L. A. HAWTHORNE.

METAL WORKING MACHINE.

APPLICATION FILED MAY 16, 1914.

1,241,256.

Patented Sept. 25, 1917.

3 SHEETS—SHEET 1.

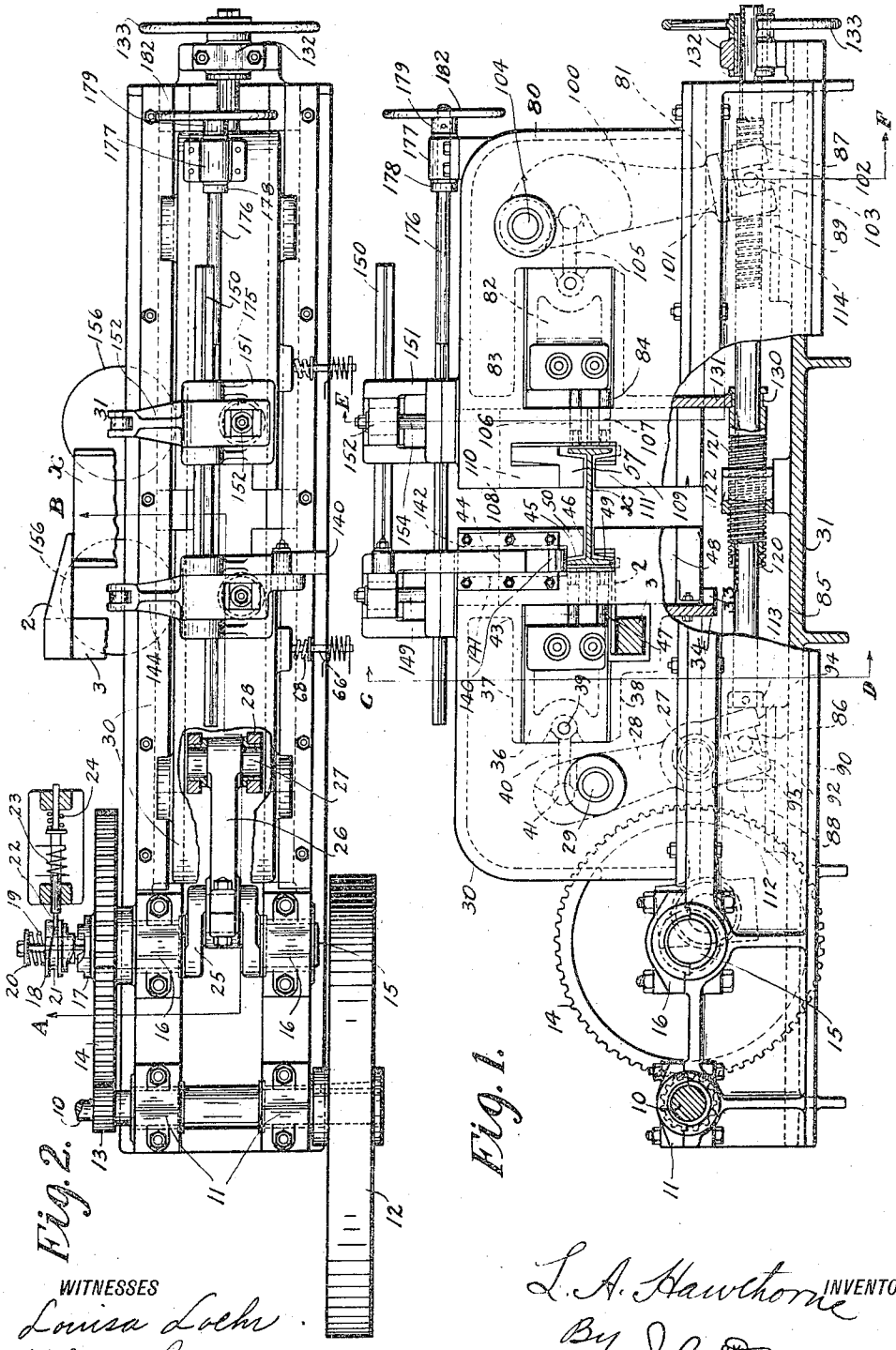


Fig. 2.

Fig. 1.

WITNESSES

Louisa Lochr

Elsie Geyer

L. A. Hawthorne INVENTOR

By John D. Morgan

ATTORNEYS

L. A. HAWTHORNE.

METAL WORKING MACHINE.

APPLICATION FILED MAY 16, 1914.

1,241,256.

Patented Sept. 25, 1917.

3 SHEETS—SHEET 2.

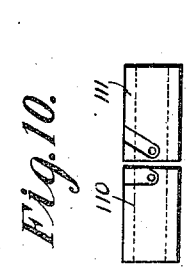


Fig. 10.

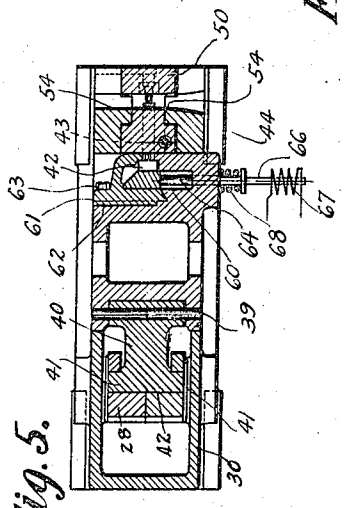


Fig. 5.

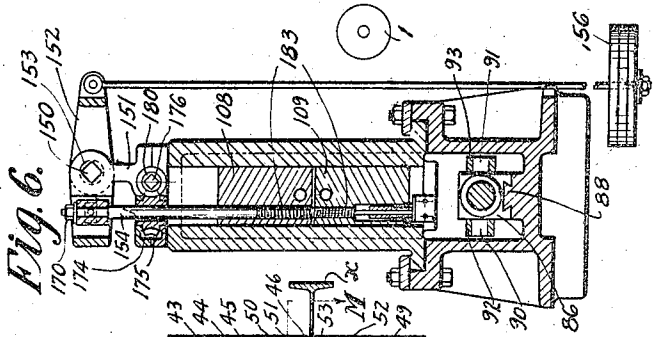


Fig. 6.

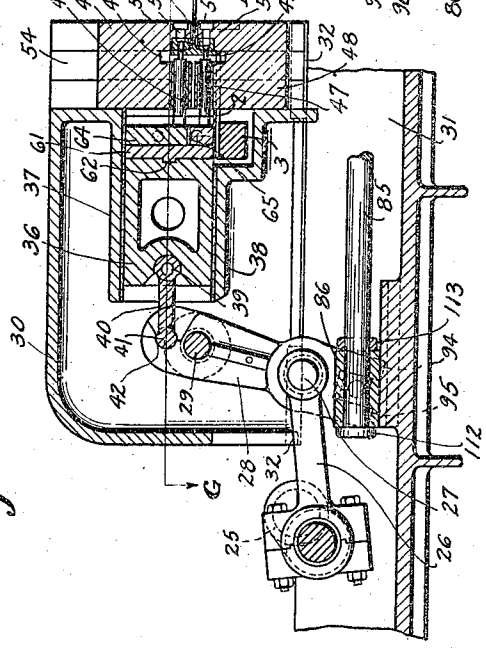


Fig. 3.

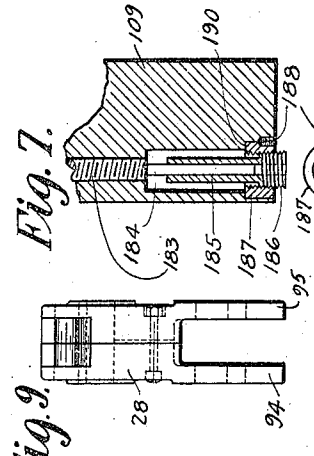


Fig. 7.



Fig. 8.

Fig. 9.

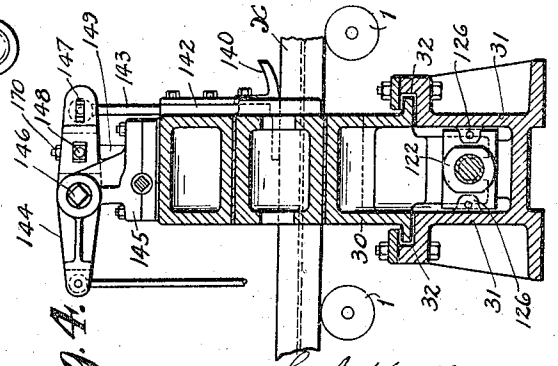


Fig. 4.

WITNESSES

Louisa Lochr.

Elsie Geyer

L. A. Hawthorne INVENTOR

John D. Morgan

ATTORNEY

L. A. HAWTHORNE.

METAL WORKING MACHINE.

APPLICATION FILED MAY 16, 1914.

1,241,256.

Patented Sept. 25, 1917.

3 SHEETS—SHEET 3.

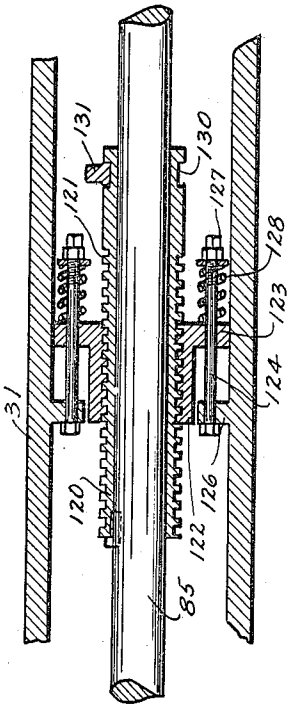


Fig. 11.

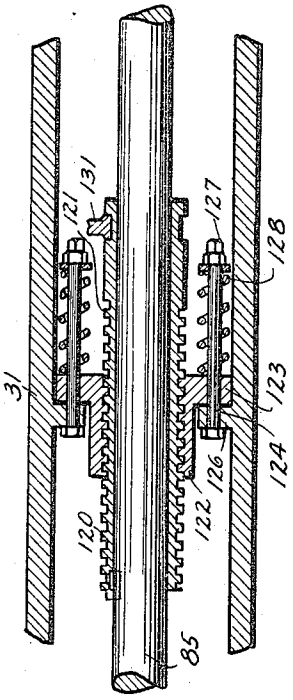


Fig. 12.

WITNESSES

Louisa Lochr

Elsie Geyer

L. A. Hawthorne INVENTOR

BY

John D. Morgan

ATTORNEYS

UNITED STATES PATENT OFFICE.

LOUIS A. HAWTHORNE, OF NEWARK, NEW JERSEY, ASSIGNOR TO STEEL UTILITIES, INCORPORATED, A CORPORATION OF NEW YORK.

METAL-WORKING MACHINE.

1,241,256. Specification of Letters Patent. Patented Sept. 25, 1917.

Application filed May 16, 1914. Serial No. 838,954.

To all whom it may concern:

Be it known that I, LOUIS A. HAWTHORNE, a citizen of the United States, residing at Newark, N. J., have made certain new and useful Improvements in Metal-Working Machines, of which the following is a specification.

The invention relates to machines for punching structural shapes and other work, and in certain of its aspects the invention relates to the punching of shape flanges and like work. Various objects and advantages of the invention will be set forth in part hereinafter, and in part will be obvious herefrom, or may be learned by practice with the invention.

The invention consists in the novel parts, constructions, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and forming a part hereof illustrate one embodiment of the invention, and together with the description serve to explain the principles thereof.

Of the drawings:

Figure 1 is a side elevation, with parts broken away and with parts in section, of a machine embodying the invention;

Fig. 2 is a top plan of the machine of Fig. 1, with parts of the casing broken away;

Fig. 3 is a section on the line A—B of Fig. 2, looking in the direction of the arrows, with parts omitted;

Fig. 4 is a vertical section on the line C—D of Fig. 1 looking in the direction of the arrows.

Fig. 5 is a horizontal section on the line G—M of Fig. 3 looking in the direction of the arrows.

Fig. 6 is a vertical section on the line E—F of Fig. 1 looking in the direction of the arrows;

Fig. 7 is a fragmentary sectional view on an enlarged scale of the lower central part of Fig. 6;

Fig. 8 is a bottom plan in detail of the adjusting nut of Fig. 7;

Fig. 9 is a detail elevation of the punch actuating lever arm;

Fig. 10 is a detail of the die blocks;

Fig. 11 is a sectional detail on an enlarged scale of the lower central part of Fig. 1, showing the springs under compression; and

Fig. 12 is a similar view to Fig. 11, but showing the springs extended and the frame at its stop.

Referring by way of example to the illustrated embodiment of the invention, and in accordance with certain features of the invention, it is especially adapted and designed to punch beam flanges, and as embodied the machine is shown especially adapted to punch simultaneously, and symmetrically both flanges of an I-beam. The beam is run through the machine, and stopped from time to time and after the desired amount of travel, to be punched in the proper and desired positions for the rivet holes, to be used in fabrication.

So far as concerns many features of the invention, any desired form of traveling and stopping means may be utilized. As embodied, said means comprise devices for impelling the beam or shape forward, said devices acting either continuously or intermittently, in coöperation and conjunction with distance determining devices, manually settable or automatically controlled from a distance record sheet, there being connections from the distance determining means to the beam or shape whereby it is successively permitted to travel distances corresponding to the successive settings of the distance determining devices.

The beam or shape x rests upon driven rolls 1, driven either continuously or intermittently in harmony with the successive settings of the distance determining means and the successive punchings of the beam. The forward end of the beam x abuts upon a head 2 (Figs. 1 and 2), which head is attached to a long bar or rail 3 extending horizontally backwardly along the shape x. The rail 3 is connected to the distance determining means, not shown herein, but which may be substantially like that shown and described in copending application Serial No. 814,380, filed January 26, 1914, or in copending application Serial No. 842,231, filed June 1, 1914, and need not be shown and described in detail herein.

In accordance with certain features of the invention, means are provided for clamping or firmly holding the beam flanges for punching and alternately freeing them to be fed forward between the succesive punches, and in connection therewith means for simultaneously punching both flanges of the

beam, and making such punching symmetrical, with a single punch or a plurality thereof on each side, and in accordance with one feature of the invention single actuating means for operating the punches for both flanges are provided.

The embodied form of actuating means comprises devices for operating the punch after the shape x has been brought to rest and for preventing another operation thereof until the shape has been traveled and stopped for the successive punching operations thereon. Suitable driving means, such as an electric motor, are connected to a shaft 10 having journals 11 in the machine frame, said shaft carrying a fly-wheel 12. Fixed to shaft 10 is a pinion 13 in mesh with a gear 14. The gear 14 is loosely sleeved upon a shaft 15 having journals 16 carried upon the machine frame. Fixed to the gear 14 is a clutch member 17. The corresponding or coöperating clutch member 18 is splined to the shaft 15, and is impelled into engagement with the coöperating clutch member 17 by a spring 19 in compression between clutch member 18 and a suitable head or washer 20. In the external face of the member 18 is a cam groove 21, in which works a cam finger 22. The cam finger or pin 22 connects to the core of a solenoid 23. A spring 24 acts to press the cam pin 22 into the groove 21, the solenoid when energized acting against the spring 24 to retract the finger or pin 22 out of the groove 21.

Formed in shaft 15 between its journal bearings 16 is a double crank 25 having a connecting rod 26. Said connecting rod is pivotally connected to a wrist pin 27, which wrist pin is mounted in a lever arm 28. Said lever arm 28 has pivotal mounting as by supporting shaft 29 upon a sliding frame 30. Said frame 30 is slidable in guides 32 upon the bed plate 31, and movable to and from a positioning stop 33 upon the bed plate, with which stop a piece 34 on the frame 30 contacts.

Slidably mounted in the frame 30 is a reciprocable head 36 reciprocably mounted in guides 37 and 38 formed in each side of the vertical walls of the slidable frame 30. Pivotally connected to the rear part of the reciprocable head 36, by means of a pivot pin 39, is a flat connecting rod or plate 40, having a bearing head 41 mounted in a socket 42 in the upper end of the lever 28. The punches 43 and 47 for one of the beam flanges are operated by the head 36, and the punches are relatively movable with respect to each other for the purpose of punching beams of different sizes, their movements for this purpose in the present arrangement being to and fro vertically, this being effected by means hereinafter to be described. The punch 43 is reciprocably mounted in a carrier 44. Said carrier 44 is vertically reciprocable to and fro on guides 54 mounted at each side on frame 30. The carrier 44 is recessed at 45 to receive a beam flange, the web of the beam passing out horizontally beneath the end 46 thereof. The punch 47 is reciprocably mounted in a carrier 48 similar to 44 and located beneath the carrier 44. Carrier 48 has a recess 49 adapted to receive the lower portion of the beam flange, and is shaped to accommodate between it and carrier 44 the horizontally extended web of the beam. Carrier 48 is likewise vertically movable on guides 54 on the frame 30.

The upper carrier 44 is formed with a downwardly projecting portion 50 adapted to come within the beam flange and to be pressed firmly thereagainst during the punching. The die 51 for the punch 43 is formed in the part 50 of the block or carrier 44. The block or carrier 48 has a similar part 52 extending upwardly and behind the other part of the beam flange, and adapted to press thereagainst during the punching, said part 52 carrying the die 53 for the punch 47.

The blocks or punch supports 44 and 48, as stated, are both movable to and fro vertically on guides 54, and are so movable relatively to each other by means hereinafter to be described to properly position the punches for beams of different sizes and also for the purpose of symmetrically locating the punches on both sides with respect to the web of the beam or shape.

The punches are detachably mounted with respect to the head 36, and as embodied the heads 42 of the punches 43 and 47 are located in a recess formed partly in the forward end of the head 36, and formed partly within a detachable holder 61, having a tongue and groove sliding connection 62 with the forward end of the head 36, and being held to position by suitable means such as a tap bolt or lag bolt 63.

Means are provided by the invention for selectively operating one or more of the punches, and as embodied herein, gags 64 and 65 are slidable to and fro in the recess 60 into and out of gagging position with respect to the punches 43 and 47. Said gags may be operated either manually or automatically, and in accordance with one feature of the invention, the gags are operated automatically from a distance record strip. They are shown accordingly with rods 66 extending therefrom and connected to the cores of solenoids 67, electrically controlled from the distance record sheet. Springs 68 serve to restore the gags when the solenoids 67 are deënergized.

In accordance with certain features of the invention, means are provided for simulta-

neously punching both flanges of the beam, and in the embodied form of such means, there is provided a sliding frame 80, carried in guides 81 upon the bed plates 31 of the machine.

Mounted reciprocably upon said sliding frame 80 is a reciprocable head 82, carrying punches 83 and 84 for punching the opposite flange of the shape or beam x. The connections for operating together the heads 36 and 82 comprise a longitudinally sliding rod 85, said rod 85 being mounted upon supporting blocks 86 and 87, on the bed plate of the machine. Blocks 86 and 87 reciprocate, respectively, on guide ways 88 and 89 formed in the bed plate. Extending from the block 86 are pivot pins 90 and 91, pivotally mounted on which pins are blocks 92 and 93. The lower portion of the lever arm 28, below the wrist pin 27 is bifurcated into parts 94 and 95, each of said parts being yoked or recessed to straddle and engage the pivoted blocks 92 and 93.

On the opposite side of the machine, a lever arm 100 has its lower end 101 bifurcated and yoked similarly to the lower end of lever arm 28, to embrace and engage blocks 102, pivotally mounted on pins 103 carried by sliding block 87 (near the right hand end of rod 85 in Fig. 1).

Arm or lever 100 has a pivotal bearing on pin or shaft 104, which is mounted on the slidable frame 80. A link 105, similar to link 40, is pivotally connected to reciprocable head 82 and has a pivotal socket connection with arm 100. The head 82 carries two punches 106 and 107, which are mounted in the same way, and have the same movements and relative movements as the punches 43 and 47, and therefore need not be described in detail. The punches 106 and 107 are reciprocably mounted, respectively, in carriers 108 and 109. Said carriers 108 and 109 work on vertical guides on frame 80, similar to the guides 54 on frame 30. Said carriers are movable to and fro vertically on said guides, and also are vertically movable relatively to each other to get the right amount of separation between the punches 106 and 107, and also to get both punches at the right height for beams or shapes of different sizes.

The block 108 has a recess for the upper half of the beam flange, as appears from Fig. 1, and it has a part 110 extending downwardly behind the beam flange, and adapted to press tightly against the inner face of the flange during the punching operation. The block 109 is similarly recessed to receive the lower part of the beam or shape flange. The block 109 has a part 111 extending upwardly behind the lower part of the beam flange, and likewise adapted to press against the inner face of the flange during the punching operation. The parts 110 and 111 have dies therein, and suitable discharging ducts for the punchings as shown in Fig. 10.

Means are provided by the invention for increasing and decreasing the space or degree of separation between the punches and dies for one flange of the beam and those for the other flange, to accommodate beams of different sizes. As embodied, the shaft 85 is made rotatable for this purpose, and by such rotation the slidable frames 30 and 80 are drawn together for smaller beams or are moved apart for larger beams. The shaft 85 has also, in the present embodiment, reciprocatory longitudinal movement during the punching operation to bring the die blocks up tight against the inside of the flanges of the beam. Encircling shaft 85, medially of its length, is a sleeve 120, splined to rotate with shaft 85 but permitting relative slidable movement of the sleeve 120 and shaft 85. The sleeve 120 has on its exterior a screw thread 121 and encircling the screw thread 121 is a nut 122. Fixed to nut 122 are apertured wings 123, and through the apertures pass rods 124, said rods 124 being fixed to a support 126 on the machine frame. On the ends of rods 124 are nuts 127, and springs 128 are in compression between the wings 123 and nuts 127. Sleeve 120 has an annular groove 130, with which groove engages a flange 131 fixed to slidable frame 80.

The end of the shaft 85 is held against longitudinal movement relatively to the sliding block 86, at the left in Fig. 1, by collars 112 and 113 fixed to the shaft at either side of the block. The slidable block 87 (at the right in Fig. 1) is apertured internally longitudinally thereof, said aperture being screw threaded to engage an external screw thread 114 on that portion of shaft 85. The shaft 85 has a journal bearing 132 at the right hand end in Fig. 1, and is thus rotatably journaled in bearing 132 and in the slidable blocks 86 and 87. Suitable means are provided for rotating the shaft 85, such as a hand wheel 133, although this could be effected automatically from a distance record sheet, or by other suitable means.

The manner of operation of the mechanism so far described, is substantially as follows:—

The beam or shape x is traveled and stopped in accordance with the setting of the distance determining means, or by the indications of the distance record sheet, or in other suitable manner so far as concerns many aspects of the invention. The clutch 17, 18 is released by the withdrawal of pin 22, by the solenoid 23 or otherwise. This permits the shaft 15 to make one rotation,

as the retracted pin 22 is released to enter the broad part of groove 21 and cam the rotating clutch member 18 against its spring and to hold it out until the pin 22 is again retracted.

When the shaft 15 begins to rotate, the arm 28 is rocked about 29 to bring the punches 43 and 47 against the beam flange (Fig. 1) and the shaft 85 is moved slightly to the left (Fig. 1) to rock arm 100 about 104 to bring the punches 106 and 107 against the other flange. As the shaft 15 continues its rotation, arm 28 rocks next about its bearing on the link 40 and arm 100 rocks about its bearing on link 105. Arm 28 through bearing 29 draws or slides frame 30 to the left in Fig. 1 drawing the die bearing pieces 50 and 57 firmly against the inside of the flange. At the same time, shaft 85 is moved longitudinally and arm 100, through bearing 104, slides frame 80 slightly to the right in Fig. 1, and so draws die bearing pieces 110 and 111 up firmly against the inside of the other flange. This sliding of frame 80 compresses springs 128, which later expand to restore the clearance between the beam flange and the die blocks 110 and 111.

The die blocks pressing firmly on the inside of the flanges stop the movement of frames 30 and 80, and the arms 28 and 100 again pivot, respectively about 29 and 104, and the heads 36 and 82 are forced forward driving the punches through the flanges. As the shaft 15 continues to rotate, the punches are withdrawn, the frames 30 and 80 move toward the center, easing the die blocks away from the flanges and leaving the beam free to be fed forward and to be positioned for the next punching. The springs 128 serve to move frame 80 and ease its die blocks away from the inner flange of the beam.

Means are provided by the invention for automatically centering the punches for shapes of different sizes, so as to bring the openings in and between the die blocks or die carriers into alinement with the flanges and web of the beam or shape as it is fed in and traveled along upon the rollers 1. In accordance with one feature of the invention, the die blocks are automatically positioned by the fed in shape. In the embodied form, a shoe 140, has its end turned or flared upwardly in the direction of the approaching beam, as shown in Fig. 4. The shoe 140 is slidable to and fro vertically in guides 141 and 142 on the machine frame. Extending upwardly from the shoe 140 is a rod 143, pivotally connected at 147 to a lever 144. Lever 144 is pivotally supported at 146 within a double bracket 145 upon the top of the sliding frame 30. Midway between pivot points 146 and 147 is a pivotal support 148 for a rod 149, which rod carries the carriers 44 and 48, previously described as being vertically slidable on guides in frame 30. The rod 149 being carried half way between pivot points 146 and 147, the vertical movement of said rod 149 will be one half that of the shoe 140, when the shoe is moved by engagement with the edge of the flange of a beam or shape. Thus the horizontal opening between the support 44 for the upper punch and die and the support 48 for the lower punch and die will be correctly positioned to receive the web of the beam and to give the proper desired position of the holes in the flange.

Means are provided by the invention for simultaneously positioning the punch and die blocks for both flanges of the beam, and as embodied, a similar mechanism is provided for the other side of the machine, and it is operated simultaneously from the shoe 140. For this purpose, as embodied, a square shaft 150 is fixed to lever 144 at its pivotal bearing 146, said shaft 150 extending horizontally and having a sleeved or bushed bearing in a bracket 151 mounted on the top of the sliding frame 80. The bracket 151 is double, and between the two parts thereof is carried lever 152, like lever 144 by a pivotal bearing 153. The lever 152 is squared to fit shaft 150, while the lever and its bracket 151 are slidable along shaft 150 with the sliding frame 80 to accommodate beams of varying size.

Pivotally supported from lever 152 is a rod 154 distant from pivot point 153 by the same amount that pivot support for rod 149 is from the pivotal support 146 for lever 144. Supported on rod 154 are the carriers 108 and 109 for the punches and dies for the opposite flange of the beam, already described as being vertically slidable in guides on sliding frame 80. Thus, these punches and dies are likewise centered from shoe 140 for the horizontally disposed web of the beam, as the levers 144 and 152 will rock together, while lever 152 is at the same time movable longitudinally of the shaft 150 with the frame 80. The lever arms 144 and 152 extend backwardly from their pivot points to support counterweights 156 for balancing the weight of the punch and die carriers 44, 48, 108 and 109, thereby rendering the up and down movement thereof easier.

Means are provided by the invention for increasing or decreasing the distance between the punches for a beam flange on one side of the web and those for said flange on the other side of the web. In practice the rivet holes are spaced apart variably with the differences in the width of the tread of the flange. In the embodied form of such means, the rod 149 is screw threaded into the punch and die carriers 44 and 48 by

right and left handed screw threads, respectively, as shown in Fig. 6, whereby when rod 149 is rotated the carriers 44 and 48 are moved toward or apart from each other. For this purpose rod 149 is rotatably supported in its pivotal support 148, as shown at the top of Fig. 4, the piece 148 being pivotally mounted in the lever 144, and the rod 149 having a rotatable bearing in the piece 148, and being held in position by a nut 170.

A like arrangement is provided for the rod 154, which likewise has right and left hand screw thread connection with the punch and die carriers 108 and 109. The rod 154 has likewise rotatable mounting in its pivotal bearing, similar to the rod 149, all of which need not be further described in detail.

Means are provided for rotating said rods 149 and 154 together, and as embodied each of said rods 149 and 154 carries splined thereon respectively a pinion 174, mounted in a bracket 175, which brackets are carried upon the corresponding sliding frame 30 or 80. The pinion 174 has either helical or worm teeth. A shaft 176 extends horizontally past the respective pinions 174, said shaft having bearings in the brackets 145 and 151 and being also journaled in a bearing 177 carried by the slidable frame 80. Suitable means such as collars 178 and 179 serve to keep the shaft 176 from longitudinal movement. The shaft 176 is square or splined to carry worm or gear wheels 180, which mesh with the pinions 174. Thus the gear wheels 180 remain in mesh with the pinions 174, to rotate the rods 149 and 154 with the rotation of the shaft 176, while gears 180 and the shaft 176 are relatively slidable during the movements of the sliding frames 30 and 80. Suitable means for rotating the shaft 176 are provided, shown herein as a hand wheel 182, although so far as concerns many features of the invention, other means for controlling the rotation of the shaft 176 may be provided controlled from the setting of a distance determining device or from an automatic distance record sheet.

Means are provided by the invention for vertically moving or adjusting the lower punch and die carriers 48 and 109 to regulate or vary the distance of the lowermost rivet hole from the bottom edge of the beam flange, said means coöperating with the means for adjusting or regulating the spacing apart of the rivet holes for either side of the beam web. As embodied (see Figs. 6, 7 and 8), the lower end of the rods 149 and 154 extend into apertures 183 in the lower portion of the carriers 48 and 109. The lower end of said rods have square portions 184 fitting within internally square sleeves 185. Said sleeves 185 are externally threaded as shown at 186. The thread 186 engages the internal or tapped thread of a nut 187 fixed in the lower part of the respective carriers 48 and 109 by suitable means such as a set screw 188. Thus when the rods 149 and 154 are rotated, the nuts 187 and the corresponding carriers 48 and 109 travel upwardly and downwardly, as the sleeve 185 rests upon a seat 190 formed in the machine frame.

The manner of operation of the mechanisms shown and described will be clearly understood from the descriptions or statements of operation already given in connection with the various groups of mechanism, and further description will be unnecessary.

From all the foregoing it will be understood that a machine has been provided embodying and realizing the objects and advantages herein set forth, together with other objects and advantages. It will also be understood that changes may be made from the mechanisms shown and described within the scope of the accompanying plans, without departing from the principles of the invention and without sacrificing its chief advantage.

What I claim as my invention and desire to secure by Letters Patent, is:—

1. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices.

2. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and connections between said levers.

3. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices and connections between said levers.

4. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices

mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and connections between said levers for causing them to move together.

5. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device.

6. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, and means for moving said levers together.

7. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device and connections between the free ends of said two levers.

8. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and common actuating means for said levers.

9. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices, mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices and common actuating means for said levers.

10. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device and common actuating means for said levers.

11. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and a crank shaft for actuating said levers.

12. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, and a crank shaft for actuating said levers.

13. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, a crank shaft for actuating said levers, and means for causing a single rotation of said crank shaft.

14. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange,

an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, a crank shaft for actuating said levers, and means for causing a single rotation of said crank shaft.

15. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for causing a single actuation of said levers.

16. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device and means for causing a single actuation of said levers.

17. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and common actuating means for said levers for imparting a single actuation to said punches.

18. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, and common actuating means for said levers for imparting a single actuation to said punches.

19. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, a crank shaft for actuating said levers and connections between the free ends of said levers.

20. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, a crank shaft for actuating said levers and connections between the free ends of said levers.

21. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means.

22. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means and means for automatically centering the flange receiving devices for beams of different sizes.

23. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating

levers connected to said slidable frames and to said punch actuating devices, means for successively traveling and stopping a beam relatively to the punching means and means controlled automatically by the beam for centering the flange receiving devices for beams of different sizes.

24. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means for successively traveling and stopping a beam relatively to the punching means and means for automatically centering the punches and dies for beams of different sizes.

25. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means and means controlled automatically by the beam for centering the punches and dies for beams of different sizes.

26. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, means for successively traveling and stopping a beam relatively to the punching means and means controlled automatically by the beam for centering the punches and dies for beams of different sizes.

27. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means for supporting a beam to be punched and means for centering the flange receiving devices for beams of different sizes.

28. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means controlled by the size of the beam for supporting a beam to be punched and means for centering the flange receiving devices for beams of different sizes.

29. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, means for supporting a beam to be punched and means for centering the flange receiving devices for beams of different sizes.

30. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices, means controlled by the size of the beam for supporting a beam to be punched and means for centering the flange receiving devices for beams of different sizes.

31. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices, means controlled automatically by the size of the beam for supporting a beam to be punched and means for centering the flange receiving devices for beams of different sizes.

32. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame

adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means for supporting a beam to be punched and means for centering the punches and dies for beams of different sizes.

33. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means controlled by the size of the beams for supporting a beam to be punched and means for centering the punches and dies for beams of different sizes.

34. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means controlled automatically by the size of the beams for supporting a beam to be punched and means for centering the punches and dies for beams of different sizes.

35. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial point to the corresponding movable punch actuating device, means for supporting a beam to be punched and means for centering the punches and dies for beams of different sizes.

36. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices, means controlled automatically by the size of the beams for supporting a beam to be punched and means for centering the punches and dies for beams of different sizes.

37. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames, and to said punch actuating devices and means for varying the distance between said flange receiving devices for beams of different depth.

38. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices and means for varying the distance between said slidable frames for beams of different depth.

39. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and common actuating means for said levers and means for varying the distance between said flange receiving devices for beams of different depth.

40. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for bringing the die members firmly against the backs of the flanges preparatory to punching.

41. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, an actuating lever pivoted to one of said sliding frames at a medial point and connected at one of its ends to the corresponding movable punch actuating device, an actuating lever pivoted at one of its ends to the other sliding frame and connected at a medial

point to the corresponding movable punch actuating device and means for bringing the die members firmly against the backs of the flanges preparatory to punching.

42. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and common actuating means for said levers and means for bringing the die members firmly against the backs of the flanges preparatory to punching.

43. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means and means for bringing the die members firmly against the backs of the flanges preparatory to the successive punchings.

44. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers pivoted upon said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means, and for moving them away preparatory to the forward travel of the beam.

45. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means and means for automatically centering the flange receiving devices for beams of different sizes and means for bringing the die members firmly against the backs of the flanges preparatory to the successive punchings.

46. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices and means for successively traveling and stopping a beam relatively to the punching means and means for automatically centering the flange receiving devices for beams of different sizes and for moving them away preparatory to the forward travel of the beam.

47. A punching machine including in combination a slidable punch and die carrying frame adapted to receive a beam flange, an opposed punch and die carrying frame adapted to receive the other flange of the beam, movable punch actuating devices mounted on said slidable frames, actuating levers connected to said slidable frames and to said punch actuating devices, means for successively traveling and stopping a beam relatively to the punching means, means controlled by the beam for centering the flange receiving devices for beams of different sizes and means for bringing the die members firmly against the backs of the flanges preparatory to the successive punchings.

48. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group.

49. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group and means for varying the distance of the holes from the edges of the flanges.

50. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges and means for varying the distance between the sets of punches and dies for the respective flanges.

51. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group and means for pressing the die carrying members firmly against the backs of the flanges preparatory to punching.

52. A punching machine including in com-

bination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges and means for pressing the die carrying members firmly against the backs of the flanges preparatory to punching.

53. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges, means for varying the distance between the sets of punches and dies for the respective flanges and means for pressing the die carrying members firmly against the backs of the flanges preparatory to the punching.

54. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group and means for successively traveling and stopping a beam relatively to said punching devices to be punched thereby.

55. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges and means for successively traveling and stopping a beam relatively to said punching devices to be punched thereby.

56. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges and means for varying the distance between the sets of punches and dies for the respective flanges and means for successively traveling and stopping a beam relatively to said punching devices to be punched thereby.

57. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for pressing the die carrying members firmly against the backs of the flanges preparatory to punching and means for successively traveling and stopping a beam relatively to said punching devices to be punched thereby.

58. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges, means for pressing the die carrying members firmly against the backs of the flanges preparatory to punching and means for successively traveling and stopping a beam relatively to said punching devices to be punched thereby.

59. A punching machine including in combination a plurality of sets of punches and dies for simultaneously punching groups of holes in both flanges of a beam, means for varying the distance between the punches in each group, means for varying the distance of the holes from the edges of the flanges, means for varying the distance between the sets of punches and dies for the respective flanges, means for pressing the die carrying members firmly against the backs of the flanges preparatory to punching and means for successively traveling and stopping a beam relatively to said punching devices to be punched thereby.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

LOUIS A. HAWTHORNE.

Witnesses:
JOHN D. MORGAN,
EDW. V. WENTS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."