated with a single valve.

A still further object is to provide a double-acting rod bending apparatus whereby a greatly increased production can be obtained from a given amount of pressure with a given number of workmen.

An additional object which may be considered in connection with the objects above set forth is to provide a rod bending apparatus which will progressively bend rods in a series of steps and which may be quickly and conveniently adjusted to regulate the length or the width of the steps and to thereby provide a single machine which may be used to manufacture articles of different sizes from rods of different dimensions.

The above objects are accomplished and additional ends are attained by the novel construction, combination and arrangement of parts hereinafter described and illustrated in the accompanying drawing, in which I have shown a preferred form of the invention, it being understood that the invention is capable of various adaptations and that changes and modifications may be made or resort had to substitutions which come within the scope of the claims hereunto appended.

In the drawing, like characters of reference are employed to designate like parts as the same appear in any of the several views and in which:—

Figure 1 is a top plan view of a device constructed in accordance with this invention, the same being shown partly in horizontal section to more clearly illustrate the invention,

Figure 2 is a cross sectional view taken as indicated by the lines 2—2 of Figure 1,

Figure 3 is a central, sectional view of a valve employed in carrying out the invention.

Figure 4 is a fragmentary view illustrating a preferred means of adjustably securing the pressure cylinders in place.

Figure 5 is a plan view showing the manner of adjusting the dies to produce a modified form of product.

Proceeding now to a detailed description of the invention, with reference to the particular adaptation thereof disclosed in the drawing, the numeral 6 is used generally to denote the bed of a rod bending apparatus constructed in accordance with this invention. In the particular adaptation of the invention shown, the bed 6 is provided on each lateral side thereof with an elevated portion 7 and 8. The bed 6 may be supported in any suitable manner. In the drawing, I have shown the bed 6 supported by the legs 9 and 10, but it is understood that it may be supported in any suitable manner.

The numerals 11 and 12 are used to denote track members which are bolted or otherwise suitably secured to the bed 6 so as to extend thereacross in parallel spaced relation to each other. Each track 11 and 12 is provided on the upper side thereof with a dove-tail groove 13 which extends longitudinally thereof. The numerals 14, 15, 16 and 17 denote cylinders which are preferably alike. Each of said cylinders is provided on the lower side thereof at a point adjacent each end thereof with a downwardly project-

ing lug 18. Each lug 18 is of dove-tail cross section and is adapted to be slidably received in the groove 13. Each track 11 and 12 is provided on the lower side thereof with a plurality of threaded bores 19 and the bed 6 is likewise provided with alined bores 20 to which a screw bolt 21 is threaded so that it will be operated to bear against the bottom of each lug 18, to securely hold the lug 18 against sliding movement in the channel 13. The cylinders 14, 15, 16 and 17 are thus adjustably secured to the bed 6 so as to be arranged in a row in parallel spaced relation to each other.

Each of the cylinders 14, 15, 16 and 17 is provided on each end thereof with a cylinder head 22 which is bolted or otherwise suitably secured thereto. Each head 22 is provided with the axially arranged bore 23 in which is slidably mounted a piston rod 24. The said piston rod 24 extends entirely through the cylinder and projects from each end thereof, suitable packing glands 25 being employed to prevent leakage. A piston 26 is operatively positioned in each of said cylinders and each piston 26 is fixed to one of the rods 24 by means of the nuts 27 or otherwise suitably secured thereto.

The elevated portions 7 and 8 of the bed 6 are each provided at a point adjacent the outer end thereof with a rail 28 which may be formed integrally therewith or suitably secured thereto. The numeral 29 denotes shaping dies or blocks which are positioned on the elevated portion 8 in regularly recurring spaced relation and are adjustably secured to the elevated portion 8 by means of the bolts 30. The dies 29 are preferably positioned to abut against one of the rails 28 as shown in the drawing; each die 29 is of triangular shape, but the same may be of any shape necessary to impart the desired configuration to the rod. The elevated portion 7 of the bed 6 is likewise provided with a plurality of shaping dies or blocks 31 which are adjustably secured to the portion 7 by means of the bolts 32.

Each of the piston rods 24 is provided on the end thereof presented toward the blocks 29 with a head 33, which, in the particular adaptation of the invention shown, are of triangular shape and correspond in contour to the space between the dies 29. The end of each rod 24 which is presented toward the dies 31 is likewise provided with a head 34 which likewise conforms in shape to the space between the dies 31 whereby each of the heads 33 and 34 when forced toward the adjacent dies 29 and 31 will have two faces thereof in spaced relation to the adjacent die member.

The numeral 35 denotes a valve which comprises an elongated hollow cylinder which is provided at one end thereof with the head 36 and on the other end thereof with the head 37. The heads 36 and 37 are secured to the cylinder 35 by means of the bolts 38*a*, but may be formed integral therewith or secured thereto by any suitable means. The head 36 is provided with an axially arranged bore in which is slidably mounted a rod 38, a suitable packing gland 39 being provided to prevent leakage. An elongated piston 40 is mounted on the rod 38. The head 36 is provided with a bore 41 in which is mounted a pipe 42. The head 37 is likewise provided with a suitable bore in which is mounted a suitable pipe 43. The pipes 42 and 43 lead to the four-way valve 44. The valve 44 is provided with a cylindrical cavity 45 from which project the radial nipples 46, 47, 48 and 49. The nipple 46 is operatively connected to a pipe 50 which leads from a source of fluid under pressure. The nipple 48 is operatively connected to a waste line 51. The nipple 49 is operatively connected to the pipe 42 and the nipple 47 is likewise connected to the pipe 43. A valve member 52 is secured in the cavity 45 so as to be capable of limited rotary movement therein. A suitable stem 53 is fixed to the valve member 52 and a lever 54 is fixed to the stem 53 whereby the lever 54 will be operated to turn the valve member 52 from the solid line to the dotted line position shown in Figure 3. A second lever 55 is rotatably secured on the stem 53 so as to project in the direction opposite the lever 54. A coil spring 56 is secured to the lever 55 at a point adjacent the free end thereof. The lever 55 is provided with a slot 57 and the rod 38 is provided with a pin 59 which is entered in the slot 57 in the lever 55 whereby the piston when positioned in the end of the cylinder toward the head 37 will move the lever 55 to the position shown in Figure 1. As soon as the lever 55 is moved past the center line of the lever 54, the spring 56 acts to move the lever 54 to move the rotor 52 to the position shown in Figure 3. In this position fluid pressure from the pipe 50 will enter the cavity 45 and will pass through the pipe 43 to the end of the cylinder provided with the head 37, and the pipe 42 leading from the other end of the cylinder 35 is connected through the cavity 45 to the waste line 51.

The wall of the cylinder 35 is provided adjacent the head 37 with a plurality of openings 60, 61, 62 and 63 arranged in spaced relation longitudinally of the cylinder, preferably in a row. Each of the cylinders 14, 15, 16 and 17 is provided at a point adjacent the end thereof presented toward the dies 29 with an opening 64. Each of said cylinders 14, 15, 16 and 17 are likewise provided adjacent the end thereof presented toward the dies 31 with an opening 65. One end of the tube 66 is operatively connected to the cylinder 35 so as to communicate with the opening 60, the other end of said tube 66 is connected with the cylinder 14 so as to communicate with

the opening 64. One end of the tube 67 is connected to the cylinder 35 so as to communicate with the opening 61. The other end of the tube 67 is connected in the opening 64 in the cylinder 15. One end of the tube 68 is operatively connected with the cylinder 35 so as to communicate with the opening 62, the other end thereof being operatively secured in the opening 64 in the cylinder 16. One end of the tube 69 is likewise connected to the cylinder 35 so as to communicate with the opening 63 and the other end of said tube 69 is operatively connected in the opening 64 in the cylinder 16. The cylinder 35 is provided adjacent the other end thereof with a plurality of openings 70, 71, 72 and 73 which are arranged therein in spaced relation longitudinally of the cylinder, preferably in a row with the opening 70 closest to the head 39. The numeral 74 denotes a tube, one end of which is operatively connected in the opening 70 and the other end thereof in the opening 65 in the cylinder 14. A like tube 75 has one end connected in the opening 71 and the other end thereof connected in the opening 65 in the cylinder 15. The tube 76 has one end thereof connected in the opening 72 and the other end thereof connected in the opening 65 in the cylinder 16.

The tube 77 has one end thereof operatively connected in the opening 73 and the other end thereof connected in the opening 65 in the cylinder 17. The numeral 78 denotes blocks which are adjustably secured to the elevated portions 7 and 8 so as to extend in a row along the inner portion of each of said elevated portions with the outer edges thereof in spaced relation to a line extending in parallel spaced relation to the inner edges of the adjacent dies 29 and 31.

In operation, the tube 50 is connected to a line carrying water or other fluid under pressure. Each of the heads 33 and 34 may be provided with the groove 80 which is adapted to fit the rod or other elongated member 79. The use of the improved apparatus will be described in connection with the disclosure made in Figure 1 in which it will be seen that a rod 79 may be placed between the dies 31 and the blocks 78, with one end of the rod projecting only a short distance past the rectangular block 31 and the other end of the rod 79 projecting some distance from the apparatus with the valve 54 positioned as shown in Figure 1, the valve is positioned as shown in Figure 3. The water under pressure enters the cavity 45 and flows through the nipple 47 and the pipe 43 to the end of the cylinder and through the head 37 to the adjacent end of the cylinder.

As the water pressure from the line 50 is thus directed into the cylinder 35, the piston 40 is moved toward the other end of the cylinder until the opening 63 is uncovered. This permits the fluid under pressure to flow through the pipe 69 and enter the end of the cylinder 17 presented toward the dies 29, this forces the piston 26 toward the dies 31 and causes the head 34 to engage the rod 79. The fluid in the other portion of the cylinder escapes through the pipe 77 into the cylinder 35 where it escapes through the pipe 42 to the cavity 45 and flows outwardly through the waste pipe 51. The fluid pressure thus introduced in the cylinder 17 forces the head 34 into the space between the adjacent dies 31 causing the adjacent end of the rod 79 to fold at a right angle against one side of the head 34 and moving the other rod 79 longitudinally to compensate for the bend thus made. As the fluid pressure continues to move the piston 40 until the opening 62 is exposed thereby permitting fluid pressure to enter the tube 68 to operate the piston 26 in the cylinder 16, this forces the head 34 into the adjacent dies 41 bending the rod 49 and forming the second step therein. The piston 42 continues to move exposing the opening 61 and admitting fluid to the pipe 67, thus forcing the head 34 carried by the rod 24 in the piston 15 in place to bend the rod 79 and form a third step therein. Upon further movement of the piston 40 the opening 60 is exposed admitting fluid pressure to the tube 66 and forcing the piston 26 in the cylinder 14 forwardly causing the die 34 to form the last step in the rod 79.

It will be seen that the blocks 78 permit the free longitudinal movement of the rod 79; that the said blocks hold the rod in position during the progressive bending operation herein described. It will be seen that the heads 33 are thus moved away from the dies 29 so that the zig-zag rod 81 may be removed and a straight rod quickly and conveniently substituted. As the lever 55 reaches the dotted line position shown in Figure 1, the spring 56 is carried past the center line of the lever 54, whereupon the spring 56 automatically operates to the dotted line position shown in Figure 1, thus moving the rotor 52 in the valve 44 to the dotted line position shown in Figure 3, thereby connecting the water power line 50 with the tube 42 and the waste line 51 with the tube 43. As the piston 40 is of sufficient length to cover either group of openings in the wall of the cylinder 35, sufficient time will be given the operator to remove the bent rod and submit a straight rod. As the piston 40 is thus forced in the opposite direction in the cylinder 35, the openings 70, 71, 72 and 73 are successively exposed to progressively operate the pistons in the cylinders 14, 15, 16 and 17.

It will also be understood that the invention is not confined to a machine for manufacturing a truss member having the particular N-bend shown and that rods 79 may be bent with each side of each step oblique to

the line of movement of the plungers 24 and that the heads 33, 34 and the die members 29 and 31 may be made of any suitable shape to produce a series of step-bends of any suitable pattern.

Having thus illustrated the invention and described the same in detail, what I claim as new and desire to secure by Letters Patent is:—

1. In apparatus of the character described, a supporting structure, a row of spaced parallel plungers mounted thereon, a head on each end of each plunger, a pair of oppositely positioned bending dies, each of said dies having a face provided with a plurality of steps and means to consecutively move said plungers to bring said heads into operative engagement with said steps.

2. In apparatus of the character described, a supporting structure, a row of spaced, parallel plungers mounted thereon a head on each end of each plunger, bending dies arranged along the ends of said plungers to receive said heads and means to move said plungers to alternately bring the heads on the opposite ends of said plungers into operative engagement with said dies.

3. In apparatus of the character described, a supporting structure, a plurality of plungers mounted thereon, a head on each end of each plunger, bending dies mounted on said structure, each of said dies arranged to receive the heads on the like ends of said plungers and fluid pressure means for consecutively moving said plungers into operative engagement with each of said dies.

4. In apparatus of the character described, a supporting structure, a plurality of cylinders mounted thereon, a piston on each of said cylinders, a plunger attached to each piston, each plunger projecting from each end of each cylinder, a head on each end of each plunger, bending dies arranged along the like ends of said plungers and fluid pressure means for operating said pistons to bring said heads into mating relation with said dies.

In testimony whereof I have hereunto set my hand.

ALPHONSO H. MARIETTA.