E. V. WURTS & L. A. HAWTHORNE.

MACHINE FOR PUNCHING AND CUTTING ANGLE PLATES.

APPLICATION FILED AUG. 8, 1914.

1,241,260.

Patented Sept. 25, 1917.

4 SHEETS—SHEET 1.

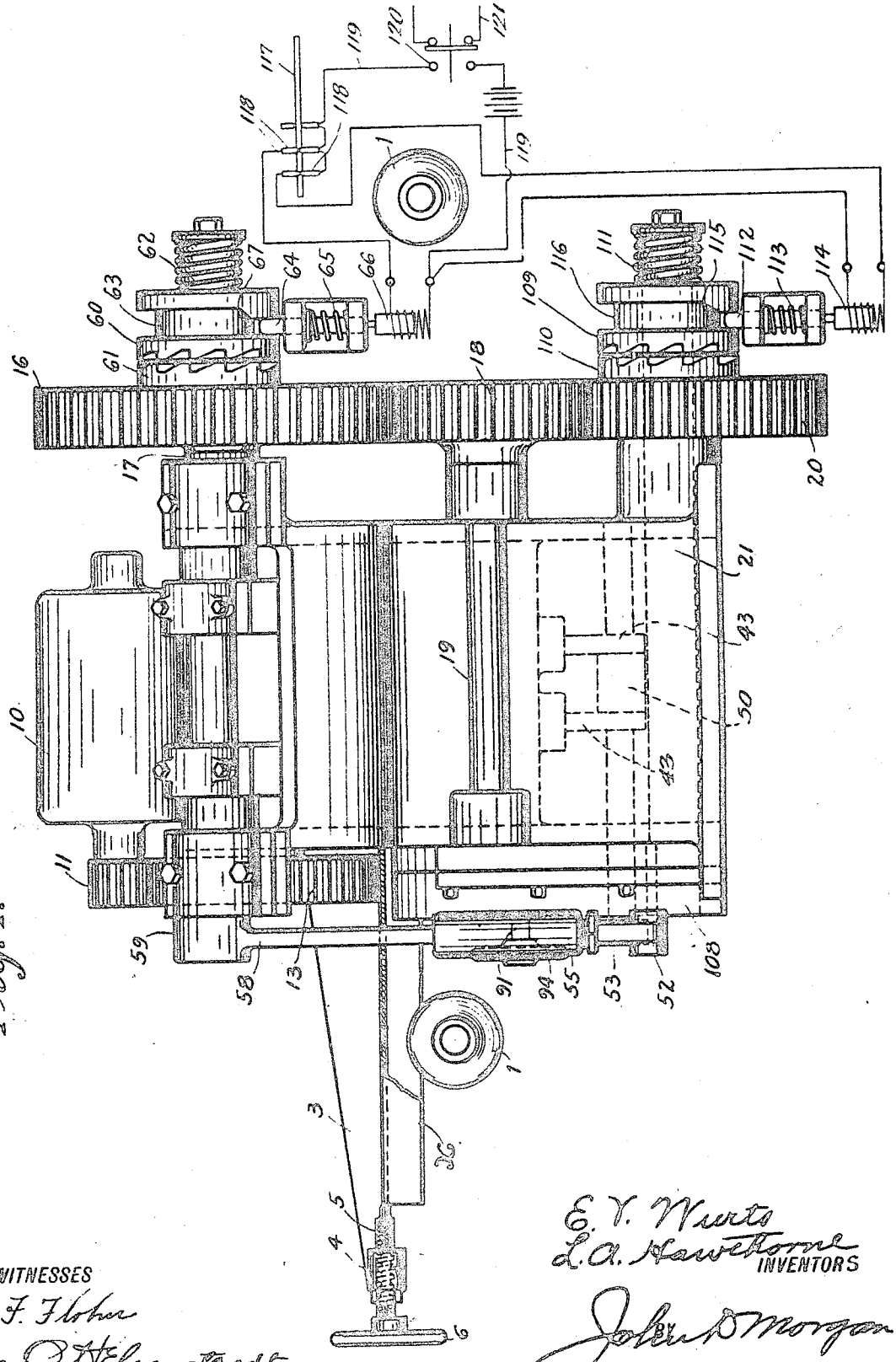


Fig. 1.

WITNESSES

K. F. Flohr

Geo. O. Helmstadter

E. V. Wurts

L. A. Hawthorne

INVENTORS

By John D. Morgan

ATTORNEY

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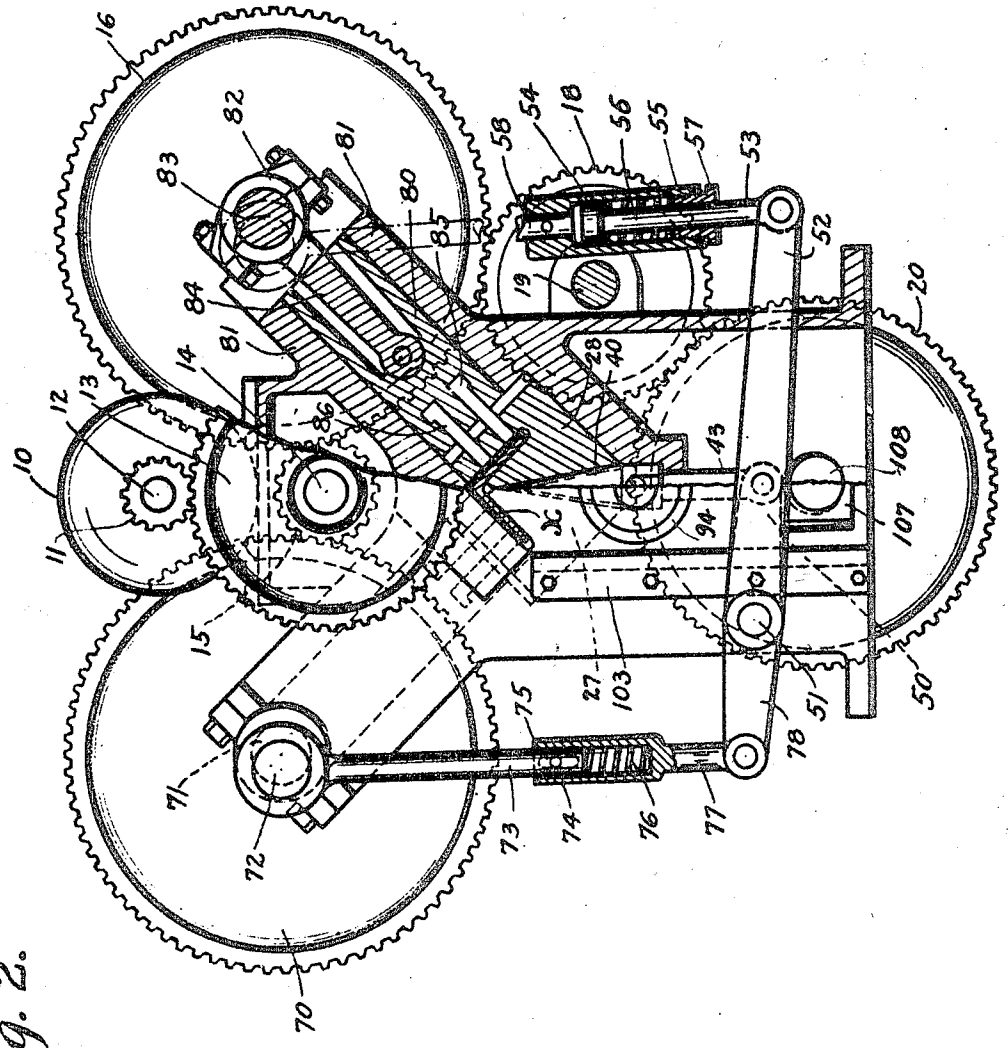


Fig. 2.

WITNESSES

H. F. Flohr

Geo. O. Helmstaedter

E. V. Wurts

L. A. Hawthorne

INVENTORS

BY John D. Morgan

ATTORNEY

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4 SHEETS—SHEET 3.

Fig. 4.

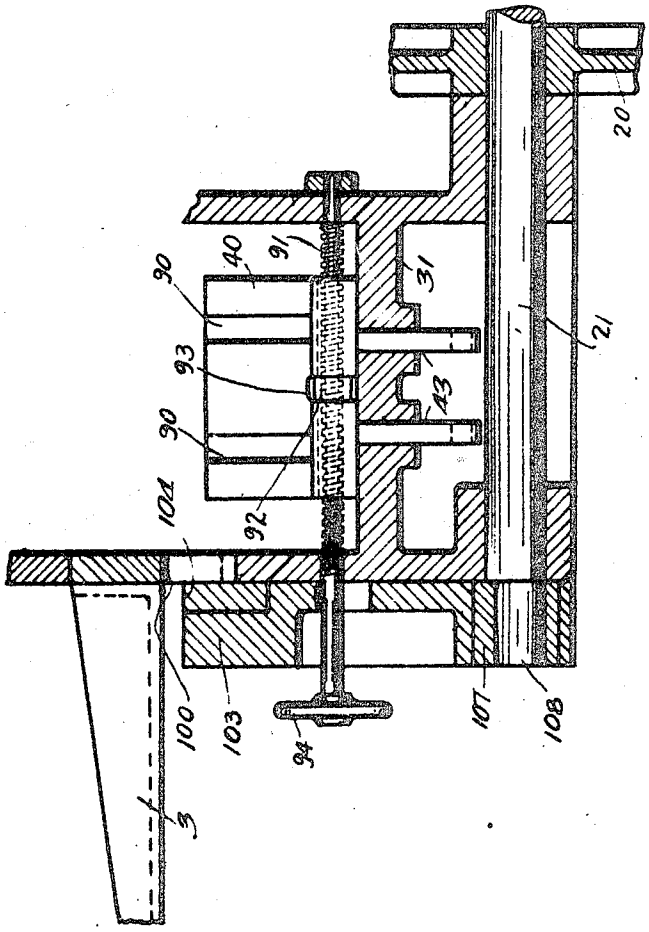
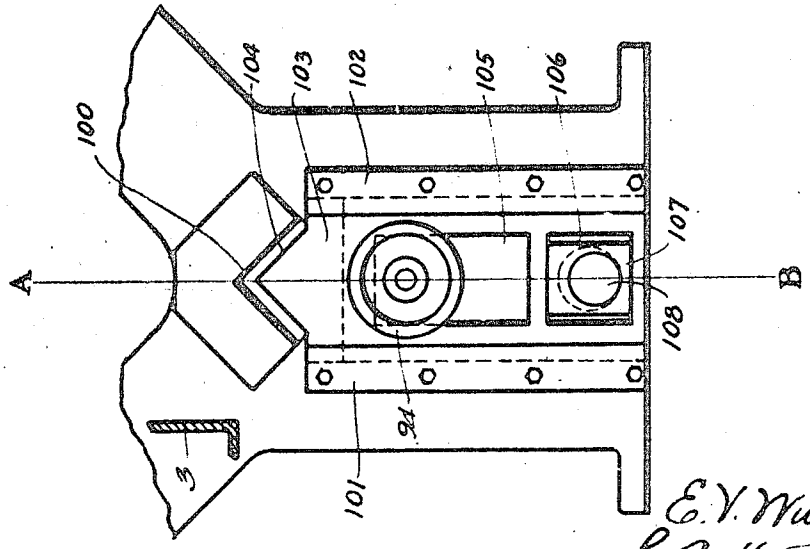


Fig. 3.



E. V. Wurts

L. A. Hawthorne

INVENTORS

WITNESSES

H. F. Flohr

Geo. A. Helmstaedter

John D. Morgan

ATTORNEY

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4 SHEETS—SHEET 4.

Fig. 6.

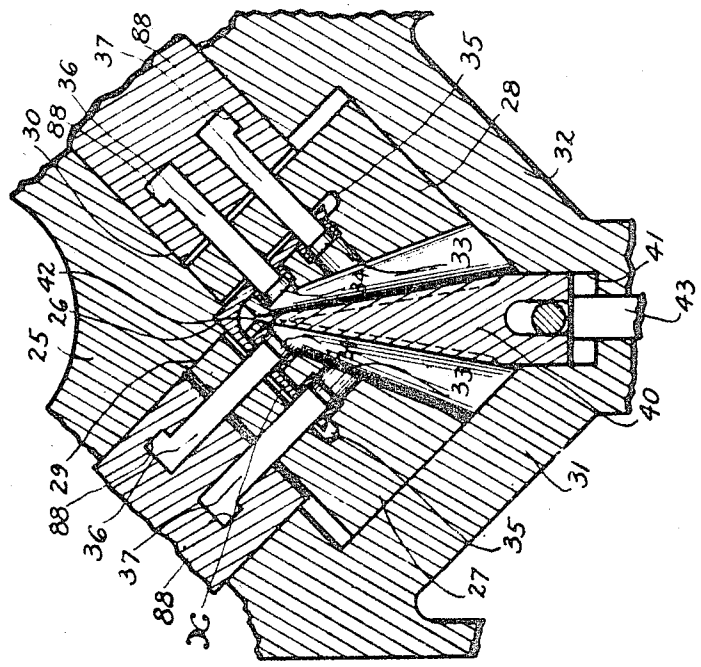
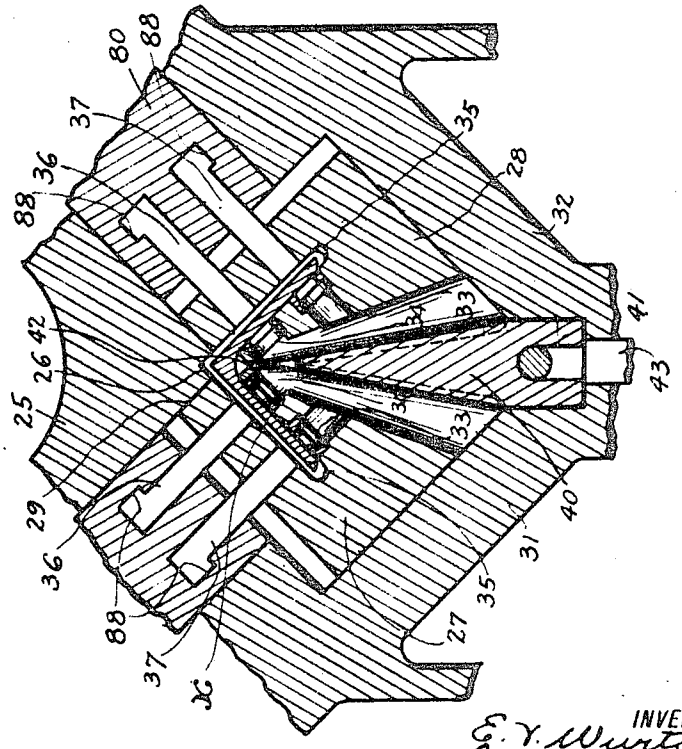


Fig. 5.



WITNESSES

H. F. Hohn

Geo. O. Helmstadter

INVENTORS

E. V. Wurts

L. A. Hawthorne

BY

John D. Morgan

ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD V. WURTS, OF PITTSBURGH, PENNSYLVANIA, AND LOUIS A. HAWTHORNE, OF NEWARK, NEW JERSEY, ASSIGNORS TO STEEL UTILITIES, INCORPORATED, A CORPORATION OF NEW YORK.

MACHINE FOR PUNCHING AND CUTTING ANGLE-PLATES.

1,241,260. Specification of Letters Patent. Patented Sept. 25, 1917.

Application filed August 8, 1914. Serial No. 855,817.

To all whom it may concern:

Be it known that we, EDWARD V. WURTS, of Pittsburgh, Pennsylvania, and LOUIS A. HAWTHORNE, of Newark, N. J., citizens of the United States, have made Improvements in Machines for Punching and Cutting Angle-Plates, of which the following is a specification.

The invention relates to machines for cutting and punching the rivet holes in angle plates for use in fabricating metal structures, and more especially to machines in which these operations are effected simultaneously or at one operation of the machine.

The objects and advantages of the invention will in part be set forth hereinafter, and in part will be obvious herefrom. The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

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

Of the drawings:

Figure 1 is an elevation of a machine constructed in accordance with the invention, and is a view looking at Fig. 2 from the right;

Fig. 2 is an elevation, with parts in section, looking at Fig. 1 from the left;

Fig. 3 is a fragmentary elevation of the lower part of Fig. 2; with parts removed.

Fig. 4 is a central section on the line A—B of Fig. 3, looking from the right, but showing wedge 40 in elevation;

Fig. 5 is a transverse fragmentary section, on an enlarged scale of the central part of Fig. 2 showing the parts in position to permit longitudinal travel of the angle bar; and

Fig. 6 is a figure corresponding to Fig. 5 but showing the parts with the work clamped or gripped, and at the completion of the punching operation.

Referring to the accompanying drawings, illustrating by way of example one embodiment of the invention, means are provided in the machine for feeding in from time to time as needed or used by the machine, a stock angle piece, from which the angles or angle plates are cut successively and punched with the requisite number of rivet holes, the stock piece being then fed forward for a repetition of the operation. In the embodied form of such means, a series of rolls 1 are provided, said rolls being preferably of double conoidal form, the angle bar or plate resting thereon in inverted position with its apex or vertex up. The roll or rolls at the left hand or delivery end are somewhat lower to facilitate the delivery of the punched and sheared angle plates. Suitable stopping and gaging means are also provided for regulating or varying the length of angle plate to be cut off. As embodied a bracket 3 is supported from the machine frame, and may be extensible in itself, if desired. Carried by the bracket 3 is an internally screw threaded support 4. Screwed in the internally threaded support 4 is a screw threaded rod 5 provided with a hand wheel 6. Driving mechanism of any convenient form is provided for the rolls 1 (not shown in the drawing).

In accordance with certain features of the invention, means are provided whereby a previously punched section is cut off while another section of the angle bar or piece is being punched or in position to be punched. Thus the measuring and gaging device operates both to position one section of the angle bar or plate for the cutting mechanism and to position or measure another section thereof for the punching mechanism.

In the embodied form of mechanism embracing the foregoing and other features of the invention, and describing first the driving mechanism, the embodied form thereof comprises a motor 10 mounted upon the machine frame and having a pinion 11 rotating with the motor shaft 12. Pinion 11 meshes with a gear 13 fixed to shaft 14, said shaft 14 extending transversely across the machine. Fixed upon the shaft 14 to rotate therewith is a pinion 15. Said pinion

15 is in mesh with a gear wheel 16, mounted loosely upon shaft 17 to rotate freely thereon. Meshing with pinion 16 is an intermediate gear 18 supported on a shaft 19, carried by the machine frame. Intermediate gear 18 drives gear 20, which gear 20 is mounted loosely on shaft 21 to rotate freely thereon.

Referring more particularly to the punching mechanism for the angle plates, means are provided for alternately holding the plate firmly for the punching operation and for then freeing it while it is fed forward to bring a new length into position to be punched, and moving the punched end forward to be cut. In the embodied form of such means, holding devices are provided acting at and near the vertex of the angle piece or plate to hold it firmly in position, and at the same time bringing the dies firmly against the two faces or sides of the angle plate preparatory to punching. In such embodiment a block or anvil 25 is carried upon the machine frame above the work. Said block 25 has a longitudinally arranged downwardly opening V-shaped guideway or recess 26 therein extending longitudinally of the machine just above the apex or vertex of the angle piece as it is fed forward by the rollers 1 into position to be punched. Adjacent to said block or anvil 25 are two slidably arranged die carrying blocks 27 and 28, mounted to slide in guideways formed by the lower, external faces 29 and 30 of the anvil 25 and by the upper faces of the inclined parts 31 and 32 carried upon or constituting a part of the machine frame. Said die blocks 27 and 28 also provide guideways for the angle piece and serve also as guides for the punches. As embodied each of said die blocks is of similar construction and provided with two series of dies 33 and 34. Above these series of dies each block is provided with a recess 35 extending longitudinally therethrough, the two legs or flanges of the angle piece x extending into said recesses, and traveling therealong during the feeding forward of the work. Suitable orifices and passageways communicate with the dies to permit the punchings to drop away. Guideways 36 and 37, in series corresponding to the dies, are provided for the punches.

Means are provided for permitting the die carrying blocks 27 and 28 to firmly press the dies against the angle plate x, and to press the angle plate x firmly against the V-groove 26 in anvil 25, and for alternately permitting the parts to move back into the disengaging position to permit the forward feed of the work. As embodied a wedge 40 is reciprocably mounted in a guiding aperture 41 in the machine frame. The apex of the wedge 40 fits between inclined faces 42 on the contiguous inner faces of the die carrying blocks 26 and 27. The wedge 40 is carried upon reciprocable rods 43, mounted in the machine frame.

Means are provided whereby the clamping and releasing of the angle bar x is effected, and further such means are provided operative when only one leg or flange of the angle bar x is being punched without necessitating the otherwise idle operation of the punches on the other side of the machine. As embodied said actuating rods 43 are pivotally connected to an arm or arms 50 fixed to a shaft 51, to which shaft is also fixed an arm 52. Pivotally connected to arm 52 is a link 53 provided with a head 54. Said head 54 slides within a hollow cylinder 55 and works against a coiled spring 56. Said spring 56 is coiled about the rod 53 and is in compression between the head 54 of said rod 53, and a head 57 screw-threaded into the end of the cylinder 55. Said cylinder 55 is fixed upon a rod 58, pivotally connected to a crank plate 59 on the left hand end of shaft 17, (Fig. 1).

Means are provided for starting the punching mechanism and for stopping it after one operation. As embodied, upon the right hand end of shaft 17 is shown a clutch connecting said shaft to driving gear 16 for a single revolution. As embodied a clutch member 60 is splined or otherwise arranged to slide along shaft 17 while rotating therewith. A corresponding clutch member 61 is fixed to and rotates with driven gear 16. Clutch member 60 is impelled toward the clutch member 61 by spiral spring 62. In the periphery of clutch member 60 is a cam groove 63 into which projects a spring pressed, slidable pin 64. The spring 65 acts to project pin 64 into the groove 63. Suitable means for retracting the spring 64 are provided, and as embodied a solenoid 66 is employed for this purpose, which solenoid may be electrically energized in a suitable manner, and this may be done from a perforated sheet such as is shown in application Serial No. 814,380, filed January 26, 1914 of T. P. Payne. The momentary retraction of the pin 64 permits the escape of the clutch member 60 which immediately engages the driven clutch member 61, and the shaft 17 begins to rotate. The pin 64 then reënters groove 63 and on engaging cam surface 67, clutch 60 is cammed out from clutch 61, and shaft 17 comes to rest having made one revolution.

During the rotation of shaft 17 the rod 58 and cylinder 55 are drawn upwardly. Under the compression of spring 56 and the movement of lever arms 52 and 50, the wedge 40 is yieldingly but powerfully driven between the die carrying blocks 27 and 28. The spring 56 may be regulated to give a

sufficient continuance of the requisite pressure upon the die blocks to permit the punching operation being performed while the angle plate is held clamped. When the wedge 40 is driven up, the die blocks are brought firmly against the inner sides of the two legs or flanges of the angle plate, and the vertex of the angle plate is pressed into the groove 26 and it is thus powerfully clamped for the punching operation.

Additional means for operating wedges 40 are provided, so that the clamping is effected, whether one or both legs of the angle plate are punched. In the embodied form, a spur gear 70 is in mesh with pinion 15, said spur gear being mounted upon shaft 71. A similar clutching device and control therefor (not shown) to that used upon the other side of the machine is provided. Pivotally connected to a crank plate 72 is a rod 73. Said rod 73 works in the interior of a hollow cylinder 74, having a pin and slot connection 75 therewith. A coil spring 76 is in compression between the end of the rod 74 and the bottom of cylinder 75. Cylinder 75 is continued as a rod 77 and said rod 77 is pivotally connected with a lever arm 78. Said lever arm 78 is fixed to shaft 51, already described in connection with the similar mechanism on the other side of the machine. The manner of operation will be the same or similar to that already described for the other side of the machine. Sufficient clearance will be provided in cylinders 55 and 75 to permit either the separate or joint action of the two mechanisms.

The punching means are duplicated on both sides of the machine to punch both legs of the angle x simultaneously or to punch either leg separately. The embodied form of punching means (see especially right hand side Fig. 2) comprises a reciprocable block 80, mounted in suitable guideways 81 in the machine frame. Said guideways extend upwardly, and at their upper end are provided with journals 82 for shaft 17. The central portion of shaft 17, between the journals 82 constitutes a crank 83 carrying a connecting rod 84, connected to the reciprocable block 80. The block 80 is provided with longitudinally arranged grooves 88 for the heads of punches 85 and 86, which punches are carried in the apertures 36 and 37 of the die blocks. The mechanism just described serves to punch the rivet holes in one leg or flange of the angle plate x. A similar mechanism, which need not be described in detail, is provided for the other leg of the angle plate and is operated from the shaft 71. The punches are thus driven down through the tightly clamped angle plates and then retracted preparatory to the release of the angle plate and the feed forward thereof. The position and movement of the parts is indicated by Figs. 5 and 6. In Fig. 5 the parts are shown loose and in position to permit the feed of the angle plate or bar x, and in Fig. 6 the angle is clamped and the punches are shown driven through the angle piece.

Means are provided for positioning the punches and dies and also the wedge 40 longitudinally with respect to the angle bar or stock piece x, and this also, with suitable positioning of stop 5, positions them with respect to the shear thereby providing for both the punching and shearing of angle plates of different sizes. As embodied, the die blocks 27 and 28 engage with the wedge 40 by means of vertically arranged tongue and groove connections 90 (referred to Fig. 4), whereby the die blocks and wedge will move together horizontally for positioning as stated, but are free to move relatively to each other during the wedging action. It will be understood also that the punches, which are reciprocably mounted in the apertures 36 and 37, will be carried along with the die blocks, sliding along in the grooves 88 in the punch actuating block 80, but being always in position to be actuated by block 80. A longitudinally arranged screw threaded rod 91 (referred to Fig. 4) extends within a recess in the bottom of wedge 40. Threaded on said screw rod 91 is a square nut 92, resting in an enlarged aperture 93 in the central bottom part of wedge 40. The nut rests also on the bottom of the groove 41 in the machine frame, so that it travels longitudinally when the rod 91 is turned, and when so traveling carries the wedge 40 and the die blocks with it. The screw rod 91 is provided with a hand wheel 94, and has suitable bearings in the machine frame.

The embodied form of cutting means comprises a shearing blade or edge 100 fixed upon the machine frame, just above the place of emergence of the punched angle plate x. Fixed upon the machine frame are vertical guides 101 and 102. Within these guides reciprocate a plate 103 having a V shaped shearing edge 104 corresponding to the shear edge 100. The plate 103 is recessed at 105 to clear the rod 91. The plate 103 is likewise recessed at 106. In the recess 106 is a horizontally slidable block 107. The block 107 has a cylindrical aperture therein within which aperture fits rotatably an eccentric end 108 of shaft 21. Upon shaft 21 is a clutch member 109 rotating with the shaft 21 but slidable therealong. A corresponding clutch member 110 is fixed to the driven gear 20. Clutch member 109 is impelled into engagement with clutch member 110 by spring 111, and is restrained by the pin 112. The pin 112 is projected by its spring 113 into cam groove 116 formed in clutch member 109. Retracting means such

as solenoid 114 are provided for momentarily withdrawing the pin 112 and permitting a single rotation of the shaft 21, and a consequent operation of the shear members 101 and 104. The cam 115 retracts the clutch member 109 to stop shaft 21, all the foregoing being similar to the clutch mechanism already described, and operating in the same manner. The successively punched and cut-off angle plates are fed out or discharged forwardly and downwardly by the roll 1 at the left in Fig. 1.

The two punching mechanisms and the cutting mechanism can be operated together, or singly as desired, by means of their various clutch controls, whether these be operated automatically or not.

In Fig. 1 is shown diagrammatically the automatic control for the clutches. A distance record sheet, or other controlling sheet 117, has coöperating therewith contacts 118. Contacts 118 are in circuit 119, in which circuit are also solenoids 66 and 114, previously described. The double-throw switch 120 releases one or both clutches when motor circuit 121 for the feed motor for feed rolls 1 is broken. The timing of the various shafts may be determined and regulated by the adjustment and placing of the gears.

It will be understood that the machine is adapted to punch both legs or flanges of the angle and to cut off the angle plates from a longer piece containing a multiple of angle plates, and to rapidly feed up the stock and make repeated punchings and cuttings or shearings of successive angle plates. Both legs or flanges of the angle plate may be punched at the same time, or only one may be punched if desired. The machine is readily arranged to operate upon angle plates of different sizes, including widely varying lengths, by reason of the clamping and punching mechanism and the shearing mechanism being variable or adjustable in their relative positions. The holding and releasing of the stock when a longer bar or plate is successively cut into angle plates is automatically effected and the stock automatically fed forward into position for the next punching and shearing operation. The setting and clamping of the work is automatic and accurate. The machine also produces standard connections which are absolutely interchangeable one way or the other. It will be understood further that the invention provides other advantages in addition to those pointed out.

The invention in its broader aspects is not limited to the constructions shown and described, but departures may be made therefrom within the scope of the accompanying claims, without departing from the principles of the invention and without sacrificing its chief advantages.

We claim—

1. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, said cutting means operating after the feed of each angle plate length.

2. A machine for operating upon angle plates including in combination automatically operating means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, said cutting means operating after the feed of each angle plate length.

3. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for clamping and releasing the angle bar between successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, said cutting means operating after the feed of each angle plate length.

4. A machine for operating upon angle plates including in combination automatically operating means for feeding an angle bar, means for determining the length of the successive feeds, means for clamping and releasing the angle bar between successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, said cutting means operating after the feed of each angle plate length.

5. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and a starting and stopping means for the punching mechanism.

6. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and starting and stopping means for both or either of the punching means and cutting means.

7. A machine for operating upon angle plates including in combination automatically operating means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and starting and stopping means for both the punching means and the cutting means.

8. A machine for operating upon angle

plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and a starting and stopping means for the punching mechanism, and a continuously running drive for the punching mechanism.

9. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and a starting and stopping means for the punching mechanism, and a common continuously running drive for both the punching and cutting mechanism.

10. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and a starting and stopping means for the cutting mechanism, and a continuously running drive for the cutting mechanism.

11. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and starting and stopping means for both the punching means and the cutting means, and a common continuously running drive for both the punching and cutting mechanism.

12. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and starting and stopping means for both or either of the punching means and cutting means, and a continuously running drive for the punching mechanism.

13. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and starting and stopping means for both or either of the punching means and cutting means, and a common continuously running drive for both the punching and cutting mechanism.

14. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and automatically operating starting and stopping means for the punching mechanism.

15. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and automatically operating starting and stopping means for the cutting mechanism.

16. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and automatically operating starting and stopping means for both or either of the punching means and cutting means.

17. A machine for operating upon angle plates including in combination automatically operating means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and automatically operating starting and stopping means for both or either of the punching means and cutting means.

18. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and automatically operating starting and stopping means for the punching mechanism, including a perforated sheet and devices coöperating with said perforations.

19. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths and automatically operating starting and stopping means for the cutting mechanism, including a perforated sheet and devices coöperating with said perforations.

20. A machine for operating upon angle plates including in combination means for feeding an angle bar, means for determining the length of the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and automatically operating starting and stopping means for both or either of the punching means and cutting means, including a perforated sheet and devices coöperating with said perforations.

21. A machine for operating upon angle plates including in combination automatically operating means for feeding an angle bar, means for determining the length of

the successive feeds, means for punching the successive lengths, and means for cutting the successive lengths, and automatically operating starting and stopping means for both the punching means and the cutting means, including a perforated sheet and devices coöperating with said perforations.

22. A machine for operating upon angle plates including in combination means for imparting successive feeds to an angle bar, means for punching said angle bar, means for cutting said angle bar, means for determining the amounts of the successive feeds of the angle bar, said last three means being relatively movable with respect to each other to punch and cut off angle plates of different lengths.

23. A machine for operating upon angle plates including in combination means for imparting successive feeds to an angle bar, means for punching said angle bar, means for cutting said angle bar, means for determining the amounts of the successive feeds of the angle bar, and devices for varying the distance between said cutting means and said punching means to punch and cut off angle plates of different lengths.

24. A machine for operating upon angle plates including in combination means for imparting successive feeds to an angle bar, means for punching said angle bar, means for cutting said angle bar, means for determining the amounts of the successive feeds of the angle bar, said last three means being relatively movable with respect to each other to punch and cut off angle plates of different lengths, and automatically operating means for giving a single actuation to said punching means and said cutting means.

25. A machine for operating upon angle plates including in combination means for imparting successive feeds to an angle bar, means for punching said angle bar, means for cutting said angle bar, means for determining the amounts of the successive feeds of the angle bar, and devices for varying the distance between said cutting means and said punching means to punch and cut off angle plates of different lengths, and automatically operating means for giving a single actuation to said punching means and said cutting means.

26. A machine for operating upon angle plates including in combination means for punching an angle bar, means for cutting said angle bar, means for determining the amounts of the successive feeds of the angle bar, said last three means being relatively movable with respect to each other to punch and cut off angle plates of different lengths, and automatically operating means for giving a single actuation to said punching means and said cutting means.

27. A machine for operating upon angle plates including in combination means for clamping an angle plate and means for punching both legs of the clamped angle plate, said clamping means including movable members acting against the inside face of the angle.

28. A machine for operating upon angle plates including in combination means for clamping an angle plate and means for punching either or both legs of the clamped angle plate, said clamping means including movable members acting against the inside face of the angle.

29. A machine for operating upon angle plates including in combination means for clamping an angle plate and means for punching both legs of the clamped angle plate, and a stop relatively movable with respect to said punching means for positioning the angle plate, and a shear located between said stop and said punching means.

30. A machine for operating upon angle plates including in combination a measuring stop, means for clamping an angle plate and means for punching either or both legs of the clamped angle plate, said punching means for the two legs being either separately or simultaneously operable, and a shear located between said stop and said punching means.

31. A machine for operating upon angle plates including in combination a measuring stop, means for clamping an angle plate and means for punching both legs of the clamped angle plate and means for feeding the punched angle plate away from the punching mechanism, and a shear located between said stop and said punching means.

32. A machine for operating upon angle plates including in combination a measuring stop, means for clamping an angle plate and means for punching both legs of the clamped angle plate, and a stop relatively movable with respect to said punching means for positioning the angle plate, and means for feeding the punched angle plate away from the punching mechanism, and a shear located between said stop and said punching means.

33. A machine for operating upon angle plates including in combination a measuring stop, punching devices for one leg of the angle plate, punching devices for the other leg of the angle plate, and separate actuating means for said two punching devices, said actuating means operating simultaneously or either operating alone, and a shear located between said stop and said punching means.

34. A machine for operating upon angle plates including in combination means for cutting an angle bar into plates, punching devices for one leg of the angle plate, punching devices for the other leg of the angle

plate, and separate actuating means for said two punching devices, said actuating means operating simultaneously or either operating alone, and a shear located between said stop and said punching means.

35. A machine for operating upon angle plates, including in combination punching devices for one leg of the angle plate, punching devices for the other leg of the angle plate, and separate actuating means for said two punching devices, said actuating means operating simultaneously or either operating alone, and means for increasing and decreasing the distance between said cutting means and punching devices to produce angle plates of different sizes.

36. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means operating within the angle plate for pressing the vertex of the angle plate thereinto, and means for punching the angle plate.

37. A machine for operating upon angle plates including in combination an anvil to receive the vertex of the angle plate, die carrying blocks, and means moving the die blocks for pressing the vertex of the angle plate into the anvil and the dies against the legs of the angle, and means for punching the angle plate.

38. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means operating within the angle plate for pressing the vertex of the angle plate thereinto, and means for punching either or both legs of the angle plate.

39. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching both legs of the angle plate, and means for positioning the punches longitudinally of the position of the angle plates.

40. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching the angle plate, and means for positioning the punches longitudinally of the position of the angle plate.

41. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching either or both legs of the angle plate, and means for positioning the punches longitudinally of the position of the angle plate.

42. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching both legs of the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, said shearing means being between said punching means and said stop.

43. A machine for operating upon angle plates including in combination an anvil to receive the vertex of the angle plate, movable die carrying blocks, and means moving said die blocks for pressing the vertex of the angle plate into the anvil and the dies against the legs of the angle, and means for punching both legs of the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, and means for varying the distance between the punched means and die block and the shearing means to produce angle plates of different sizes.

44. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, said shearing means being between said punching means and said stop.

45. A machine for operating upon angle plates including in combination an anvil to receive the vertex of the angle plate, die carrying blocks, and means for pressing the vertex of the angle plate into the anvil and the dies against the legs of the angle, and means for punching the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, said shearing means being between said punching means and said stop.

46. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching either or both legs of the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, said shearing means being between said punching means and said stop.

47. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching either or both legs of the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, and means for varying the distance between the punching means and die block and the shearing means to produce angle

plates of different sizes, said shearing means being between said punching means and said stop.

48. A machine for operating upon angle plates including in combination an anvil to receive the vertex of the angle plate, die carrying blocks, and means for pressing the vertex of the angle plate into the anvil and the dies against the legs of the angle, and means for punching either or both legs of the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, said shearing means being beween said punching means and said stop.

49. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching both legs of the angle plate, and means for positioning the punches longitudinally of the position of the angle plates, and actuating means remaining in operative relation with the punches in the various positions into which they may be moved, a stationary shear, and a movable stop on the opposite side of the shear from the punching means.

50. A machine for operating upon angle plates including in combination an anvil formed to receive the vertex of the angle plate, means for pressing the vertex of the angle plate thereinto, and means for punching both legs of the angle plate, means for shearing the angle plate, and an adjustable stop on the opposite side of said shear from said punching means, for positioning the angle plate, and actuating means remaining in operative relation with the punches in the various positions into which they may be moved.

51. A machine for operating upon angle plates including in combination means for punching in an angle bar a group of holes for an angle plate, means for positioning the angle bar, and shearing means for cutting off an angle plate, two of said means being adjustable along the angle bar and the other being stationary.

52. A machine for operating upon angle plates including in combination means for punching in an angle bar a group of holes for an angle plate, means for positioning the angle bar, and shearing means for cutting off an angle plate, at least two of said means being adjustable relatively to the third.

53. A machine for operating upon angle plates including in combination an anvil to receive the vertex of the angle plate, die carrying blocks, and means for pressing the vertex of the angle plate into the anvil and the dies against the legs of the angle, and means for punching the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, and means for varying the distance between the punching means and die block and the shearing means to produce angle plates of different sizes, and actuating devices remaining in operative relation with said punching means and shearing means in the various changes of distance therebetween.

54. A machine for operating upon angle plates including in combination an anvil to receive the vertex of the angle plate, die carrying blocks, and means for pressing the vertex of the angle plate into the anvil and the dies against the legs of the angle, and means for punching either or both legs of the angle plate, means for shearing the angle plate, and an adjustable stop for positioning the angle plate, and means for varying the distance between the punching means and die block and the shearing means to produce angle plates of different sizes, and actuating devices remaining in operative relation with said punching means and shearing means in the various changes of distance therebetween.

55. A machine for operating upon angle plates including in combination two blocks, each of said blocks being slotted to receive one leg of the angle, and each block having an aperture in which a punch is mounted and having a die on the opposite side of the slot therefrom, an anvil opposed to both said blocks and having a recess therealong for receiving the vertex of the angle plate, and means for pressing said dies against the angle legs and the vertex of the angle against the anvil.

56. A machine for operating upon angle plates including in combination two transversely movable blocks, each of said blocks being slotted to receive one leg of the angle and each block having an aperture in which a punch is mounted and having a die on the opposite side of the slot therefrom, an anvil opposed to both said blocks and having a recess therealong for receiving the vertex of the angle plate, and means for moving said die block transversely to press said dies against the angle legs and the vertex of the angle against the anvil.

57. A machine operating upon angle plates including in combination an anvil shaped to receive the vertex of an angle plate, two blocks transversely slidable on the inner faces of the angle legs, and means for forcing said blocks perpendicularly against the inner sides of the angle legs.

58. A machine for operating upon angle plates including in combination an anvil shaped to receive the vertex of an angle plate, two blocks transversely slidable on the inner faces of the angle legs, and a wedge for forcing said blocks perpendicu-

larly against the inner sides of the angle legs.

59. A machine for operating upon angle plates including in combination an anvil shaped to receive the vertex of an angle plate, two blocks transversely slidable on the inner faces of the angle legs, and a resiliently driven wedge for forcing said blocks perpendicularly against the inner sides of the angle legs.

60. A machine for operating upon angle plates including in combination means for punching in both legs of an angle bar a group of holes for an angle plate, a stationary shear for cutting off the punched angle plate from the bar, and a stop on the opposite side of the shear from the punching means, the punching means and stop being positionable toward and away from the shear.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

EDWARD V. WURTS.
LOUIS A. HAWTHORNE.

Witnesses:
H. F. FLOHN,
F. C. TAFT.